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Rialáil Cumarsáide
Commission for
Communications Regulation

Multi Band Spectrum Award - Response to Consultation and Decision

The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and
2.6 GHz Bands

Response to Consultation and Decision

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Executive Summary

Introduction

1. Mobile and wireless broadband services are an essential part of our everyday lives, at home, at work and on the move. Mobile voice services now account for 84% of total voice traffic in Ireland and users are consuming an average 10.1 GBs of mobile data a month, representing an increase of 40% compared to this time last year, and 153% more compared to just three years ago¹. These trends are only likely to accelerate as Ireland moves forward, with more and more functions and greater functionality shifting to the mobile sphere.
2. To meet these demands for mobile services, service providers are adding greater capacity and coverage, using a variety of means including the deployment of new infrastructure, more efficient wireless technologies and the use of additional radio spectrum.
3. Efficient distribution and use of radio spectrum is an important aspect of fostering and facilitating these developments. Radio spectrum is a scarce and valuable² national resource which is managed by the Commission for Communications Regulation (“ComReg”). An important part of this function is the assignment of spectrum rights of use for electronic communications services (“ECS”) in a manner that furthers ComReg’s statutory objectives³.
4. Spectrum awards, and particularly those suitable for the deployment of mobile and wireless broadband services, are very important events which only occur every few years and which have economy-wide impact. The last major award was in 2017 for the 3.6 GHz band⁴, a 5G candidate band, and before that in 2012 for the 800 MHz, 900 MHz and 1800 MHz bands⁵. Both awards were instrumental in promoting effective competition including new market entry, and the rollout of existing and new services, including 5G, for the benefit of Irish users.
5. This spectrum award is every bit as important. It is central to meeting the European Commission’s 5G for Europe Action Plan, a strategic initiative which

¹ Source: [ComReg Quarterly Key Data](#) as of Q3 2020.

² Based on company financial records and data from the national accounts data for 2016, Frontier Economics Ltd. estimated that the use of radio spectrum in Ireland contributed €6.2bn to the economy in 2016, accounting for around 3.5 % of Gross National Income (GNI), when modest multiplier effects are taken into account. Source: ComReg Document [18/118a](#), “The economic contribution of radio spectrum to Ireland”, December 2018.

³ Including promoting effective competition, promoting the interests of users, and ensuring the effective management and efficient use of spectrum in Ireland.

⁴ See 3.6 GHz band award webpage - <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/3-6ghz-band-spectrum-award/>

⁵ See 2012 MBSA webpage - <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/multi-band-spectrum-award-2012/>

concerns all stakeholders, private and public, small and large, in all Member States, to meet the challenge of making 5G a reality⁶. It is therefore no exaggeration to say that the speedy progress of the Award is an important aspect of general economic and social development in Ireland for the foreseeable future.

The Spectrum Award – the importance of the spectrum bands

6. As set out at Chapter 10 of this document, and following a detailed and comprehensive consultation process as outlined in Chapter 2, ComReg’s decision is to hold a multi-band spectrum award to assign long-term rights of use across four complementary and substitutable spectrum bands all of which are suitable for mobile and wireless broadband (“WBB”) services (the “Award”). These spectrum bands are the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz bands⁷, which are harmonised at European level for the provision of WBB services. This spectrum award is important for several reasons.
7. This award comprises **470 MHz** of harmonised spectrum rights, which represents a **46% increase** in the harmonised spectrum assigned for the provision of WBB services in Ireland. This will significantly enable operators to provide improved services to meet ever-increasing consumer demand.
8. The **700 MHz band** (termed a ‘coverage’ band) is an important band for the provision of widespread coverage, including in rural areas and on national transport routes, and is highly suitable for the provision of existing 4G and, over time, new 5G services. This is especially important in Ireland, given our challenging demographic characteristics and the high and exponential costs associated with deploying very high levels of coverage⁸.
9. Indeed, Ireland has one of the most widely distributed and rural populations in Europe. Ireland’s population density of 70.9 people per km² is considerably lower than the EU average of 118 people per km² (Eurostat⁹). In Irish rural areas, the density of population is only 27 people per km². Spectrum below 1 GHz (“sub-1 GHz”) is critical to meeting this coverage challenge.
10. There is also an immediate and concrete demand for spectrum rights in this band, ably demonstrated by its application when assigned temporarily by ComReg¹⁰ to

⁶ See <https://ec.europa.eu/digital-single-market/en/5g-europe-action-plan>

⁷ The 700 MHz band (703 – 733 / 758 – 788 MHz);
The 2.1 GHz band (1920 – 1980 / 2110 – 2170 MHz);
The 2.3 GHz band (2300 – 2400 MHz); and
The 2.6 GHz band (2500 – 2690 MHz).

⁸ ComReg Document 18/103, “Improving connectivity in Ireland, Challenges, solutions and actions”, 30 November 2018.

⁹ See <https://ec.europa.eu/eurostat/databrowser/view/tps00003/default/table?lang=en>

¹⁰ See COVID-19 Temporary Spectrum Management Measures webpage - <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/covid-19-temporary-spectrum-management-measures/>

help address the extraordinary circumstances presented by COVID-19. The 700 MHz band also has other important timing considerations:

- a. EU Decision 2017/899¹¹ obliges Ireland to “*allow the use*” of this band for the provision of WBB services by 30 June 2020; and
 - b. Ireland’s national roadmap for the 700 MHz band¹² envisages an award process starting shortly in Q1 2021.
11. The 2.1 GHz, 2.3 GHz and 2.6 GHz bands (termed the ‘performance’ bands) are ideally suited to providing network capacity, if used for mobile, although they can also be used for both capacity and coverage purposes (such as for fixed wireless broadband).
 12. Of these bands, the 2.1 GHz band is already in use for 3G services¹³, and extended to 4G services under the temporary spectrum rights. Notably, the inclusion of the 2.1 GHz band in the award provides opportunity for the three existing licensees to acquire continuation spectrum rights in advance of licence expiry.
 13. Including both ‘coverage’ and ‘performance’ bands in the same award encourages greater participation and competition in the award and downstream, including from potential new entrants. It provides an opportunity for different types of award participants, with potentially different intended uses and technologies, to participate and secure a comprehensive portfolio of spectrum rights of use across different bands.

Key aspects of the Spectrum Award

14. At a high level of generality, ComReg’s objectives via the Award include improving mobile coverage in Ireland (including specific coverage obligations), ensuring efficient allocation of spectrum, sustaining strong and stable competition in mobile markets, ensuring the timely availability of spectrum, the promotion of competition, and avoiding distortions of competition. These issues (and others) are developed in some detail in this document but a number of salient points bear emphasis at this stage.
15. In line with its obligation to promote competition, ComReg will award rights to these bands by way of an **open, competitive award process** where existing operators and potential new entrants can compete for these spectrum rights. We have considered a wide range of potential options in this connection and the

¹¹ [Decision \(EU\) 2017/899](#) of the European Parliament and of the Council of 17 May 2017 on the use of the 470-790 MHz frequency band in the Union.

¹² “Ireland’s National Roadmap on the Use of the 700 MHz Frequency Band, Update to Roadmap published in March 2019”, published May 2020.

¹³ These spectrum rights of use are due to expire in 2022 for Three and Vodafone, and 2027 for Eir.

particular form of open, competitive award process we will use is a form of combinatorial clock auction (“CCA”) to award the spectrum – see further below.

16. Further, and in line with European obligations, the spectrum rights are to be awarded on a **technology and service neutral** basis, meaning that new licensees will be free to deploy equipment that complies with the applicable harmonised standards, for mobile, fixed wireless and/or other uses. Without limiting the uses to which the rights of use of spectrum may be put, ComReg expects this award to be particularly suitable for enabling advancements in current 4G services while enabling the delivery of important new 5G services.
17. The **licence duration** will be 20 years for rights in the 700 MHz, 2.3 GHz and 2.6 GHz bands, with a corresponding shorter duration for rights in the 2.1 GHz band to facilitate a common expiry date for all the bands in the Award.

Auction Format

18. As noted above, having considered a number of different auction formats, ComReg is using a CCA auction format to ensure the efficient assignment of multiple substitutable and complementary bands.
19. While ComReg has used a variety of award formats in recent years, this award format has previously been used in Ireland for the successful award of spectrum rights in the 800 MHz, 900 MHz and 1800 MHz bands in 2012, and spectrum rights in the 3.6 GHz band in 2017, as well as extensive use internationally, including elsewhere in the EU.
20. Key features of this format include the following:
 - a. Package bidding which is necessary for bidders to manage the otherwise significant aggregation risk in the award (which arises as a result of complementarities between bands, between time slices, and because of minimum requirements in a band, especially for potential entrants);
 - b. Switching rules for bidders who wish to express a range of demand and their relative value for many different packages of lots that are substitutes;
 - c. An approach that selects a winning combination of bids from the pool of all feasible combinations of bids made in the course of the auction; and
 - d. Minimum revenue core (MRC) pricing which incentivises bidders to reflect their valuations for alternative packages of spectrum while also **minimising the amount** that bidders pay subject to each winner (and group of winners) paying its opportunity costs.

This approach provides good incentives for all bidders, large and small, to express potentially complex preferences over different packages of spectrum across the various bands. It encourages bidders to compete for additional spectrum in line with valuation and is likely to promote an efficient outcome.

21. Furthermore, ComReg will provide additional helpful information to bidders during the course of the auction clock rounds to help bidders assess the financial exposure resulting from their bids. This additional information is unlikely to risk distorting the outcome of the Award Process. This new feature, known as Exposure Pricing, was developed following feedback from respondents and will be provided as part of the information policy for the award.
22. A possible outcome of this Award is that winning bidders may pay different prices for spectrum, a common feature of spectrum awards. However, bidders paying comparable amounts is not an objective of the Award in its own right. Rather, one of ComReg's main objectives is to ensure the efficient assignment and use of the radio spectrum. Asymmetric prices may be entirely necessary in achieving such objectives particularly in the presence of complementarities and where bidders are in different starting positions by virtue of existing spectrum holdings.

Coverage

23. ComReg is fully committed to maximising coverage for mobile services, not least because, as noted above, Ireland retains a relatively high rural focus in terms of user dispersal and concentration. In considering coverage obligations for the 700 MHz band, ComReg has considered various options, including the use of 'precautionary' and 'interventionist' coverage obligations¹⁴, where:
 - 'precautionary' coverage obligations refer to obligations which would not exceed the levels of coverage that might be expected anyway from well-functioning competition between network operators; and
 - 'interventionist' coverage obligations refer to obligations that can be expected to constrain the commercial choices of network operators and force coverage in excess of competitively determined levels.
24. As outlined in its Regulatory Impact Assessment ("RIA") on this issue, and following consideration of the various options available to it, ComReg's approach is to set coverage obligations which are precautionary in nature and towards the upper end of the range of commercially realistic competitive outcomes. Among other things, this will promote the efficient use of spectrum and safeguard competition in the Award. This underpins the role of competition between network operators in driving forward coverage, while also precluding outcomes where spectrum rights might remain unassigned due to any excessive obligations.

¹⁴ See further in ComReg Document 18/103d.

25. ComReg's coverage obligations for the 700 MHz band will be required to be achieved over a period of 3 to 7 years and, among other things, will oblige existing licensees¹⁵ to expand their current networks to provide and maintain¹⁶:
- a 3 Mbit/s service to 99% of the population and 92% of the geographic area of Ireland;
 - a 30 Mbit/s service¹⁷ to 95% of the population, 90% of motorways, and 80% of primary roads; and
 - a 30 Mbit/s service to 345 specific locations¹⁸, consisting of 40 business and technology parks (including "strategic sites"), 65 hospitals, 24 higher education campuses, 14 air and seaports, 160 train and bus stations, and 42 top visitor attraction information points.
26. ComReg is also putting in place additional obligations to improve indoor voice and text coverage and quality of service. These obligations¹⁹ will require that licensees deploy and maintain Voice over LTE (VoLTE)²⁰ and Native Wi-Fi²¹ technologies within 2 years.
27. ComReg received limited submissions in support of stronger 'interventionist' coverage obligations. Taking this into account, together with the views of its expert advisors and being particularly mindful of the timing obligations and clear benefits of a prompt award of rights of use in the 700 MHz band, ComReg will include the precautionary coverage and other obligations outlined in this Award.

¹⁵ ComReg imposes different obligations on new entrants.

¹⁶ The 3 Mbit/s and 30 Mbit/s services identified in these coverage obligations refer to single user throughput services at the cell edge.

¹⁷ A 30 Mbit/s service obligation applies where an existing licensee obtains 2 × 10 MHz or more of 700 MHz band in the Award. A lower throughput obligation (20 Mbit/s) applies where it obtains 2 × 5 MHz of the 700 MHz band.

¹⁸ In considering these specific locations ComReg has had regard to the output of the Mobile Phone and Broadband Taskforce which provided a guidance [report](#) on the broad categories of locations where mobile services should be available. Based on a ranking of the benefits (economic, societal, safety) of different location categories, it provides the following conclusions:

- 1) *There is a clear emphasis on the provision of mobile phone coverage at locations where large numbers of people work or spend typical working hours. It should be noted that often people do not live where they work.*
- 2) *Residential locations and locations where people pass their free time were the next most important type of location.*
- 3) *Quiet roads, rail lines, cycleways, walking routes and locations where low numbers of people work were considered the lowest priority for mobile phone coverage.*

¹⁹ Under certain conditions

²⁰ Voice over LTE (VoLTE) is a managed voice service that benefits from prioritisation over other traffic.

²¹ With native Wi-Fi calling, calls and texts on a smartphone, rather than going through the mobile network directly, instead use the available Wi-Fi connection. Native Wi-Fi is particularly relevant for Ireland given the challenges in providing mobile connectivity to all premises and the use of modern building materials which can significantly impair the availability of radio signals indoors. The advent of the National Broadband Plan seems likely to increase its ability even further.

28. ComReg remains prepared to assist the State in any subsequent step it may wish to pursue by which to procure coverage outcomes beyond market-driven levels. There are clear advantages in conducting such a step following this award process, including:

- Being able to see what the proposed precautionary obligations and competition between operators deliver first; and
- Better ensuring that the societal benefits obtained from any intervention exceed the costs of imposing them.

29. In relation to the 2.1 GHz, 2.3 GHz and 2.6 GHz bands, ComReg is obliging licensees to deploy a specific number of base stations in each portion of the bands in order to ensure the efficient use of spectrum and promote competition.

Spectrum competition caps

30. As noted above, ComReg is in principle keen to have open competitive bidding in the Award. Consistent with our statutory duties, however, we have also considered the state of competition in the provision of mobile services to see whether there are any competition concerns which should be addressed in designing the Award.

31. Downstream retail services in Ireland have relatively high concentration levels on the supply side, with only three principal own-network mobile network operators (“MNOs”). In this basic context, we have considered whether certain possible outcomes of the Award with respect to relevant spectrum distributions could, bearing in mind current spectrum holdings, give rise to concerns about the strength of competition for mobile services in Ireland. A particular concern we have identified would be if the auction resulted in very asymmetric shares of spectrum amongst the MNOs. We therefore impose specific caps in relation to both sub- and super-1 GHz on the proportion of spectrum designated for mobile services which a single bidder may hold as a result of the award. This cap is consistent with past auctions conducted by ComReg, as well as the widespread use of caps in spectrum auctions in other jurisdictions. This measure will therefore limit the spectrum which operators can acquire in the award, so as to avoid potential distortions of competition.

32. More specifically, ComReg will employ two sets of spectrum competition caps for the duration of this award – a sub-1 GHz cap of 70 MHz and an overall cap of 375 MHz. The calculation of these spectrum competition caps would encompass existing spectrum holdings, since it is the potential post-auction aggregate position that needs to be considered in terms of the impact on competition.

33. The sub-1 GHz spectrum competition cap recognises that the 700 MHz band and other sub-1 GHz spectrum bands are likely to have an important role in

determining the cost to network operators of delivering wide-area mobile telecommunications services, especially in rural areas. This is an important consideration in promoting and safeguarding competition given Ireland's particular demographics and the limited supply of critical sub-1 GHz spectrum, noting that even after the release of the 700 MHz band there will be only 190 MHz in total of sub-1 GHz spectrum available.

34. The overall spectrum competition cap is designed to strike a balance between avoiding excessive asymmetry in post-award spectrum holdings whilst also not unduly restricting competition within the award process.
35. The use of appropriate spectrum competition caps is particularly relevant to Ireland following the 2014 merger of Three and O2 which reduced the number of MNOs from 4 to 3 and resulted in Three having a larger amount of both sub-1 GHz and overall spectrum holdings than other MNOs. The **consideration of existing spectrum holdings** is important in safeguarding against the possibility of extreme asymmetric outcomes, as operators use all spectrum holdings available when providing mobile telecommunications services and not just the spectrum obtained in the latest award process.
36. Counting existing spectrum holdings in determining the spectrum competition cap, is a common practice internationally. For instance, Ofcom, the UK communications regulator, will impose a 'safeguard cap' on total mobile spectrum to ensure that the 700 MHz and 3.6 – 3.8 GHz award does not lead to a significant asymmetry in spectrum holdings²². The specifics of the UK award will be well-known to the Irish MNOs, given that two of the three, Three and Vodafone, are active in the UK market and one of those, Three, has a shared CEO.
37. As the current spectrum holdings of Irish MNOs vary, it follows that they are not starting from equal positions and each will have their own valuations for the additional radio spectrum on offer. Consequently, the spectrum competition cap for the Award will naturally affect each operator differently.

Next Steps

38. Following this decision, ComReg will advance its response to consultation and publication of the Information Memorandum during Quarter 1, 2021 which will commence the Award Process. The Information Memorandum, when published, will be an implementation of, and will reflect the Decision made in this document.
39. Subsequently, ComReg will present the draft licensing regulations for the consent of the Minister for the Environment, Climate and Communications. Following ministerial consent, ComReg will accept applications to the Award Process.

²² See <https://www.cullen-international.com/client/site/documents/CTSPEU20200054> (Cullen International).

Chapter 1

1 Introduction

- 1.1 The purpose of this document is to set out the Commission for Communications Regulation's ("ComReg") response to consultation and its decision concerning its proposed award of a limited number of individual rights of use in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz bands²³ (the "Proposed Bands") (the "Proposed Award").
- 1.2 All these spectrum bands are harmonised at a European level for the provision of wireless broadband ("WBB") services, including mobile services, and in total ComReg proposes to award rights of use in respect of 470 MHz of harmonised spectrum. This would represent a 46% increase in the harmonised spectrum assigned for the provision of WBB services in Ireland and would significantly enable the market to deliver improved services to meet increasing consumer demand for mobile data and new services.
- 1.3 In arriving at the decision set out in this document ComReg has had regard to its statutory functions, objectives and duties relevant to its management of the radio frequency spectrum, the most relevant of which are summarised in Annex 2. ComReg has also had regard to all relevant information available to it, which includes amongst other things:
- all submissions received²⁴ throughout this consultation process²⁵;
 - the independent expert advice and recommendations of:
 - DotEcon Ltd. ("DotEcon") its economic and award design consultant²⁶;
 - Plum Consulting London LLP ("Plum") its technical consultant²⁷,

²³ The 700 MHz Duplex Band (703 – 733 / 758 – 788 MHz);
The 2.1 GHz Band (1920 – 1980 / 2110 – 2170 MHz);
The 2.3 GHz Band (2300 – 2400 MHz); and
The 2.6 GHz Band (2500 – 2690 MHz).

²⁴ Including submissions made to Documents 14/101 (as relevant to the Proposed Award), 18/60, 18/103, 19/59R, 19/124, 20/32, 20/56 and 20/78.

²⁵ Documents relating to the Proposed Award are available on ComReg's website at: <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/proposed-multi-band-spectrum-award/>

²⁶ Including Documents 14/102, 19/59a, 19/59b, 19/124a, 20/122a.

²⁷ Including Documents 19/59c, 19/59d, 19/124c, 19/124d, 20/122b.

- LS telecom UK Ltd (“LS telecom”) on the spectrum management options for terrestrial Broadband Public Protection and Disaster Relief (“BB-PPDR”)²⁸; and
- Frontier Economics Ltd (“Frontier”), Oxera Consulting LLP (“Oxera”) with Real Wireless Ltd (“Real Wireless”) and DotEcon on connectivity²⁹;
- various background information, international decision documents and international developments relating to the Proposed Bands (see chapter 2 and Annex 3); and
- its most recent Radio Spectrum Management Strategy Statement³⁰ and its electronic communications services strategy³¹.

ComReg’s most recent consultations

1.4 ComReg has consulted extensively on the Proposed Award³², with the most recent consultation documents being:

- Document 19/124³³, where ComReg set out its response to consultation Document 19/59R³⁴ and its preliminary positions on its detailed proposals including its draft Decision for the Proposed Award;
- Document 20/32³⁵, where ComReg set out its draft Information Memorandum (Draft IM) detailing and consulting on the rules and procedures that ComReg proposed to employ in the implementation of its substantive proposals as set out in its draft Decision (Chapter 9 of

²⁸ Including Documents 19/59e and 19/124e.

²⁹ Including Documents 18/103a, 18/103b, 18/103c, 18/103d, 19/124b and 19/124f.

³⁰ Document [18/118](#), “Radio Spectrum Management Strategy Statement 2019 to 2021”, published 20 December 2018.

³¹ Document [19/09](#), “Strategy Statement 2019 – 2021: Public Consultation on Mid-term review of ComReg’s Five Year ECS Strategy”, published 25 February 2019.

³² Including Documents 14/101, 18/60, 18/103, 19/59R, 19/124, 20/32, and 20/56. See also Section 2.8 of this document for a chronology of the Proposed Award.

³³ Document [19/124](#), “Proposed Multi Band Spectrum Award - Response to Consultation and Draft Decision on the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands”, published 20 December 2019.

³⁴ Document [19/59R](#), “Proposed Multi Band Spectrum Award – including the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands”, published 18 June 2019.

³⁵ Document [20/32](#), “Proposed Multi Band Spectrum Award - Draft Information Memorandum and Draft Regulations”, published 13 May 2020.

Document 19/124). Document 20/32³⁶ also set out ComReg's proposals regarding the information policy on "Exposure Pricing"³⁷; and

- Document 20/56³⁸, where ComReg published an information notice requesting views from interested parties on five auction format options, some of which have multiple sub-options³⁹.

1.5 Five (5) responses were received to Document 19/124, being from:

- Eircom Ltd ("Eir");
- Imagine Communications Group Ltd ("Imagine");
- Mr. Liam Young;
- Three Ireland Hutchison Ltd ("Three"); and
- Vodafone Ireland Ltd ("Vodafone");

1.6 The non-confidential submissions to Document 19/124 are published in Document 20/56s⁴⁰.

1.7 Four (4) responses were received to Document 20/32, being from Eir, Imagine, Three and Vodafone. The non-confidential submissions to Document 20/32 are published in Document 20/68⁴¹.

1.8 Four (4) responses were received to Document 20/56, being from Eir, Imagine, Three and Vodafone. The non-confidential submissions to Document 20/56 are published in Document 20/78⁴². In addition, two (2) responses were received to Document 20/78, being from Eir and Three. The non-confidential submissions

³⁶ See Section 1.3 and Section 4.2.2 of Document 20/32.

³⁷ Exposure Pricing refers to the additional information that could be provided to bidders in the course of a Combinatorial Clock Auction (CCA) in terms of the final price a bidder would have to actually pay arising from bids made in the clock rounds.

³⁸ ComReg Document [20/56](#), "Proposed Multi Band Spectrum Award: Request for views from interested parties on auction formats including potential alternative options or modifications to ComReg's proposed auction format", published 06 July 2020.

³⁹ In the proposals put forward in the submissions to Document 19/124, views were submitted in relation to alternative auction formats and modifications to ComReg's proposed auction format, as well as a request from one respondent to carry out an additional Regulatory Impact Assessment ("RIA") on auction formats.

⁴⁰ Document [20/56s](#), "Proposed Multi-Band Spectrum Award - Publication of non-confidential submissions to Document 19/124", published 6 July 2020.

⁴¹ Document [20/68](#), "Proposed Multi Band Spectrum Award - Non-Confidential Submissions to ComReg Document 20/32", published 24 July 2020.

⁴² Document [20/78](#), "Proposed Multi Band Spectrum Award: Non-Confidential Submissions to ComReg Document 20/56", published 26 August 2020.

to Document 20/78 are published in Document 20/94⁴³.

1.9 In November and December 2020, ComReg also received submissions⁴⁴ from:

- Tesco Mobile Ireland Ltd (“Tesco Mobile”) in relation to Mobile Virtual Network Operators (MVNO) access; and
- Three in relation to a potential return of spectrum in the 900 MHz band.

1.10 ComReg is grateful for all submissions received to the above consultations and to the consultation process more generally. ComReg has given careful consideration to all the material submitted as well as to other relevant information before it.

This Document

1.11 This document sets out:

- ComReg’s response to consultation on the submissions received in response to ComReg’s most recent consultations⁴⁵, being the submissions received in response to Documents 19/124, 20/56 and certain submissions received in response to the Draft IM; and
- ComReg’s Decision concerning the Proposed Award.

1.12 In the interests of clarity, ComReg addresses all material submissions⁴⁶ received to the consultations listed in the following way:

- a) where a respondent raises a point which has previously been considered and assessed by ComReg during this consultation process, ComReg provides a reference to where the issue has already been considered;

⁴³ Document [20/94](#), “Proposed Multi Band Spectrum Award: Non-confidential Submissions to ComReg Document 20/78”, published 7 October 2020.

⁴⁴ Non-confidential versions of these submission are set out in Annex 15 and Annex 16 of this document.

⁴⁵ Submissions to previous consultations are considered in Documents 18/60, 19/59R and 19/124.

⁴⁶ ComReg has received a very large volume of submissions and materials from respondents on an iterative basis over an extended period of time. ComReg has at all material times endeavoured to respond to these submissions, and in particular to the material points contained therein. Equally, in this document, ComReg has endeavoured to deal with the material points raised by respondents, including by way of cross-reference to earlier documents setting out the Respondent’s position, and ComReg’s response, in more detail. This document does not therefore deal with every single submission made at any point by every respondent but focuses on the material issues. In not responding specifically to a particular respondent submission in this document, ComReg should not be taken as agreeing with it or in deviating from the position(s) taken earlier by ComReg as respects such submission(s).

- b) where a respondent raises a point which has previously been considered and assessed by ComReg during the consultation process on its Radio Spectrum Management Strategy Statement⁴⁷, ComReg provides a reference to where the issue has already been considered by ComReg;
- c) where new material or reasoning is submitted in support of a view, ComReg references and assesses these submissions in the appropriate section of this document; and
- d) submissions received to the Draft IM will be considered in a separate response document, save to the extent that they are relevant to ComReg's Decision (set out in Chapter 10 of this document).

1.13 ComReg is publishing alongside this document:

- an analysis prepared by ComReg's economic and award design expert, DotEcon, of submissions received in response to Documents 19/124, 20/32 (where relevant to ComReg's decision) and Documents 20/56 and 20/78 relating to the award design and format (published separately as Document 20/122a);
- an analysis prepared by ComReg's technical expert, Plum, updating its co-existence modelling of RurTel and aeronautical radar with Wireless Broadband (WBB) in the 2.3 and 2.6 GHz bands given updated information relating to same (published separately as Document 20/122b); and
- updated submissions to ComReg Documents 19/124, 20/32 and 20/56 (Document 20/122s).

Structure of this document

1.14 This document is structured as follows:

- **Chapter 2:** sets out some background information relevant to this consultation process and chronology;
- **Chapter 3:** sets out matters relevant to the bands to include in the Proposed Award and the type of award process to be used, having regard to ComReg's final Regulatory Impact Assessment (RIA) on same as set out in Annex 4;

⁴⁷ Document [18/118](#), "Radio Spectrum Management Strategy Statement 2019 to 2021", published 20 December 2018.

- **Chapter 4:** sets out matters related to the 2.1 GHz Band, including (i) the liberalisation of existing rights of use in the band, (ii) a mechanism for addressing the different expiry dates of existing licences in this band, and (iii) the use of time slices in the 2.1 GHz Band and in other substitutable bands;
- **Chapter 5:** sets out matters related to key aspects of the Proposed Award, including the band plans and compatibility considerations, the geographic scope of the licences, licence duration, lot sizes and fees;
- **Chapter 6:** sets out matters related to spectrum competition caps;
- **Chapter 7:** sets out ComReg's Regulatory Impact Assessment (RIA) regarding the appropriate auction format to use in the Proposed Award;
- **Chapter 8:** sets out matters related to the conditions to be attached to rights of use on foot of the Proposed Award, including conditions relating to coverage and rollout, quality of service, service and technology neutrality, and technical conditions;
- **Chapter 9:** sets out matters related to the transition issues that may arise as a consequence of the outcome of the Proposed Award and the need for Preparatory Licences;
- **Chapter 10:** sets out ComReg's Decision regarding the Proposed Award;
- **Chapter 11:** details the envisaged next steps in this process;
- **Annex 1:** includes a glossary of terms;
- **Annex 2:** summarises ComReg's statutory functions, objectives and duties relevant to the management of Ireland's radio frequency spectrum;
- **Annex 3:** provides updated information on equipment availability, award status in Europe, harmonisation decisions and spectrum availability for the spectrum bands considered in Document 19/124;
- **Annex 4:** sets out ComReg's final 'Spectrum for Award' RIA and 'Assignment Process' RIA and an assessment of the preferred options against ComReg's statutory powers, functions, objectives and duties;
- **Annex 5:** sets out ComReg's consideration of relevant submissions on the alignment of the different expiry dates of existing licences in the 2.1 GHz Band in 2022 and ComReg's final view on same;

- **Annex 6:** sets out ComReg's final RIA informing the liberalisation of existing rights of use in the 2.1 GHz Band and the timing considerations around same;
- **Annex 7:** sets out ComReg's assessment of submissions regarding the appropriate auction format for the Proposed Award;
- **Annex 8:** sets out ComReg's final RIA regarding indoor mobile voice and text coverage;
- **Annex 9:** sets out ComReg's final RIA regarding the coverage obligations for rights of use in the 700 MHz Duplex;
- **Annex 10:** sets out the specific locations related to the 700 MHz Duplex Coverage obligations;
- **Annex 11:** sets out ComReg's final RIA regarding the rollout obligations for rights of use in the 2.1 GHz, 2.3 GHz and 2.6 GHz Bands;
- **Annex 12:** sets out ComReg's final RIA regarding the quality of service ("QoS") (including voice over LTE ("VoLTE")) and network availability obligations;
- **Annex 13:** sets out the technical licence conditions applicable to the spectrum bands in the Proposed Award;
- **Annex 14:** sets out ComReg's consideration of Three's option to return sub-1 GHz spectrum;
- **Annex 15:** Correspondence with Three regarding a potential return of spectrum;
- **Annex 16:** Correspondence with Tesco Mobile;
- **Annex 17:** Correspondence with Eir; and
- **Annex 18:** sets out ComReg's consideration of other matters raised by respondents to Document 19/124, 20/32 and 20/58 which are not already addressed in the main body of this document and will not be addressed in ComReg's forthcoming response to consultation on the responses to Document 20/32.

Chapter 2

2 Background Information

2.1 In this Chapter, ComReg sets out some background information relevant to the Proposed Award, including information on:

- COVID-19 Temporary ECS licences;
- the spectrum bands for the Proposed Award (the “Proposed Bands”)⁴⁸;
- the connectivity studies published by ComReg in November 2018⁴⁹;
- spectrum management considerations in relation to Broadband Public Protection and Disaster Relief (BB-PPDR);
- the adoption of Directive (EU) 2018/172 establishing the European Electronic Communications Code (EECC) in December 2018;⁵⁰
- cybersecurity of 5G networks;
- Ireland’s National Broadband Plan; and
- chronology of the Proposed Award.

2.1 COVID-19 temporary spectrum rights

2.2 Since the publication of Document 19/124, and in response to the extraordinary situation presented by COVID-19⁵¹, ComReg has consulted upon and put in place two licensing frameworks (with the consent of the Minister^{52,53}) for the temporary assignment of spectrum rights in the 700 MHz Duplex, 2.1 GHz and 2.6 GHz bands. These are:

- the Temporary ECS licensing framework⁵⁴; and

⁴⁸ The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands.

⁴⁹ ComReg Documents 18/103, 18/103a, 18/103b, 18/103c and 18/103d.

⁵⁰ [Directive \(EU\) 2018/1972](#) of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code.

⁵¹ COVID-19 is a new illness that can affect your lungs and airways and is caused by a virus called SARS-CoV-2 (2019-nCoV) coronavirus.

⁵² The Minister for Communications, Climate Action and Environment.

⁵³ The Minister for the Environment, Climate and Communications.

⁵⁴ The Wireless Telegraphy (Temporary Electronic Communications Services Licences ([S.I. No. 122 of 2020](#)),) Regulations 2020 were made on 8 April 2020 with the consent of the Minister for Communications, Climate Action and Environment.

- the Further Temporary ECS licensing framework⁵⁵

- 2.3 Each of these licensing frameworks provide for the temporary assignment of spectrum rights in the 700 MHz Duplex, 2.1 GHz and 2.6 GHz bands for an overall period of up to 6 calendar months from the date of coming into operation of the relevant regulations.
- 2.4 To date, temporary spectrum rights in the 700 MHz Duplex and 2.1 GHz bands have been issued to all three MNOs, Meteor, Three and Vodafone, as detailed in Table 1 below,

Table 1: COVID-19 Temporary spectrum licences

Licensee	Spectrum Bands	Initial Temporary ECS Licence	Renewal Temporary ECS Licence	Initial Further Temporary ECS Licence
Meteor	700 MHz Duplex, 2.1 GHz Band	9 April 2020 to 8 July 2020	9 July 2020 to 7 October 2020	8 October 2020 to 7 January 2021
Three	700 MHz Duplex, 2.1 GHz Band	9 April 2020 to 8 July 2020	9 July 2020 to 7 October 2020	8 October 2020 to 7 January 2021
Vodafone	700 MHz Duplex, 2.1 GHz Band	22 April 2020 to 21 July 2020	22 July 2020 to 7 October 2020	8 October 2020 to 7 January 2021

- 2.5 Moreover, ComReg has recently granted a Temporary ECS Licence renewal to each of the three MNOs which runs from 8 January 2021 to 1 April 2021.
- 2.6 These temporary licensing frameworks are intended solely to address the exceptional and extraordinary situation presented by COVID-19 and are entirely without prejudice to the award of spectrum in the Proposed Award.
- 2.7 All respondents to ComReg's consultations on the COVID-19 temporary spectrum licensing frameworks have agreed with this key principle⁵⁶ and applicants for a temporary licence have accepted same in the Application

⁵⁵ The Wireless Telegraphy (Further Temporary Electronic Communications Services Licences) Regulations 2020 ([S.I. No. 407 of 2020](#)) were made on 2 October 2020, with the consent of the Minister for the Environment, Climate and Communications.

⁵⁶ See paragraphs 3.3 to 3.6 of ComReg Document 20/27, and paragraph 3.31 of Document 20/86. Documents available on <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/covid-19-temporary-spectrum-management-measures/>.

Declaration Form⁵⁷ when applying for a licence.

- 2.8 Given the extraordinary situation presented by COVID-19, the temporary licences were granted without a competitive selection process. However, the documents submitted as part of the process leading to the assignment of those licences makes it clear that there is real demand for spectrum, in at least the 2.1 GHz and 700 MHz Duplex bands, to serve the needs of consumers. This soundly justifies ComReg's view that it is appropriate to progress the award of long-term rights of use in respect of this spectrum as soon as possible.
- 2.9 In relation to ComReg's approach to any temporary spectrum licensing beyond the current framework, as noted in paragraph 4.29 of Document 20/86, ComReg will "*continue to monitor the situation over the term of any further licensing framework, including consideration of ongoing information provided by licensees and other operators (e.g. to the network industry forum) and other relevant information, to inform its approach.*" In this regard, ComReg:
- a) observes recent information that a COVID-19 vaccine rollout could begin early in 2021⁵⁸; and
 - b) intends to issue an Information Notice in January 2021 setting out the next steps in ComReg's consideration of any further temporary licensing framework. Similar to Document 20/64⁵⁹, ComReg envisages that this would suggest the submission of a joint or common request by the MNOs.

2.2 Information on the spectrum bands in the Proposed Award

- 2.10 This section sets out summary information⁶⁰ for the Proposed Bands in the context of:
- the degree of harmonisation;
 - equipment availability;

⁵⁷ See paragraph 4 of Part 6 of the Application Form (Document [20/88a](#)).

⁵⁸ For example:

- "[Vaccine rollout could begin early in New Year, says Donnelly](#)", The Irish Times, 29 November 2020,
- "[Covid-19 vaccine could be available in Ireland from January](#)", RTE, 02 December 2020.

⁵⁹ Document [20/64](#), "COVID-19 Temporary ECS Licensing, July 2020 update and next steps in considering any further temporary licensing framework.", published 21 July 2020.

⁶⁰ Annex 3 of this document sets out information in tabular form for the Proposed Bands and the spectrum bands previously considered in this consultation process.

- the availability of spectrum; and
- awards in other Member States.

2.2.1 Degree of harmonisation

2.11 In Annex 4 and Section 2.1.1 of Document 19/124, ComReg set out information on the international harmonisation status of the Proposed Bands. In summary, this indicated that the Proposed Bands were all harmonised via an ECC Decision and/or an EC Decision.

2.12 Since Document 19/124 was published, the European Commission (EC) has adopted two Implementing Decisions amending the technical conditions for the availability and efficient use of spectrum in the 2.1 GHz and 2.6 GHz bands. These are:

- Commission Implementing Decision (EU) 2020/636 of 8 May 2020 amending Decision 2008/477/EC as regards an update of relevant technical conditions applicable to the 2500 – 2690 MHz frequency band⁶¹; and
- Commission Implementing Decision (EU) 2020/667 of 6 May 2020 amending Decision 2012/688/EU as regards an update of relevant technical conditions applicable to the frequency bands 1920 – 1980 MHz and 2110 – 2170 MHz⁶².

2.2.2 Equipment availability

2.13 In Annex 4 and Section 2.1.2 of Document 19/124, and based on information from the Global mobile Suppliers Association (GSA)⁶³, ComReg set out information on the 4G (LTE) and 5G device availability in the Proposed Bands and noted that there was a high availability of LTE devices across the Proposed Bands, while 5G devices were also becoming available albeit few in number.

2.14 Since Document 19/124 was published, the 4G (LTE) and 5G device availability in the Proposed Bands has increased further, as summarised in Table 2 below.

⁶¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1589361039474&uri=CELEX:32020D0636>

⁶² <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1589878031931&uri=CELEX:32020D0667>

⁶³ www.gsacom.com

Table 2: 4G/LTE and 5G Device availability in the Proposed Bands

Band ⁶⁴	4G devices Nov 2019	4G devices Sept 2020	5G devices Nov 2019	5G devices Sept 2020
700 MHz Duplex (B28, FDD) (n28, FDD)	2,098	2,826	12	99
2.1 GHz (B1, FDD) (n1, FDD)	8,905	10,302	11	159
2.3 GHz (B40, TDD) (n40, TDD)	5,479	6,276	3	25
2.6 GHz (B7, FDD) (n7, FDD)	9,351	10,528	9	76
(B38, TDD) (n38, TDD)	4,156	4,875	4	44
(B41, TDD) (n41, TDD)	4,164	5,003	36	206

2.2.3 Spectrum availability

- 2.15 In Document 19/124, ComReg noted that all of the Proposed Bands are available in Ireland, albeit that there were co-existence issues to address in relation in the 2.3 GHz and 2.6 GHz bands given Eir's RurTel network in the 2.3 GHz Band and the Irish Aviation Authority's (IAA) aeronautical radars in the 2.7 to 2.9 GHz band.
- 2.16 Since Document 19/124 was published, both Eir and the IAA have taken actions to further mitigate the co-existence issues in relation in the 2.3 GHz and 2.6 GHz bands. This is set out in Section 5.2 below.

2.2.4 Awards in other European countries

- 2.17 In Annex 4 and Section 2.1.4 of Document 19/124, ComReg set out information on the status of spectrum awards in other European countries, noting that no spectrum awards had been completed in Europe during the July to December 2019 time period.
- 2.18 Annex 3 to this document sets out updated information on the status of spectrum awards in other European countries⁶⁵. Since Document 19/124 was published, several relevant spectrum awards have been completed in Europe, including:

⁶⁴ All the bands presented in this table are identified as such by the 3GPP. Also, provided in parenthesis below is the 4G and 5G band number assigned by the 3GPP to each band.

⁶⁵ All information in this section is sourced from Cullen International (www.cullen-international.com) (a pay subscription website) unless otherwise stated.

- a) On 26 March 2020, in Hungary, the NMHH announced the results of its multi-band award for spectrum in the 700 MHz Duplex (2 × 25 MHz), the 2.1 GHz Band (2 × 15 MHz), the 2.6 GHz Band (15 MHz) and the 3400 – 3800 MHz bands⁶⁶. Apart from the 2.6 GHz Band, all spectrum rights offered in the award were assigned.
 - b) On 1 July 2020, in the Netherlands, the Dutch government announced the results of its multi-band award for spectrum in the 700 MHz Duplex (2 × 30 MHz), the 1.4 GHz Centre Band⁶⁷ (40 MHz) and the 2.1 GHz Band (2 × 60 MHz)⁶⁸. All spectrum rights offered in the award were assigned.
 - c) On 11 September 2020, in Austria, the RTR announced the results of its multi-band award for spectrum in the 700 MHz Duplex (2 × 30 MHz), the 1.4 GHz Band⁶⁹ (90 MHz) and the 2.1 GHz Band (2 × 60 MHz)⁷⁰. All spectrum rights offered in the award were assigned;
 - d) On 13 November 2020, in the Czech Republic, the CTU announced the results of its multi-band award for spectrum in the 700 MHz Duplex (2 × 30 MHz) and the 3400 – 3600 MHz frequency bands⁷¹. All spectrum rights offered in the award were assigned;
 - e) On 23 November 2020, in Slovakia, the Slovak regulator RÚ announced the results of its multi-band award for spectrum in the 700 MHz Duplex (2 × 30 MHz), the 900 MHz band (2 × 4.2 MHz) and 1800 MHz band (2 × 9 MHz)⁷². All spectrum rights offered in the award were assigned.
- 2.19 In addition, Ofcom in the UK, is progressing its auction for spectrum rights in the 700 MHz (2 × 30 MHz plus 20 MHz SDL) and 3.6 – 3.8 GHz (120 MHz) frequency bands. The regulations for this award came into force on 18 November 2020⁷³, and the deadline for the receipt of applications for a licence was 4 December 2020⁷⁴.

⁶⁶https://nmhh.hu/cikk/211179/Osszesen_mintegy_128_es_fel_milliard_forintot_fizet_a_harom_szol_galtato_az_5Gre_is_hasznalhato_frekvenciakert_az_NMHH_arveresen

⁶⁷ 1452 – 1492 MHz.

⁶⁸ <https://www.agentschaptelcom.nl/onderwerpen/multibandveiling/nieuws/2020/07/21/kpn-t-mobile-en-vodafoneziggo-verwerven-frequenties-via-multibandveiling>

⁶⁹ 1427 – 1517 MHz.

⁷⁰ https://www.rtr.at/en/tk/FRQ5G_2020

⁷¹ www.ctu.cz/tiskova-zprava-cesky-telekomunikacni-urad-vydrzil-kmitocty-v-pasmech-700-mhz-3400-3600-mhz

⁷² www.teleoff.gov.sk/mobilni-operatori-si-vysutazili-frekvencie-pre-5g/

⁷³ [Award of 700 MHz and 3.6-3.8 GHz spectrum by auction - Ofcom](#), 25 November 2020.

⁷⁴ [Application date and deposit notice: Award of Wireless Telegraphy Act licences for the use of the 700 MHz and 3.6-3.8 GHz spectrum bands \(ofcom.org.uk\)](#).

2.3 Connectivity studies

2.20 In Section 2.2 of Document 19/124, ComReg set out information on the connectivity studies⁷⁵ published in November 2018. These studies provide advice on different aspects of providing connectivity in Ireland, including the estimated costings to extend mobile coverage to a high level. This assists ComReg in the development of its proposals for the Proposed Award, in particular its consideration of appropriate coverage obligations.

2.21 Annex 3 of Document 19/124 set out ComReg's consideration of respondents' views to Document 19/59R in relation to the connectivity studies, noting that these views were also considered separately by Oxera and DotEcon in Documents 19/124f and 19/124b respectively.

2.22 Having carefully considered the views of the respondents to Document 19/59R, and those of Oxera and DotEcon, ComReg set out its view that:

"no additional points have been raised that would require Oxera or DotEcon to amend or reconsider the conclusions of their connectivity reports, and ComReg is also of the view that the key messages and recommendations of the Connectivity Studies⁷⁶ remain valid."

2.23 Finally, in relation to the respondents' submissions to Documents 19/124, 20/32 and 20/58, ComReg observes that while Vodafone re-submitted its view welcoming the connectivity studies⁷⁷, no other views on the connectivity studies were received.

2.4 BB-PPDR spectrum management considerations

2.24 In Section 2.3 of Document 19/124, ComReg set out information on the spectrum management considerations for BB-PPDR in Ireland, noting that ComReg proposed to include the full 2 x 30 MHz of the 700 MHz Duplex in the Proposed Award and that there are a range of technically-viable deployment and spectrum options available for BB-PPDR.

2.25 Annex 5 of Document 19/124 set out ComReg's consideration of the respondents' views to Document 19/59R regarding the spectrum management

⁷⁵ The connectivity studies are:

- "Meeting Consumers' Connectivity Needs" – a report (Document [18/103b](#)) and accompanying infographic (Document [18/103a](#)) from Frontier Economics Ltd (Frontier)
- "Future Mobile Connectivity in Ireland" - a report (Document [18/103c](#)) from Oxera Consulting LLP (Oxera), with Real Wireless Ltd; and
- "Coverage obligations and spectrum awards" – a report (Document [18/103d](#)) from DotEcon.

⁷⁶ As set out in paragraph 36 in Document [18/103](#) - "Improving connectivity in Ireland – Challenges, solutions and actions".

⁷⁷ This is considered in Annex 3 of Document 19/124.

considerations for BB-PPDR. These views were also separately considered by LS telcom in Document 19/59e.

2.26 Having carefully considered the views of the respondents to Document 19/59R and those of LS telcom, ComReg set out its updated view that it:

“remains of the view that progressing the Proposed Award on the basis of including the full 2x30 MHz of the 700 MHz Duplex would be the most appropriate option in terms of ComReg’s spectrum management functions, objectives and duties.”

2.27 In addition, ComReg stated that it planned to separately publish an Information Notice on the spectrum options for BB-PPDR in Ireland.

2.28 ComReg published the Information Notice in October 2020 as Document 20/98⁷⁸, in which it notes that:

- the Office of the Government’s Chief Information Officer (“OGCIO”) is currently considering each of the three BB-PPDR spectrum options proposed by ComReg, namely:
 - 2 × 3 MHz in the frequency range 414 – 417 MHz / 424 – 427 MHz (i.e. 3GPP Band 88)
 - 2 × 5 MHz in the frequency range 698 – 703 MHz / 753 – 758 MHz band (i.e. 3GPP Band 68); and
 - 2 × 3 MHz in the frequency range 733 – 736 MHz / 788 – 791 MHz (i.e. 3GPP Band 28B).
- ComReg will continue to engage with the OGCIO in relation to the State’s likely BB-PPDR spectrum requirements in order to inform any spectrum management considerations that ComReg may have in relation to same.

2.29 Finally, in relation to the respondents’ submissions to Documents 19/124, 20/32 and 20/58, ComReg observes that while Vodafone resubmitted its views in support of ComReg’s proposal (i.e. to include 2 × 30 MHz of the 700 MHz Duplex in the Proposed Award)⁷⁹, no other views on BB-PPDR spectrum management considerations were received.

2.5 European Electronic Communications Code

2.30 In Section 2.4 of Document 19/124, ComReg noted that on 20 December 2018,

⁷⁸ Document [20/98](#), “Broadband Public Protection and Disaster Relief (BB-PPDR) Spectrum Options October 2020 Update”, published 14 October 2020.

⁷⁹ This is considered in Annex 3 of Document 19/124.

Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (“EECC”) entered into force.

- 2.31 The EECC replaces the so-called “EU Common Regulatory Framework” adopted in 2002 (and amended in 2009) under which ComReg has regulated electronic communications since 2003.
- 2.32 With some limited exceptions (see Article 124 of the EECC), Member States have until 21 December 2020 to transpose the EECC into national law. Subject to these limited exceptions, the existing EU Common Regulatory Framework thus continues to apply in full until the transposition date. Notwithstanding this, in developing its proposals for and taking this Decision concerning the Proposed Award, ComReg has been cognisant that it must refrain from taking any measures liable seriously to compromise the result(s) or objective(s) prescribed by the EECC,⁸⁰ and does not consider that its proposals or its Decision include any such measures.
- 2.33 The Department of the Environment, Climate and Communications (DECC) is responsible for transposition of the EECC and ComReg provides assistance where appropriate. From the Minister’s recent address to members of the Telecommunications Industry Ireland (TII) federation on 11 December 2020, ComReg understands that the transposition of the EECC into Irish law will be completed end Q1/early Q2 2021, following a short public consultation.
- 2.34 No views on the EECC were submitted in respondents’ submissions to Documents 19/124, 20/32 and 20/56.

2.6 Cybersecurity of 5G networks

- 2.35 Section 2.5 of Document 19/124 sets out information on the cybersecurity of 5G networks.
- 2.36 Undertakings providing public communications networks or publicly available electronic communications services are obliged under Regulation 23 of the Framework Regulations to take appropriate technical and organisational measures to manage risks posed to the security of their networks / services and to prevent and minimise the impact of security incidents on users and interconnected networks. Similar obligations are contained in the EECC.⁸¹
- 2.37 These security obligations will continue to apply to operators that win spectrum rights of use in the Proposed Award.

⁸⁰ See for example *Inter-Environnement Wallonie*, [1997] ECR I-7411, at para 45.

⁸¹ See Article 40 – Security of networks and services, of the EECC.

2.38 In addition, on 26 March 2019, the European Commission adopted Recommendation 2335 on Cybersecurity of 5G networks (Recommendation 2335)⁸² which recommends a common EU approach to the security of 5G networks.

2.39 Point 4(c) of Recommendation 2335 provides that:

“On the basis of the national risk assessment and review and taking into account ongoing coordinated action at Union level, Member States should:

(c) attach conditions to the general authorisation concerning the security of public networks against unauthorised access and ask for commitments from the undertakings participating in any upcoming procedures for granting rights of use for radio frequencies in 5G bands as regards compliance with security requirements for networks pursuant to Directive 2002/20/EC;

2.40 Condition 19 of the General Authorisation (03/81R6⁸³) and S.I. No. 336/2011⁸⁴ already include provisions, in respect of ensuring the security of public electronic communications networks against unauthorised access.

2.41 Following on from the provisions contained in Recommendation 2335, in January 2020 a common set of measures to mitigate against cybersecurity risks across the EU, or the “Union toolbox”, was published⁸⁵. The implementation of the Union Toolbox within Ireland is led by the National Cyber Security Centre⁸⁶ (“the NCSC”), an operational arm of the DECC.

2.42 The NCSC published its National Cyber Security Strategy 2019 – 2024⁸⁷ (NCSS) in December 2019. In its strategy, the NCSC committed to introducing a set of compliance standards to support the cybersecurity of telecommunications infrastructure within the State. This is set out as Measure 7 as follows:

⁸² Recommendation C(2019) 2335 - Cybersecurity of 5G networks (Rec. 2335)

⁸³ <https://www.comreg.ie/publication/general-authorisation-for-the-provision-of-electronic-communications-networks-and-services/>

⁸⁴ S.I. No. 336/2011 - European Communities (Electronic Communications Networks and Services) (Privacy and Electronic Communications) Regulations 2011
<http://www.irishstatutebook.ie/eli/2011/si/336/#>

⁸⁵ See <https://ec.europa.eu/digital-single-market/en/news/cybersecurity-5g-networks-eu-toolbox-risk-mitigating-measures>

⁸⁶ The NCSC is the government computer security organisation in Ireland, an operational arm of the Department of the Environment, Climate and Communications.

⁸⁷ The National Cyber Security Strategy 2019 – 2024, December 2019, see https://www.ncsc.gov.ie/pdfs/National_Cyber_Security_Strategy.pdf

“Government will introduce a further set of compliance standards to support the cyber security of telecommunications infrastructure in the State.

We will introduce a new and specific set of security requirements for the telecommunications sector, with detailed risk mitigation measures to be developed by the NCSC to assist Comreg in fulfilling their statutory functions under existing EU Security Regulations (transposed by S.I. 333 of 2011), and the forthcoming EU Telecommunications Code (Directive 2018/1972)”

- 2.43 The NCSC is currently developing a set of compliance standards to address the objectives of Measure 7 of its NCSS, which will address the implementation of the Union Toolbox. NCSC intends to develop a set of enhanced Telecoms Security Requirements (“TSRs”)⁸⁸, the enforcement of which will rely on legislation that has yet to be formulated.
- 2.44 Work on the development of the TSRs is ongoing and involves the telecommunications network operators, including MNOs. ComReg is working with and assisting the NCSC with the development of its TSRs.
- 2.45 No views on the cybersecurity of 5G networks were submitted in the respondents’ submissions to Documents 19/124, 20/32 and 20/58.

2.7 Ireland’s National Broadband Plan (NBP)

- 2.46 Section 2.6 of Document 19/124 sets out information on Ireland’s National Broadband Plan, which is the Government’s plan to ensure that all premises in Ireland have access to high speed broadband services.
- 2.47 On 19 November 2019, the Government signed the contract⁸⁹ for the National Broadband Plan with National Broadband Ireland (NBI)⁹⁰.
- 2.48 Since then, work has commenced and the delivery of more than 200 public broadband connection points (BCPs) is expected to be connected before the

⁸⁸ Éamon Ryan, then Minister for Communications, Climate Action and Environment, answers Dáil questions 105, 106, 107 and 108 on security, including telecommunications network security, 28 July 2020. In answering the questions, the Minister announces that the Government is committed to further enhancing the security of telecommunications infrastructure in Ireland, including Telecoms Security Requirements (TSRs). See <https://www.oireachtas.ie/en/debates/question/2020-07-28/105/>

⁸⁹ <https://www.dccae.gov.ie/en-ie/news-and-media/press-releases/Pages/Government-sign-the-National-Broadband-Plan-Contract.aspx>

⁹⁰ <https://nbi.ie/>

end of 2020, in addition to 75 school BCPs.⁹¹

- 2.49 The full deployment of the NBP contract is expected to take five to seven years. It will involve constructing around 146,000km of fibre cable to connect more than 1m people in homes, farms, schools and businesses across the country.⁹²

2.8 Chronology of the Proposed Award

- 2.50 The process leading to the development of the proposals in this document started in 2014. Along the way, in response to submissions, ComReg ran a separate award process in respect of the 3.6 GHz band⁹³.
- 2.51 An overview of the key publications and submissions leading to the development of ComReg's current proposals is set out below.

A. Document 14/101

- 2.52 On 30 September 2014, ComReg published Document 14/101– “Spectrum award – 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands”.
- 2.53 Alongside this ComReg also published an independent report – Document 14/102 – Spectrum Award – 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands.
- 2.54 On 16 February 2015, ComReg published an Information Note – “Spectrum award – 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands”
- 2.55 That note stated that, in light of the submissions received to Document 14/101 and Document 14/126, ComReg, on 16 February 2015 published an Information Notice indicating that it intended to consider the possible release of rights of use in the 3.6 GHz band in a separate competitive award process.
- 2.56 ComReg proceeded to consult upon and finalise the award of spectrum rights of use in the 3.6 GHz band. This auction took place in the first half of 2017, and on 1 June 2017 the final results of same were published in Document 17/46.

B. ComReg Document 18/60 – 29 June 2018

- 2.57 On 29 June 2018 ComReg published Document 18/60 “Proposed Multi Band Spectrum Award – Preliminary consultation on which spectrum bands to

⁹¹ <https://nbi.ie/news/latest/2020/10/12/government-marks-major-milestone-in-national-broadband-plan/>

⁹² Ibid.

⁹³ See [3.6 GHz Band Spectrum Award | Commission for Communications Regulation \(comreg.ie\)](#)

award.”

2.58 There were eight responses to that consultation:

1. Eir response to document 18/60 dated 30 July 2018.
2. Three response to document 18/60 dated 30 July 2018.
3. Ericsson response to document 18/60 dated 30 July 2018.
4. ESB Networks response to document 18/60 dated 30 July 2018.
5. Dense Air response to document 18/60 dated 30 July 2018.
6. JRC response to document 18/60 undated.
7. Vodafone response to document 18/60 undated.
8. Imagine response to document 18/60 undated.

C. ComReg Document 18/103 – 30 November 2018

2.59 On 30 November 2018 ComReg published Document 18/103 – “Improving connectivity in Ireland – Challenges, solutions and actions published 30 November 2018.”

2.60 There were four supporting documents published alongside that:

1. Document 18/103a – Infographic Meeting Consumers’ Connectivity published 30 November 2018.
2. Document 18/103b – Frontier Economics Report – Meeting Consumers’ Connectivity Needs published 30 November 2018.
3. Document 18/103c – Oxera Consulting LLP, with Real Wireless Ltd Report – Future Mobile Connectivity in Ireland published 30 November 2018.
4. Document 18/103d – DotEcon Report – Coverage Obligations and Spectrum Awards published 30 November 2018.

D. ComReg Document 19/59R – 5 July 2019

2.61 On 18 June 2019, ComReg published Document 19/59 (updated on 5 July 2019 as Document 19/59R) – “Response to Consultation and Further Consultation of Proposed Multi Band Spectrum Award including the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands published 5 July 2019.”

2.62 There were five expert reports published alongside that:

1. Document 19/59a – DotEcon Ltd Report on Proposed Award Process for Rights of Use in the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands published 18 June 2019.
2. Document 19/59b - DotEcon Ltd Report on Proposed Award Process for Rights of Use in the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands – Benchmarking and minimum prices published 18 June 2019.
3. Document 19/59c – Plum Consulting Ltd report - Compatibility study in preparation for the award of the 2.6 GHz band published 18 June 2019.
4. Document 19/59d – Plum Consulting Ltd report - 2.3 GHz Sharing Analysis published 18 June 2019.
5. Document 19/59e – LS telcom UK Ltd. - Study on Terrestrial BB-PPDR Spectrum Options, published 18 June 2019.

2.63 ComReg received 11 responses to that consultation:

1. Dense Air response to document 19/59R dated 30 July 2019.
2. Eir Response to Document 19/59R dated 7 August 2019.
3. Three Response to Document 19/59R dated 7 August 2019.
4. Ericsson response to document 19/59R dated 7 August 2019.
5. Liam Young Response to Document 19/59R dated 7 August 2019.
6. Virgin Media Response to Document 19/59R dated 7 August 2019.
7. MNVO Response to Document 19/59R dated 7 August 2019.
8. Motorola Response to Document 19/59R dated 7 August 2019.
9. Vodafone Response to Document 19/59R undated.
10. Imagine Response to Document 19/59R undated.
11. Tesco Mobile Response to Document 19/59R undated.

E. ComReg Document 19/124 – 20 December 2019

2.64 On 20 December 2019, ComReg published Document 19/124 – “Proposed Multi Band Spectrum Award – Response to Consultation and Draft Decision – The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands”.

2.65 Alongside that, ComReg published six independent reports prepared by its consultants:

1. Document 19/124a - DotEcon – “DotEcon Assessment of Consultation Responses to Document 19/59R” published 20 December 2019.
2. Document 19/124b - DotEcon – “Coverage Obligations and Spectrum Awards” published 20 December 2019.
3. Document 19/124c – Plum Consulting Ltd. – “Update on 2.3 GHz and 2.6 GHz co-existence analysis reports (Documents 19/59d and 19/59c” published 20 December 2019.
4. Document 19/124d - Plum Consulting Ltd. – “Interference Susceptibility Measurements – Shannon Airport Radar” published 20 December 2019.
5. Document 19/124e - LS telcom UK Ltd. – “Study on Terrestrial BB-PPDR Spectrum Options – Assessment of BB-PPDR responses to ComReg Document 19/59R” published 20 December 2019.
6. Document 19/124f – Oxera Consulting LLP – “Future Mobile Connectivity in Ireland: Assessment of Respondents’ Views” published 20 December 2019.

2.66 ComReg received five responses to that consultation:

1. Eir Response to Document 19/124 dated 10 February 2020.
2. Three Response to Document 19/124 dated 10 February 2020.
3. Liam Young Response to Document 19/124 dated 10 February 2020.
4. Vodafone Response to Document 19/124 undated.
5. Imagine Response to Document 19/124 undated.

F. ComReg Document 20/32 – 13 May 2020

2.67 On 13 May 2020, ComReg published Document 20/32 – “Proposed Multi Band Spectrum Award – Draft Information Memorandum and Draft Regulations - The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands”.

2.68 ComReg received four responses to that document

1. Eir Response to Document 20/32 dated 24 June 2020.
2. Imagine Response to Document 20/32 dated 24 June 2020.

3. Three Response to Document 20/32 dated 24 June 2020.
4. Vodafone Response to Document 20/32 undated.

G. Temporary licences

2.69 In 2020, ComReg ran a separate process, as set out in Section 2.1 above to provide for temporary spectrum rights in light of the extraordinary circumstances arising from COVID-19.

H. ComReg Document 20/56 – 6 July 2020

2.70 On 6 July 2020, ComReg published Document 20/56 – “Proposed Multi Band Spectrum Award – Request for views from interested parties on auction formats including potential alternative options or modifications to ComReg’s proposed auction format”.

2.71 ComReg received four responses to that document:

1. Imagine Response to Document 20/56 dated 14 August 2020.
2. Eir Response to Document 20/56 dated 17 August 2020.
3. Three Response to Document 20/56 dated 17 August 2020.
4. Vodafone Response to Document 20/56 undated.

2.72 On 26 August 2020, ComReg published Document 20/78 - the non-confidential submissions to Document 20/56

2.73 ComReg received two responses to Document 20/78:

1. Eir Response to Document 20/78 dated 9 September 2020.
2. Three Response to Document 20/78 dated 9 September 2020.

Chapter 3

3 The Proposed Bands and Preferred Type of Assignment Process

Introductory remarks

What are the key issues?

What bands should be included in the proposed award process and whether the award process should be an open competitive auction or whether it should include some form of administrative assignment.

What did ComReg propose?

In Document 19/124, ComReg proposed to:

- include the 700 MHz Duplex, the 2.1 GHz Band, the 2.3 GHz Band and the 2.6 GHz Band in the Proposed Award (the “Proposed Bands”); and
- make available all relevant spectrum rights in the Proposed Bands using an open appropriate auction format.

What respondents said

Four respondents commented on these issues. Support for inclusion of the various bands in the Proposed Award is summarised in the table below.

Respondent	700 MHz	2.1 GHz	2.3 GHz	2.6 GHz
Vodafone	✓	✓	✓	✓
Eir	Note 1	×	✓	✓
Three⁹⁴	Note 2	×	✓	✓
Imagine	✓	✓	✓	✓

Note 1 – Eir changed its position on the 700 MHz band in its response to Document 20/56 and suggested that ComReg now should consider a separate award.

Note 2 – Three changed its position on the 700 MHz band in its response to Document 20/78 and submitted that a separate award (as suggested by Eir above) is preferable to proceeding with the current Combinatorial Clock Auction (CCA) proposal.

⁹⁴ With the exception of its position on the 700 MHz band, Three articulated this position in response to Document 19/59R and has not restated it.

All of the respondents supported an open auction format, albeit that Eir remained silent in relation to its application to the 2.1 GHz Band.

What has ComReg finally decided, and why?

ComReg's final position is to:

- include the 700 MHz Duplex, the 2.1 GHz Band, the 2.3 GHz Band and the 2.6 GHz Band in the Proposed Award.
- make available all relevant spectrum rights in the Proposed Bands using an open appropriate auction format.

3.1 Summary of ComReg's view in Document 19/124 and 20/32

3.1 In Chapter 3 of Document 19/124 ComReg set out its preliminary view on which bands to include in the Proposed Award and the type of assignment process that should be used, where ComReg:

- a) proposed to include the 700 MHz Duplex, the 2.1 GHz Band, the 2.3 GHz Band and the 2.6 GHz Band in the Proposed Award (the "Proposed Bands"); and
- b) make available all relevant spectrum rights in the Proposed Bands using an open appropriate auction format.

3.2 In arriving at this preliminary position in Document 19/124, ComReg considered:

- a) the views of respondents to Document 19/59R on the above matters and ComReg's assessment of same, as set out in Sections 3.2 and 3.3 of Document 19/124;
- b) its updated draft 'Spectrum for Award' RIA, as set out in Annex 6.4 of Document 19/124;
- c) its updated draft 'Assignment Process' RIA, as set out in Annex 6.5 of Document 19/124, and
- d) its consideration of its overall preferred option against ComReg's relevant statutory functions, objectives and duties, as set out in Annex 6.7 of Document 19/124.

3.3 In Chapter 9 of Document 19/124, ComReg set out its draft decision based on its preliminary positions on the Proposed Bands and the type of assignment process (see paragraphs 3.1 and 3.11).

3.4 Document 20/32 sets out the draft rules and procedures to implement the above preliminary positions and draft decision on the Proposed Bands and the type of

assignment process.

3.2 Summary of respondent's views to Documents 19/124, 20/32, 20/56 and 20/78

3.5 In the submissions to Document 19/124, 20/32, 20/56 and 20/78, four respondents (Eir, Imagine, Three and Vodafone) provided comments on the Proposed Bands and/or the type of assignment process.

3.6 In the submissions to Document 19/124:

- a) Imagine and Vodafone support the inclusion of the four spectrum bands while Eir supports the inclusion of the 700 MHz Duplex, 2.3 GHz and 2.6 GHz bands but has reservations on the inclusion of the 2.1 GHz Band in its entirety for the reasons it had previously set out⁹⁵;
- b) Three did not express a view;⁹⁶ and
- c) Imagine, Three and Vodafone all agree with the proposed use of an open auction format for the Proposed Bands, while Eir states that it has *"no issue in principle with eligibility for licences in the 700MHz, 2.3GHz and 2.6GHz bands being determined by means of a competitive selection procedure"*.

3.7 In the subsequent submissions to Document 20/56 and 20/78:

- a) Eir submits that ComReg should consider auctioning the 700 MHz Band on its own and that this should be considered by ComReg in any 'Auction Format' RIA. Eir submits that this would simplify a multi-band spectrum award for the higher frequency bands, and address Three's concerns regarding the potential for asymmetric pricing in the 700 MHz band at the same time, *"to the extent that any change is necessary to deal with that concern"*; and
- b) Three submits that the award of the 700 MHz band separately (as suggested by Eir above) is preferable to proceeding with the current Combinatorial Clock Auction (CCA) proposal. Three's preference would be for this to be done in a separate stage within the award, as this would not delay award of the other bands by any significant amount of time, as opposed to a separate process altogether.

⁹⁵ A summary of Eir's previous submissions on the 2.1 GHz Band is set out in paragraphs 3.32 to 3.37 of Document 19/59R and paragraph 3.15 of Document 19/124.

⁹⁶ In its submissions to Document 19/59R Three supported the inclusion of the 700 MHz Band, the 2.3 GHz Band and the 2.6 GHz Band.

3.3 Updated Information

3.8 Updated information (equipment availability, award status in Europe, harmonisation and spectrum availability) on the Proposed Bands is set out in Annex 3 to this document. This information shows that the Proposed Bands are all available for award and all harmonised, either with an EC Decision or ECC Decision. Annex 3 also illustrates that the Proposed Bands have a well-developed LTE device ecosystem of 2800 or more devices, and that 5G devices are becoming available, albeit fewer in number.

3.4 ComReg's assessment of respondents' views

3.9 Note that Annex 4 of this document - 'Spectrum for Award' RIA – should be read in conjunction with this section.

3.4.1 The Proposed Bands

The 2.3 GHz and 2.6 GHz bands

3.10 ComReg observes that no respondents disagreed with ComReg's proposal to include the 2.3 GHz and 2.6 GHz bands in the Proposed Award.

3.11 Noting the above and ComReg's rationale for proposing the inclusion of the 2.3 GHz and 2.6 GHz bands in this consultation process⁹⁷, ComReg remains of the view that it is appropriate to include the 2.3 GHz and 2.6 GHz band in the Proposed Award.

The 2.1 GHz Band

3.12 ComReg firstly notes that Eir's reservations regarding the 2.1 GHz Band, and its reasons for same, have previously been assessed by ComReg in Documents 19/59R and 19/124⁹⁸. ComReg considers that the observations set out therein (and as relevantly updated in this document) adequately address Eir's concerns.

3.13 Further, ComReg observes that there is a real demand for liberalised spectrum in the 2.1 GHz Band, as demonstrated by the MNOs' requests for, and use of, temporary spectrum rights to provide ECS services given the extraordinary situation presented by COVID-19⁹⁹.

⁹⁷ See Sections 3.4.7 and 3.4.8 of Document 19/59R, and Section 3.2.3 of Document 19/124.

⁹⁸ ComReg's assessment of Eir's views on the proposed inclusion of the 2.1 GHz Band in the Proposed Award is set out in Section 3.4.5 of Document 19/59R and in Section 3.2.3 (paragraphs 3.24 to 3.30) of Document 19/124.

⁹⁹ For further information, see <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/covid-19-temporary-spectrum-management-measures/>.

- 3.14 While there is more equipment available today for the 2.1 GHz Band than for the 2.3 GHz Band and the 2.6 GHz Band, given the very similar path losses, ComReg is of the view that these bands are substitutable in the long run.
- 3.15 The benefits of including substitutable spectrum in the same award process is discussed in the final 'Spectrum for Award' RIA set out in Annex 4 of this document.
- 3.16 Noting the above, and ComReg's rationale for proposing the inclusion of the 2.1 GHz Band in this consultation process¹⁰⁰, ComReg remains of the view that it is appropriate to include the 2.1 GHz Band in the Proposed Award.

The 700 MHz Duplex

- 3.17 Regarding the 700 MHz Duplex, ComReg notes the most recent submissions of Eir and Three to consider awarding this band separately. This arises in the context where all respondents to ComReg's previous consultations, including Eir and Three, supported the inclusion of the 700 MHz Duplex in the Proposed Award¹⁰¹.
- 3.18 In relation to the new views put forward by Eir and Three, ComReg observes that:
- a) their supporting rationale (being to simplify a multi-band award and address Three's price asymmetry concerns) relate to auction design considerations as discussed in Chapter 7 and Annex 7 of this document, as opposed to reasons disputing ComReg's rationale for proposing the inclusion of the 700 MHz Duplex in the Proposed Award or the award of this band in a multi-band spectrum award process; and
 - b) the suggestion of a separate award for the 700 MHz Duplex (either in the same award process in some fashion or other or a sequential one) would inevitably add additional delays to the Proposed Award and the assignment of spectrum rights in the 700 MHz Duplex and other proposed bands. This would arise from the need for additional consultation(s) and the time required to carry out same.

- 3.19 ComReg particularly notes that the importance of assigning long-term rights of use in the 700 MHz Duplex as soon as possible has, if anything, increased since

¹⁰⁰ See Section 3.4.5 of Document 19/59R, and Section 3.2.3 of Document 19/124.

¹⁰¹ See paragraph 3.21 of Document 19/59R, "*The seven respondents who commented on this band (Dense Air, Eir, ESBN, Imagine, JRC, Three, Vodafone) all agreed with ComReg's preliminary view to include the 700 MHz Duplex in the Proposed Award.*"

See paragraph 3.13 of Document 19/124, "*In relation to the 700 MHz Duplex, 2.3 GHz and 2.6 GHz bands, all six respondents [Dense Air, Eir, Ericsson, Mr. Liam Young, Three and Vodafone)] agreed with ComReg's proposals to include these bands in the award.*"

the publication of Document 19/124, as among other things:

- a) the use of temporary spectrum rights¹⁰² in the 700 MHz Duplex, given the extraordinary circumstances presented by COVID-19, has ably demonstrated that there is a concrete and immediate demand for spectrum rights in the 700 MHz Duplex to provide ECS services. ComReg notes that all three mobile network operators ('MNOs') (Eir, Three and Vodafone) have applied for and continue to use temporary licences first granted in April 2020¹⁰³;
- b) the number of devices capable of using the 700 MHz Duplex has increased considerably. As of September 2020, there were 2,826 LTE devices and 99 5G devices capable of operating in the 700 MHz Duplex. This represents an increase of 35% and 725% respectively compared to November 2019 when there were 2,098 LTE and 12 5G devices;
- c) the 700 MHz Duplex is an important band for the provision of wireless broadband services, including 5G services. In this regard, the 700 MHz Duplex has been identified as a '5G pioneer band' for Europe;
- d) EU Decision 2017/899¹⁰⁴ places an obligation on Member States to "allow the use" of the 700 MHz Duplex for "terrestrial systems capable of providing wireless broadband electronic communications services" by 30 June 2020;
- e) the 700 MHz Duplex is a band where WBB and 5G services can be deployed immediately given its now 'greenfield' status, following the successful migration of DTT services from this band in March 2020¹⁰⁵; and
- f) given its favourable radio propagation characteristics, the 700 MHz Duplex is a particularly important band for the provision of widespread coverage, including in rural areas and on national transport routes. This

¹⁰² Consultation documents are available on [ComReg's COVID-19 Further Temporary Spectrum Management Measures webpage](#).

¹⁰³ See for example, Table 4 of Document 20/86 which sets out the total sites deployed and planned using temporary spectrum in the 700 MHz Duplex and 2.1 GHz Bands.

¹⁰⁴ [Decision \(EU\) 2017/899](#) of the European Parliament and of the Council of 17 May 2017 on the use of the 470-790 MHz frequency band in the Union,

¹⁰⁵ Noting that the further temporary spectrum rights issued expire on 7 January 2020, and any renewal licences will expire on 1 April 2020 at the latest.

is particularly important in Ireland, given its challenging demographic characteristics¹⁰⁶.

3.20 Further, and as discussed in ComReg's 'Spectrum for Award' RIA¹⁰⁷, ComReg observes that there are well-established spectrum assignment efficiencies, and benefits for competition and consumers, in awarding interdependent (i.e. substitutable¹⁰⁸ and/or complementary¹⁰⁹) spectrum bands, in a single award process as opposed to having separate awards.

3.21 In summary, this award as proposed offers appreciable efficiencies and benefits as it:

- a) encourages greater participation and competition in the award and downstream, including from potential new entrants, by providing an opportunity for different types of award participants, with potentially different intended uses and technologies, to participate;
- b) increases the ability of award participants to express a full suite of preferences and any synergy value between Lots¹¹⁰; and
- c) reduces the risk of an award participant being inefficiently assigned spectrum rights of use in some but not all its preferred bands.

3.22 Considering the specific characteristics of the 700 MHz Duplex, ComReg observes that its rationale for including this band in a same award process as the other proposed bands is compelling. In particular:

¹⁰⁶ For example:

- 37% of the population is spread across 95% of the land area;
- of EU member states, Ireland has the highest proportion of population that live in NUTS 3 areas classified as rural at 72%, compared to the EU average of 22%;
- Ireland has an extensive road network (5,306 km of primary and secondary roads and a further 91,000 km of regional and local roads). The road density in Ireland (21 km per 1000 inhabitants) is twice the EU average.

¹⁰⁷ See for example paragraphs A6.90 to A6.99 of Annex 6 to Document 19/124 and paragraphs A4.101 to A4.110 of Annex 4 to this document.

¹⁰⁸ The terms substitute/substitutable/substitutability in relation to the Proposed Award can be taken as referring to spectrum bands which can serve the same purpose for potential licensees and so those potential licensees are relatively indifferent to switching between those bands.

¹⁰⁹ The terms complement/complementary/complementarity in relation to the Proposed Award can be taken as referring to spectrum bands where the value attributed by a potential user to spectrum rights in one band is enhanced by having or winning spectrum rights in another band.

¹¹⁰ Where complementarity exists between lots, the value of a standalone lot may be substantially lower than the value of the lot when included with other complementary lots. Bidders participating in a sequential award where such lots are sold separately may be unable to express their full value for the combination of lots in the first auction, when they are unaware of the competition they may be facing for the second lot (i.e. aggregation risk).

- a) some bidders, such as MNOs and new entrants¹¹¹, would consider the 700 MHz Duplex spectrum to be a highly complementary spectrum band to the other proposed spectrum bands, and its proposed inclusion provides an opportunity to obtain rights of use to 'coverage' and 'capacity'/'performance' spectrum in the same award;
- b) the 700 MHz Duplex is the only coverage spectrum band available for the Proposed Award and is thus an important source of synergies which in turn is important in determining an efficient assignment of spectrum; and
- c) including the 700 MHz Duplex and the other proposed bands in the same award provides greater opportunities for new entry.

3.23 With regard to any potential for new entry, ComReg observes that should the 700 MHz Duplex be assigned separately to the other proposed bands, this would notably reduce opportunities for new entry as potential new entrants would not have the option of acquiring 'coverage' and 'performance'¹¹² rights of use in the same award. ComReg's approach to new entry is that it should not preclude or discourage any entry through the choice of an auction format or specific auction design features that might reduce the opportunities for entry.

3.24 For example, a potential New Entrant would likely require a mix of 'coverage' (700 MHz Duplex) and 'performance' (2.1 GHz, 2.3 GHz and 2.6 GHz bands) spectrum and inefficient outcomes could arise in one of two ways:

- a) If such bidders obtained the required 'performance' spectrum in the first auction but then failed to obtain the complementary 700 MHz Duplex Lots in a following auction, it would potentially have little or reduced use for the 'performance' spectrum since it would have been acquired and valued on the basis of subsequently being assigned 700 MHz Duplex Lots. Indeed, such uncertainty could deter potential bidders entirely. Further, such an approach could also potentially deny an alternative bidder who might have made more valuable use of the standalone 'performance' Lots; and
- b) Alternatively, and arising from uncertainty, a bidder could bid too conservatively in the first auction and fail to acquire a package of Lots which, in hindsight after the second auction, it could have achieved. A

¹¹¹ For example, the MNOs currently use a combination of sub-1 GHz 'coverage' bands (with similar characteristic to the 700 MHz Duplex) and 'capacity' spectrum bands (with similar characteristic to the 2.1 GHz, 2.3 GHz and 2.6 GHz bands) to provide mobile services. Any new entrant wishing to provide mobile services would likely require a similar mix of spectrum.

¹¹² While some operators, such as MNOs, may use these spectrum bands to increase capacity, other operators, such as FWA operators, may use these bands on a standalone basis. Noting both of these potential uses, the term 'performance' is attributed to these bands.

simultaneous award allows bidders to better assess their chances of obtaining both Lots and thus to adjust their bidding accordingly, significantly lowering the risk of inefficient outcomes.

3.25 Noting the above, and ComReg's rationale for proposing the inclusion of the 700 MHz Duplex in this consultation process¹¹³, including the benefits of including complementary spectrum in the same award process as discussed in the final 'Spectrum for Award' RIA set out in Annex 4 of this document, ComReg is of the view that:

- a) it is appropriate to include the 700 MHz Duplex in the Proposed Award; and
- b) it is not appropriate to consider awarding the 700 MHz Duplex in a separate award or subsequent step and that this is not a viable or plausible option for the 'Spectrum for Award' RIA.

3.4.2 The type of assignment process

3.26 ComReg observes that the four respondents who provided submissions to Document 19/124 (Eir, Imagine, Three and Vodafone) all supported ComReg's proposal for the use of an open auction format / competitive selection procedure, albeit that Eir remained silent on the use of a competitive selection procedure for the 2.1 GHz Band.

3.27 In this regard, ComReg observes that Eir previously set out views on the assignment of the 2.1 GHz Band, and that these were addressed during this consultation process.¹¹⁴

3.28 Having considered the updated respondents' views and other updated information, ComReg has set out its final 'Assignment Process' RIA in Annex 4 of this document.

3.29 This concludes that ComReg's preferred approach is to "*assign the relevant spectrum rights by way of an appropriately designed auction.*"

3.5 ComReg's final position

3.30 Having considered the above including ComReg's rationale as set out in this consultation process, ComReg's final 'Spectrum for Award' and 'Assignment Process' RIAs in Annex 4 of this document, and the assessment of ComReg's preferred options against its other relevant statutory functions, objectives and

¹¹³ See Section 3.4.2 of Document 19/59R, and Section 3.2.3 of Document 19/124.

¹¹⁴ See paragraphs 3.95-3.96 of Document 19/59R and Section 3.3.2 of Document 19/124.

duties as set out in Annex 4.7 of this document, ComReg final position is to:

- a) include the 700 MHz Duplex, the 2.1 GHz Band, the 2.3 GHz Band and the 2.6 GHz Band in the Proposed Award (the “Award Bands”); and
- b) make available all relevant spectrum rights in the Proposed Bands using an open appropriate auction format.

3.31 ComReg’s consideration of the appropriate auction format is discussed in Chapter 7 and Annex 7 of this document.

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Chapter 4

4 Issues concerning the proposal to include the 2.1 GHz Band

Introductory remarks

What are the issues?

The issue is that current 2.1 GHz licences do not co-terminate. Adopting a time slice approach to address the fact that current 2.1 GHz licences do not co-terminate is generally not favoured by respondents on the grounds of award complexity. Some respondents are unhappy with the use of time slices to deal with the differing expiry dates of current licences in the 2.1 GHz band and all respondents are unhappy with the deployment of a time slice approach across all three of the performance bands in the award, namely 2.1 GHz, 2.3 GHz and 2.6 GHz.

What did ComReg propose

ComReg proposed to make available new 2.1 GHz rights of use:

- in respect of spectrum for which existing rights of use are due to expire in October 2022 (i.e. 2x45 MHz) for the period 16 October 2022 to 11 March 2027 (to coincide with Eir's current licence expiry) ('Time Slice 1'); and
- for the full 2x60 MHz available in the 2.1 GHz Band, for the period 12 March 2027 until a common expiry date ('Time Slice 2').

Considering the above proposed approach for the 2.1 GHz Band, ComReg was of the view that the same time slices should be applied to the 2.3 GHz and 2.6 GHz bands on account of the likely substitutability between the three bands.

What respondents said

- Vodafone submitted that if Eir chooses not to surrender its licence early it would be appropriate to use Time Slices in the 2.1 GHz Band. However, Time Slicing in other bands adds unnecessary complexity in its view.
- Three submitted that Time Slices are unnecessary and there are simpler ways, in its view, to manage the differences in start dates in the 2.1 GHz Band (e.g. two lot category approach). This would remove the need for Time Slicing other Bands.
- Eir submitted that that there is far less difference between the packaging of the 2.1 GHz band in two time-slices or two lot categories with different licence duration than ComReg and DotEcon suggest.

- Imagine does not support time slicing the 2.3 GHz and 2.6 GHz Bands.

What has ComReg finally decided, and why?

ComReg maintains its view that time slicing the 2.1 GHz Band, 2.3 GHz Band and the 2.6 GHz Band would best ensure the efficient assignment and use of the bands.

- Three's two lot category approach would substantially increase the risk of distortions to competition and raises the potential for tacit agreements.
- Time slicing the 2.1 GHz Band only would create substitution risks for any bidder that may wish to switch across bands in an individual time slice as it would restrict the ability of bidders to switch demand in response to changes in prices of either Time Slice.
- Time slicing all three substitutable bands provides all bidders with the flexibility to compete across all spectrum bands and to take account of any situations that may arise during the award, thereby facilitating a broad range of bidding behaviour and outcomes.

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4.1 Introduction

4.1 This chapter sets out ComReg's final position on issues concerning the proposal to include the 2.1 GHz Band in the Proposed Award and is structured as follows:

- First, a summary is provided of ComReg's consideration of these issues in Document 19/124;
- Second, a summary is provided of submissions received on these issues since the publication of Document 19/124;
- Third, a summary is provided of DotEcon's consideration of those submissions; and
- Finally, ComReg sets out its assessment of those submissions and its final position¹¹⁵.

4.2 Summary of ComReg's view in Document 19/124

4.2 In Chapter 5 of Document 19/124, having considered the views of respondents to Document 19/59R and DotEcon's assessment of same, ComReg set out its assessment of the potential issues arising from the inclusion of the 2.1 GHz Band in the Proposed Award. The assessment was set out under the following headings and a summary of each is provided below:

- Licence period alignment;
- 2.1 GHz Liberalisation;
- Time Slices in 2.1 GHz Band; and
- Time Slices in other bands.

4.2.1 Licence period alignment

4.3 Having considered the responses received to Document 19/59R, ComReg (in Annex 7) reaffirmed its view of the requirement for proposals to align the licence period of the existing 2.1 GHz Licences. ComReg formed the preliminary decision to:

- a) upon receipt of an appropriate application from Three, grant it interim 2.1 GHz rights of use – comprised of the frequencies in its existing "A Licence" – which would commence on 25 July 2022 and fully expire on

¹¹⁵ Except for licence period alignment, which is set out separately in Annex 5.

15 October 2022 (Interim 2.1 GHz A Licence);

- b) upon receipt of an appropriate application from Three, grant it interim 2.1 GHz rights of use – comprised of the frequencies in its existing “B Licence” – which would commence on 2 October 2022 and fully expire on 15 October 2022 (Interim 2.1 GHz B Licence);
- c) attach conditions to both the Interim 2.1 GHz A and B licences by reference to the current licence conditions in each of the existing “A Licence” and “B Licence”, respectively; and
- d) calculate the licence fees for each of the Interim 2.1 GHz A and B licences by reference to the licence fees for Vodafone’s and Eir’s existing 2.1 GHz licences but updated to current day levels by reference to the overall CPI.

4.4 Responses to the licence period alignment are summarised and assessed separately in Annex 5 of this document.

4.2.2 2.1 GHz Liberalisation

4.5 Having considered the responses received to Document 19/59R, ComReg reaffirmed its preliminary view that Option 2A (provide the option for all existing licensees to liberalise some or all existing 2.1 GHz rights of use from the time of the substantive decisions concerning the present Proposed Award) is the preferred option and would be appropriate in the context of ComReg’s statutory framework, including being objectively justified and proportionate.

4.6 In relation to liberalisation fees, ComReg also reaffirmed the view that, should Eir liberalise its 2.1 GHz licence, it would be appropriate to charge Eir a liberalisation fee for the period of its licence from 16 October 2022 to 11 March 2027 should an estimate of the prices determined in the Proposed Award imply that the market value of the spectrum (on a liberalised use basis) exceeds the current fees being paid by Eir.

4.7 The proposed methodology remained the same as that discussed in paragraph 5.58 of Document 19/59R.

4.2.3 Time Slices in 2.1 GHz

4.8 Having considered the responses received to Document 19/59R, ComReg reaffirmed its preliminary view that the inclusion of the 2.1 GHz Band necessitates the use of Time Slices absent Eir surrendering its licence.

4.2.4 Time Slices in 2.3 GHz and 2.6 GHz

4.9 Having considered the responses received to Document 19/59R, ComReg reaffirmed its preliminary view that it remains appropriate to apply Time Slices to the 2.3 GHz and 2.6 GHz bands. Furthermore, ComReg made fully available the previously redacted Annex A of the DotEcon Report (Document 19/59a). This annex informed ComReg's considerations of Time Slices and set out detail of the potential for gaming behaviour towards Eir if Time Slices were not applied to the 2.3 GHz and 2.6 GHz bands.

4.2.5 Alternatives for assigning 2.1 GHz rights of use

4.10 ComReg noted the suggestions by Three and Vodafone that the requirement for Time Slices could be removed if all existing licensees surrendered their 2.1 GHz licences. However, ComReg considered that the attractiveness of this option may be greater to Vodafone and Three than to Eir which would still be required to pay its Spectrum Access fees in respect of the full duration of its licence.

4.11 Notwithstanding, ComReg noted that should Vodafone and Three agree to surrender their rights of use, even if Eir does not, this would usefully remove the need for Three's licence alignment and potentially allow new rights of use to begin earlier than proposed. ComReg advised that, as these are matters for existing licence holders, parties should jointly notify ComReg of any intention to surrender 2.1 GHz rights of use by 12 noon on 10 February 2020. ComReg has not received any notification from Eir.

4.12 ComReg reflected its position on the assignment of the 2.1 GHz Band in its Draft Decision as follows:

3.15.4 2.3 GHz Band Fixed Frequency Lot (Lower)¹¹⁶, 2.3 GHz Band Fixed Frequency Lot (Upper)¹¹⁷, 2.3 GHz Band Frequency Generic Lots¹¹⁸, 2.6 GHz Band FDD Frequency Generic Lots¹¹⁹, 2.6 GHz Band TDD Fixed Frequency

¹¹⁶ Where a 2.3 GHz Band Fixed Frequency Lot (Lower) means "a right of use in respect of the 1x30 MHz block of spectrum from 2300 – 2330 MHz".

¹¹⁷ Where a 2.3 GHz Band Fixed Frequency Lot (Upper) means "a right of use in respect of the 1x10 MHz block of spectrum from 2390 – 2400 MHz".

¹¹⁸ Where a 2.3 GHz Band Frequency Generic Lot means "a right of use in respect of a 1x5 MHz block of spectrum in the range 2330 – 2390 MHz, with the specific frequencies of such Lots being determined in the assignment stage".

¹¹⁹ Where a 2.6 GHz Band FDD Frequency Generic Lot means "a right of use in respect of a 2x5 MHz block of spectrum in the range 2500 – 2570 MHz paired with 2620 – 2690 MHz, with the specific frequencies of such Lots being determined in the assignment stage".

Lot (Lower)¹²⁰, 2.6 GHz Band TDD Fixed Frequency Lot (Upper)¹²¹ and 2.6 GHz Band TDD Frequency Generic Lots¹²² being made available in two “time slices”, viz:

- i. Time Slice 1: From [1 December 2020] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to [11 March 2027] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum); and
- ii. Time Slice 2: From [12 March 2027] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to [30 November 2040] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum);

3.15.5 2.1 GHz Band Frequency Generic Lots¹²³ being made available in two “time slices”, viz:

- i. 2.1 GHz Band Time Slice 1: From [16 October 2022] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to [11 March 2027] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum); and
- ii. Time Slice 2: From [12 March 2027] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to [30 November 2040] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum);”

4.13 Finally, in Document 20/32, ComReg reflected this position in its Draft IM and Draft Regulations where:

“Time Slice 1” means, in relation to 2.3 GHz Band Blocks and 2.6 GHz Band Blocks, the period commencing on [1 December 2020] and ending on 11 March 2027 or on such other date or dates as may be specified by the Commission, and, in relation to 2.1 GHz Band Blocks, means the period

¹²⁰ Where a 2.6 GHz Band TDD Fixed Frequency Lot (Lower) means “a right of use in respect of the 1x5 MHz block of spectrum from 2570 – 2575 MHz”.

¹²¹ Where a 2.6 GHz Band TDD Fixed Frequency Lot (Upper) means “a right of use in respect the 1x5 MHz block of spectrum from 2615 – 2620 MHz”.

¹²² Where a 2.6 GHz Band TDD Frequency Generic Lots means “a right of use in respect of a 1x5 MHz block of spectrum in the range 2575 – 2615 MHz, with the specific frequencies of such Lots being determined in the assignment stage”.

¹²³ Where a 2.1 GHz Band Frequency Generic Lot means “a right of use in respect of a 2 x 5 MHz block of spectrum in the 2.1 GHz Band, with the specific frequencies of such Lots being determined in the assignment stage”.

commencing 16 October 2022 and ending on 11 March 2027 or on such other date or dates as may be specified by the Commission;

“Time Slice 2” means, in relation to 2.1 GHz Band Blocks, 2.3 GHz Band Blocks and 2.6 GHz Band Blocks, the period commencing on 12 March 2027 and ending on [30 November 2040], or on such other date or dates as may be specified by the Commission under Regulation 5 of these Regulations;

4.3 Summary of respondent’s views to proposals for the 2.1 GHz Band

4.14 The submissions of the respondents to Document 19/124, Document 20/32, Document 20/56 and Document 20/76 on matters related to the assignment of the 2.1 GHz Band are summarised below under the following headings.

- Early Liberalisation;
- Time Slices in the 2.1 GHz Band; and
- Time Slices in the 2.3 GHz and 2.6 GHz Bands.

4.3.1 Early liberalisation

Response to 19/124

Eir

4.15 Eir welcomes clarification that liberalisation is up to the licensee (at any point from when the option becomes available) but states that Option 2A is of little use to it until the award is completed and any liberalisation fee is known.

4.16 Eir submits that ComReg has a statutory obligation to act fairly, and that any pricing approach that fails to take into account the value of its spectrum during the first 5 years and the scope for competitors to artificially inflate the price to be paid by Eir cannot be deemed fair.

4.17 Eir agrees with the fundamental principle expressed in paragraph 4.36 of ComReg 19/124 that *“it would be appropriate to charge a liberalisation fee based on the going market rate”* however it questions whether the proposal to use final clock prices across both time slices as an input into the calculation is consistent with this principle. In that regard, Eir submits that:

- a) it is not clear how ComReg will ensure Eir only pays the value of the spectrum related to the relevant 5 years as any new 5G technology will take time before it achieves mass market appeal and therefore the business case benefits will likely be *“back-ended”*;

- b) if the 2.1 GHz, 2.3 GHz and 2.6 GHz bands are substitutable, it would be reasonable to use the average price for all supra 1 GHz Time Slice 1 spectrum to calculate any liberalisation fee. Eir considers that this would reduce the risk of gaming should Eir decide to exercise the early liberalisation option; and
- c) focusing solely on final clock round prices of the 2.1 GHz is not appropriate to calculate a liberalisation fee because, in the context of a combinatorial format, the value of 2.1 GHz spectrum will be related to the other bands in a package bid. ¹²⁴

4.18 Eir reiterates its submission that the 3.6 GHz approach to issuing refunds is not appropriate for the calculation of a liberalisation fee:

- a) the 3.6 GHz approach relies on final clock round prices. The very nature of a combinatorial auction is to allow bidders to express values for packages of spectrum;
- b) the value of 2.1 GHz spectrum in a bidder's package will be related to the other spectrum bands included in that package;
- c) the value of the package will be what drives the bidder's behaviour relative to their valuation rather than the relative value of each component lot of the package to the clock round price of each lot; and
- d) focussing solely on the final clock round prices of the 2.1 GHz spectrum (in one or both timeslots) may encourage gaming.

Vodafone

4.19 Vodafone agrees with ComReg's proposal for the timing of liberalisation (Option 2A) but notes Eir's concerns regarding spectrum imbalance in the 2.1 GHz Band and considers that this remains a significant issue.

Three

4.20 Three agrees with the preferred approach in Document 19/124 (Option 2A) and offers the following views:

- a) the European Commission Decision (2012/688/EU) required that the 2.1 GHz spectrum should have been liberalised from 30th June 2014,

¹²⁴ More particularly, Eir contends that: "*the value of the package will be what drives the bidder's behaviour relative to their valuation rather than the relative value of each component Lot of the package to the clock round price of each Lot. Focussing solely on the final clock round prices of the 2.1GHz spectrum (in one or both timeslots) may encourage gaming.*" Eir response to Document 19/124, p7.

subject only to a review to ensure that no competitive distortions arise from such liberalisation;

- b) ComReg has now concluded that no competitive distortions arise; and
- c) substantial consumer benefits arise from the early liberalisation of the 2.1 GHz Band as operators can choose an optimal mix of technologies across bands on their networks.

4.21 Three submitted that ComReg should take the necessary steps to avoid any further delay in the availability of liberalised 2.1 GHz licences and suggested steps that should be taken to:

- a) prepare a draft Statutory Instrument/ regulations and relevant briefing material for the Minister;
- b) prepare and present draft liberalised licences no later than making the substantive decision;
- c) in the case of Vodafone and Three, where no liberalisation fee will apply, confirmation from the licensee should simply be necessary to confirm acceptance of the amended licence;
- d) in the case of Eir, additional confirmation may be required to accept any liberalisation fee; and
- e) ensure no further administrative process is required and that licences issue within a reasonable time of receiving confirmation from licensees. Three suggests a maximum of 5 working days.

Response to 20/32

Eir

4.22 Eir welcomed the confirmation in Section 13(3) and 13(6) of the Draft Regulations that the option may be exercised before or after the award.

4.23 Eir submitted that it was unable to identify any reference to the Liberalisation Fee and the proposed method for calculation in the Draft IM and that ComReg must provide this missing section for consultation.

Response to 20/56

Eir

4.24 Eir submits that it would have to determine whether to liberalise its 2.1 GHz rights of use without any knowledge of the fee it may have to pay. Eir also

submits that the time between the making of the Decision and the completion of the award could be significant.

- 4.25 Eir submits that [✂] and that ComReg has not addressed this concern.
- 4.26 Eir submits that if the liberalisation fee is to be determined by the following then the following should apply:
- a) operators should only be able to exercise early liberalisation after the completion of the award (i.e. Option 2B);
 - b) appropriate safeguards should be included to ensure there are no gaming opportunities for other bidders to inflate any early liberalisation fee Eir might have to pay; and
 - c) the mechanism to calculate the early liberalisation fee should be based on the value of liberalisation in the period to 2027 and subject to a consultation process.

4.3.2 Time slices in the 2.1 GHz band

Response to 19/124

Eir

- 4.27 Eir submits that if the 2.1 GHz Band is time sliced, its competitors would have almost the exact same opportunity to bid strategically to increase the price Eir would have to pay to re-acquire its existing 2.1 GHz licence in the context of a CCA than if the band was split into long and short licences. Eir submits that DotEcon did not appear to recognise this risk and that its analysis seems to be based on what might happen in a uniform price auction with time slices.

Vodafone

- 4.28 Vodafone submits that if Eir chooses not to surrender its licence early it would be appropriate to use Time Slices in the 2.1 GHz Band.
- 4.29 In relation to Three's long and short licence proposal, Vodafone reiterates its response to Document 19/124 that it does not support this two lot category proposal because, it asserts, the issues outlined by DotEcon played a significant part in the German auction where parties bid for lots that were desired by others, thereby resulting in significant distortions of the auction.

Three

- 4.30 Three submits that Time Slices are unnecessary and there are simpler ways to manage the differences in start dates in the 2.1 GHz Band.

4.31 In relation to its two lot category proposal for the 2.1 GHz Band, Three submits that:¹²⁵

- a) DotEcon is incorrect in concluding that that this approach leaves Eir susceptible to price driving. In Three's view, despite Eir likely preferring the shorter licences, Eir could tactically switch to bidding for longer licences should competitors seek to drive the prices of the shorter lots as these are "superior" substitutes.¹²⁶;
- b) there is a risk for Three and Vodafone from switching back and forth as the shorter licences are not a good substitute for longer ones. However, Three acknowledges that this risk is outweighed by the benefit of the reduced complexity;
- c) DotEcon's concern in relation to long and short licences leading to natural focal points for collusion is misplaced, given the role of the reserve price. Three states that, in its view, such concerns offer insufficient justification for changing the Lot structure in multiple bands; and
- d) in relation to DotEcon's view that the long and short licence approach could make it simple for bidders to segment demand and avoid competition, Three contends that the risk that MNOs identify a natural split of lots in the 2.1 GHz Band is a general issue regardless of how lots are packaged.

Response to 20/32

Three

4.32 Three reiterates its submission that ComReg could follow the German approach of having two separate 2.1 GHz lot categories with different start dates instead of applying Time Slices and that Eir would benefit from this approach, contrary to the positions of DotEcon and ComReg in Document 19/124. Three adds that this approach would hugely simplify spectrum packaging for the award.

Response to 20/56

Eir

4.33 Eir submits that that there is far less difference between the packaging of the

¹²⁵ Response to Document 19/124.

¹²⁶ Three considers that as "the shorter licences are strictly a subset in time of the longer licences, they are a superior substitute, so Eir would face no downside from switching if the price differences is attractive". Three response to Document 19/124, p 10.

2.1 GHz band in two time-slices or two lot categories with different licence duration than ComReg and DotEcon suggest.

4.34 Eir submits that if the band is time sliced, there is just as much opportunity for competitors to drive up the price that Eir would have to pay for 2.1 GHz spectrum from 2027. In that regard Eir contends that other bidders could:

4.35 [✂ 



 ✂]




4.36 Eir also submits the following in relation to time slicing and auction formats:

- a) if a uniform price auction format is used, Eir contends that it is preferable for the 2.1 GHz spectrum to be time-sliced, since that would then ensure that all bidders pay the same price for 2.1 GHz spectrum in each time-slice;
- b) if a uniform price auction format is used then the use of the two lot category approach would put Eir at risk of having to pay a higher price than its competitors for the same spectrum as a consequence of any price driving by one or more of its competitors;
- c) it is only in the case of a uniform price auction format being employed that Eir sees any benefit from time-slicing as compared with categorising the spectrum by start date and licence duration; and
- d) the price driving risk would also exist in a CCA¹²⁸ even if the spectrum were time-sliced.

4.37 Eir disagrees with DotEcon's suggestion that there is "a clear split" in the 2.1 GHz spectrum between all the MNOs and that it has a strong interest in acquiring additional 2.1 GHz spectrum from 2022. Additionally, Eir anticipates that other bidders have a real interest in acquiring additional 2.1 GHz spectrum from 2027 and expects there to be effective competition for all available 2.1 GHz spectrum in the auction.

¹²⁷ Eir response to Document 20/56, p7.

¹²⁸ Eir submits that if a CCA is used, "there is just as much opportunity for competitors to drive up the price that eir has to pay for 2.1GHz spectrum from 2027, irrespective of the way in which the 2.1GHz spectrum is packaged. Time-slicing the 2.1GHz spectrum will not prevent bidders from driving up the price that eir has to pay for 2.1GHz spectrum in time-slice 2 – all that they will have to do is [✂



] Eir response to Document 20/56, p7.

Vodafone

- 4.38 Vodafone repeats its submission that it does not support the two lot category approach to assigning rights of use in the 2.1 GHz Band based on its experience in the German award.

Response to 20/78

Three




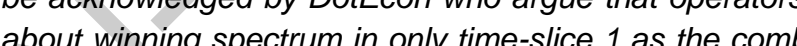
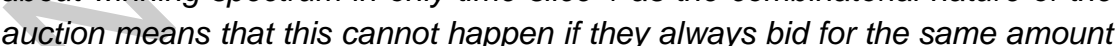

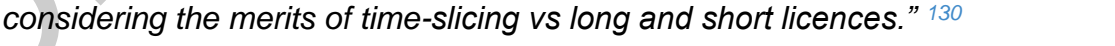
- 4.39 Three submits that Eir has also proposed the two lot category approach to assigning rights of use in the 2.1 GHz band. Three notes that *“one of ComReg’s main stated reasons for keeping Time-Slicing is protection of Eir, however with Eir rejecting that reasoning and considerable opposition from all respondents there would seem to be little reason for maintaining Time-slicing at all.”*¹²⁹

4.3.3 Time slices in the 2.3 GHz and 2.6 GHz bands

Response to 19/124

Eir

- 4.40 Eir states that it is aware of the potential for gaming as set out in the DotEcon Annex but that it balanced these risks relative to the benefits of simplicity.
- 4.41 Further, in relation to DotEcon’s suggestion that Eir can switch demand into 2.3 GHz Time Slice 2 or 2.6 GHz Time Slice 2 if the price of 2.1 GHz Time Slice 2 spectrum becomes relatively high, Eir notes that this:

- 4.42 “[...]        *]. This appears to be acknowledged by DotEcon who argue that operators do not have to worry about winning spectrum in only time-slice 1 as the combinatorial nature of the auction means that this cannot happen if they always bid for the same amount of spectrum in both time-slices, but then they ignore this reality when considering the merits of time-slicing vs long and short licences.”*¹³⁰

Vodafone

- 4.43 Vodafone submits that the proposed CCA is complex and that the large number of lots available will create complexity for bidders. Vodafone notes that it is aware that it can aggregate Time Slices but submits that the price differential could be significant between time slices and it needs to be prepared to bid for

¹²⁹ Three response to Document 20/78, p3

¹³⁰ Eir response to Document 19/124, p10.

differing packages. Vodafone also notes that it is entirely feasible that any bidder could miss-value spectrum in one of these time-slices and there could be an inefficient outcome.

- 4.44** Vodafone submits that while ComReg does not have a mandate to promote a simpler award process, ComReg's objective to ensure efficient use of spectrum should be enough to justify working towards a simpler process.
- 4.45** Vodafone states that it disagrees with DotEcon's view that multiple time-slices are unproblematic because operators could bid for packages only containing Time Slice 1 and Time Slice 2 for a given band. Vodafone submits that Time Slices introduce a risk that someone might incorrectly value spectrum, as a result of the difficulty of valuing spectrum due to the potentially significant price differentials that may occur between time slices.
- 4.46** Vodafone also contends that, in considering whether to apply Time Slices to the 2.3 GHz and 2.6 GHz bands, ComReg overstates the interchangeability of equipment. Vodafone submits that, having discussed with its BTS equipment suppliers, it understands that current radio equipment has very limited flexibility to work in multiple bands and that because of cost, operators are likely only purchase band specific equipment. Vodafone considers that this will limit options for switching from band to band between Time Slices as both Time Slices are too short to economically use equipment in spectrum unavailable in the other Time Slice.
- 4.47** Vodafone submits that it would be better to offer the 2.3 GHz and 2.6 GHz Bands in a single time slice because, in its view, the gains in auction simplicity outweigh the risk that there is gaming in the 2.1 GHz band and that because Eir does not support splitting these bands there appears to be no justification to apply Time Slices to them.

Imagine

- 4.48** Imagine stated that it is disappointed that the 2.3 GHz and 2.6 GHz bands under ComReg's proposals are subject to the same Time Slices proposed for the 2.1 GHz Band. Imagine considers time slices in the 2.3 GHz and 2.6 GHz bands to be unnecessary and inappropriate.

Three

- 4.49** Three understands the rationale for time slicing the 2.3 GHz and 2.6 GHz bands in order to prevent gaming at 2.1 GHz. However, Three submits that time slicing is unnecessary and that there are simpler ways to manage the differences in start dates in the 2.1 GHz Band. Three argues that issues identified by ComReg in relation to the 2.1 GHz Band do not provide sufficient justification to change the lot structure of multiple bands, particularly as this will create artificial short

term lots at 2.3 GHz and 2.6 GHz that no one will want to acquire in isolation.

- 4.50 Three also submits that the current sub-1 GHz licences will expire in 2030 and argues that there is no guarantee that it will be reassigned to any particular MNO, although these licences are being used to inform the current sub-1 GHz cap proposals. In Three's view, this means that the 800 MHz and 900 MHz bands are not reliable substitutes for the 700 MHz Band in the long term and has the effect of extending what it asserts to be a bias against Three for a decade beyond the expiry of the current licences. Three submits that the only way to avoid this under ComReg's current proposals would be to introduce a time slice for the 700 MHz band from July 2030 to December 2040. Three also submits that similar consideration might apply to the supra-1 GHz spectrum.¹³¹

Response to 20/32

Vodafone

- 4.51 Vodafone reaffirms its view that the 2.6 and 2.3 GHz bands should be offered in a single time-slice and that it appears unprecedented, to it, to split unused bands into separate Time Slice lots. Vodafone believes that the gain in auction simplicity outweighs the risks of gaming.

Three

- 4.52 Three resubmits that its proposed two lot category approach would remove the need for Time Slices in each of the bands.

Response to 20/56

Eir

- 4.53 Eir submits that it is grateful to DotEcon and ComReg for the concern over the risks that Eir faces in relation to reacquiring 2.1 GHz spectrum [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]] for a number of reasons including that:

- a) [REDACTED]
[REDACTED]

¹³¹ Three makes this submission in Section 5 of its response to 19/124. It claims that this is an inconsistency in "ComReg's underlying logic for treating Three differently".

b) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]. [REDACTED]

4.54 In Eir’s view, the only potential use of time slicing the 2.3 GHz and 2.6 GHz bands is:

“...that it might allow [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] [REDACTED].¹³²

4.55 However, Eir submits that in its view, given the rules of the CCA, this would not have any material impact on the outcome of the auction as it would not prevent competitors from driving up the price that Eir would have to pay for 2.1 GHz Time Slice 2 spectrum.

4.56 Eir considers that there may be merit to time slicing the 2.3 GHz and 2.6 GHz bands if a uniform price auction format is used because:

a) [REDACTED]
[REDACTED] [REDACTED]; and

b) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] [REDACTED].

4.57 Eir contends that bidders may consider the reserve price for 2.3 GHz and 2.6 GHz Time Slice 1 spectrum to be too high relative to its expected value. As such, Eir believes that demand in Time Slice 1 may be below supply thus leaving some Time Slice 1 spectrum unsold. Eir adds that bidders might subsequently discover that they did have a valuable use for said Time Slice 1 spectrum but are unable to use it because they did not acquire it at auction. Eir adds that it would be better if the 2.3 GHz and 2.6 GHz bands are sold in lots covering the entire 20 year duration to ensure bidders do not find themselves unable to make use of the spectrum from the earliest possible date because they underestimated its value at the time of the auction.

4.58 In Eir’s view, ComReg should:

¹³² Three response to 20/56, p6.

- a) properly assess the likely risks and benefits of time-slicing the 2.3 GHz and 2.6 GHz spectrum in the context of this specific award, taking into account all aspects of likely demand (in particular the likelihood that anyone would bid for spectrum in Time Slice 1 on its own); and
- b) evaluate all potential spectrum auction formats both with and without time-slicing of the 2.3 GHz and 2.6 GHz spectrum, in order to identify the best possible combination of options for this spectrum award.

Three

- 4.59 In describing its own enhanced SCA (with Time Slices) proposal, Three states that its proposal would eliminate time slicing in the 2.3 GHz and 2.6 GHz bands, as it believes that it is unnecessary and not supported by respondents to prior consultation responses.

Imagine

- 4.60 Imagine maintains that it does not believe there is “*valid justification*” for creating time slices for 2.3 GHz and the 2.6 GHz TDD bands.

4.4 DotEcon’s updated view

- 4.61 DotEcon’s assessment of responses related to issues concerning the proposal to include the 2.1 GHz Band are summarised below.

4.4.1 2.1 GHz liberalisation

- 4.62 DotEcon notes that its proposed approach, where the liberalisation fee (if any) would be based on the combined auction price of the 2.1 GHz lots across both time slices, was primarily driven by concerns over preventing opportunities for competitors to drive the price of lots for the first time slice in an attempt to influence the liberalisation fee for Eir. However, DotEcon notes that Eir’s view to only use the first time slice in the calculation of any fee has some merit and recommends that the proposed calculation of the early liberalisation fee be amended to only use the first time slice price.

- 4.63 However, DotEcon does not believe that it would be appropriate to include the 2.3 GHz and 2.6 GHz prices in the calculation because, while the bands are likely to be long term substitutes for the 2.1 GHz Band, it has never claimed that they are perfect substitutes. In that regard, DotEcon considers that basing the value of 2.1 GHz liberalised licences on the price of the 2.3 GHz and 2.6 GHz first time slice licences is, therefore, not likely to provide a more precise estimate of the short-term 2.1 GHz value and would do little to effectively mitigate any gaming opportunities as they are substitutes for the 2.1 GHz band rather than complements.

4.64 Further, DotEcon sees little merit in applying a liberalisation fee to Vodafone and Three based on auction prices as none of the MNOs are being charged for liberalisation in the period up to the start of the first time slice. Further, DotEcon notes that there is no directly determined price for comparable liberalised spectrum prior to the start of the first time slice.

4.4.2 Assignment of the 2.1 GHz Band

4.65 DotEcon remains of the view that, unless Eir returns its 2.1 GHz licence before the award, a measure that accommodates the different expiry dates of the 2.1 GHz licences and includes the entire band in the award is necessary. To that extent, DotEcon reiterates that Three's alternative suggestion of long/short licences creates the potential for segmentation of demand; a risk that time slicing the band would avoid as bidders can compete for the entire band on a neutral basis. Further, DotEcon does not agree that time slicing is any more complex than Three's suggested approach as even under Three's alternative bidders may need to assess their valuations for the second period only as well as for the full 19 years and 1.5 months.

4.66 Further, DotEcon disagrees with Three's argument that Eir would have an effective strategy to defend against gaming using the long/short licences approach. DotEcon contends that such a strategy does not exist if Eir bids at the cap in both lot categories because bidding at the cap is only possible if it continues to bid for the shorter licences. Further, DotEcon argues that even if such a strategy is possible, it is not straightforward and importantly, that the auction design should not create gaming opportunities when there are reasonable methods available to avoid them (in this case, time slicing).

4.4.3 Time slices in the 2.3 GHz and 2.6 GHz bands

4.67 DotEcon notes that all respondents disagreed with time slicing the 2.3 GHz and 2.6 GHz bands. It maintains its view that, given the need to time slice the 2.1 GHz Band, time slicing the 2.3 GHz and 2.6 GHz bands is desirable as it maximises the potential for competition and any rearrangement across the various supra-1 GHz bands on expiry of Eir's existing licence.

4.68 In relation to Vodafone's concern about mistakes in the relatively complicated valuation process leading to an inefficient outcome, DotEcon is not convinced that this is a significant issue, because:

a) it is always the case that if bidders do not know their valuations, we cannot discover an efficient outcome, but ComReg has proposed an open auction to mitigate this; and

b) if valuations for some packages are inherently uncertain, we would

expect cautious bids for these, which would be less likely to affect the outcome.

4.69 Insofar that a bidder knows its valuation but considers that the Time Slices are too short on their own to make economic use of the spectrum, DotEcon notes that it should not bid for a package that contains spectrum in only one Time Slice. Further, in relation to Eir's concern that spectrum may go inefficiently unsold in Time Slice 1 on account of relatively high reserve prices and uncertain valuations, DotEcon argues that, if the reserve price for lots covering the entire duration is low enough, then package bidding is an effective means of preventing this.¹³³

4.5 ComReg's assessment of respondents' views

4.5.1 2.1 GHz liberalisation

4.70 ComReg agrees with Eir that it would be appropriate to charge a liberalisation fee based on the going market rate.

4.71 ComReg notes Eir's concerns that the liberalisation fee should be for the relevant 5 years and not an average across the two Time Slices. ComReg previously considered it appropriate to use an average of two Time Slices in respect of setting the liberalisation fee.

4.72 However, ComReg is of the reconsidered view that the liberalisation fee can be calculated based on Time Slice 1 only. In this way, Eir would only pay the estimated value of the spectrum related to the relevant five years.

4.73 DotEcon notes that the inclusion of the second Time Slice price in the proposal method for calculating the liberalisation fee was the result of an abundance of caution in mitigating the risk of distortion to the 2.1 GHz first Time Slice price.¹³⁴ However, if only the first Time Slice price were included in the calculation, DotEcon¹³⁵ expects there to be a fairly low risk of competitors being able to artificially inflate the price to the extent that it affect Eir's liberalisation fee, predominantly because:

- a) to have any affect, it would require driving the first Time Slice price up to a sufficiently high level to imply a market value higher than Eir's current fees, which would be a difficult and risky strategy if that were above the bidder's own valuation (which we would expect given available estimate of market value); and

¹³³ DotEcon Report, Document 20/122a, p40.

¹³⁴ DotEcon Report, Document 20/122a, p27.

¹³⁵ Ibid

- b) there is not any obvious direct and immediate benefit for Vodafone or Three that could be achieved by artificially forcing a liberalisation fee on Eir, so there would seem to be little incentive to engage in such a strategy in the first place (in particular given the risks involved).

4.74 ComReg notes that DotEcon's previous advice of including both Time Slices in the calculation of any liberalisation fee was motivated out of concerns that other bidders could have an incentive to bid up the price of 2.1 GHz lots in Time Slice 1 simply to manipulate the liberalisation fee and impose a cost on Eir. However, having considered the matter further, ComReg agrees that such an approach may be unduly cautious and such price driving attempts are unlikely to occur (i.e. using Time Slice 1 only as the basis of the liberalisation fee would be appropriate). This revised view is informed by the following:

- a) any such price driving strategy would be risky as such bidders could win with price-driving bids and therefore end up with unwanted lots at a price that exceeds their valuation. In this case, the assignment of additional Time Slice 1 lots following a failed attempt at price driving would lead to an asymmetry of 2.1 GHz rights of use over the duration of the licence and rights of use that would not be needed in period up to 2027. Moreover, such lots would count towards that bidder's competition cap and so constrain the other lots that they could win;
- b) price driving strategies typically aim to increase the price a rival bidder would have to pay. However, in this case, it is unlikely that any liberalisation fee would even apply to begin with, and other bidders would be aware of this. (i.e. it is not driving an existing fee but creating the need for a fee first and driving it second). For such price driving bids to be successful it would:
 - i. need to pass a high threshold to create a situation where a liberalisation fee would even be required; and
 - ii. need to be significantly above such a threshold for the fee to materially impact Eir.
- c) in that regard, any price driving bid would need to be large, which conversely has a significant disciplinary effect of increasing the chance that such bids would result in winning unwanted lots.

4.75 In any event, there does not appear to be any long-run commercial benefits for bidders in engaging in such behaviour, noting that any such fee would only apply to at most 2 × 15 MHz in the 2.1 GHz Band and in Time Slice 1 only.

4.76 In relation to Eir's suggestion of using the average price of all Time Slice 1 supra 1 GHz spectrum to calculate the liberalisation fee, ComReg notes that it would not be appropriate to include those bands (2.3 GHz and 2.6 GHz) to calculate any liberalisation fee because their inclusion would likely artificially reduce the

occurrence of any liberalisation fee and level of same¹³⁶. Such an approach would likely be discriminatory given the other bidders would be paying for liberalised 2.1 GHz rights of use and Eir would not.

- 4.77 In that regard, ComReg notes and agrees with DotEcon that while the bands are likely to be long term substitutes for the 2.1 GHz band, they are not perfect substitutes and short-run differences in how they might be used may create differences in valuations. Basing the value of 2.1 GHz liberalised licences on the price of the 2.3 GHz and 2.6 GHz first Time Slice licences is, therefore, not likely to provide a more precise estimate of the short-term 2.1 GHz value.¹³⁷
- 4.78 In relation to ComReg's use of final round prices and the combinatorial nature of the award, ComReg agrees with Eir's view that the value of 2.1 GHz Band will be related to the assignment of other spectrum bands in the same package. However, any methodology that attempts to estimate the price of a Lot (e.g. 2.1 GHz lot in this case) in a combinatorial format involves certain assumptions and approximations because the winning price applies to a winning package rather than a band or lot category.¹³⁸ Package bidding and opportunity cost pricing also allows bidders to place bids taking account of complementarities across lots. Lots are complementary when a bidder's valuation of the combination exceeds the sum of the standalone values of the individual lots (i.e. valuations are synergistic). ComReg refers to this as 'synergistic valuations' for ease of exposition.
- 4.79 As bidders are given the opportunity to express valuations across a variety of potentially complementary lots, it is important to recognise that in any combinatorial format where there are synergistic values expressed there is no specific standalone value for an individual lot category (or the component lots) since the value depends on what other lots it is combined with. In this way, any methodology for determining the price of individual 2.1 GHz lots does not seek to create a set of prices that matches any hypothetical standalone value of those lots (in the sense that all bidders would pick the exact same number of lots if faced with those prices).
- 4.80 Rather, the objective of the approach used by ComReg (and used in the 3.6 GHz Award) is to identify a price per lot that best explains the auction outcome given the preferences expressed by bidders, subject to the same overall revenue being created from the award. For the avoidance of doubt, Eir would not be required to pay final round prices, these prices are only used to

¹³⁶ As noted in Document 19/59, there is nevertheless the potential for distortions to competition in the event that Eir's licence was liberalised over the period from 16 October 2022 until 11 March 2027 (with no scope for additional fee over its current licence fee) and other operators paid fees for liberalised 2.1 GHz rights over the same period in excess of Eir's current licence fee.

¹³⁷ DotEcon Report, Document 20/122a, p28.

¹³⁸ This would also be true in a SCA which is Eir's preferred format.

determine what proportion of the overall winning price is reasonably attributable to the 2.1 GHz Band, and Eir would be required to pay the difference between that and its current 2.1 GHz licence fees (adjusted for the appropriate duration) as its liberalisation fee.

- 4.81 In relation to the 3.6 GHz approach to issuing refunds, ComReg reiterates its views as expressed in Document 19/124 (paragraph 4.72) that the proposed approach for determining the liberalisation fee has been successfully used for estimating the price of specific lots in that award which was also a combinatorial format (i.e. CCA).
- 4.82 In relation to Eir's view that there should be a consultation to determine the early liberalisation fee, ComReg notes that it has already consulted on the liberalisation of the 2.1 GHz Band (including relevant fees) in Document 19/59R (Section 5.6) and Document 19/124 (Section 4.4.2). This response to consultation sets out ComReg's final position on same having considered the views of respondents.
- 4.83 In relation to the timing of any liberalisation (and Vodafone submissions regarding a potential spectrum imbalance), ComReg's detailed assessment on the impacts on competition are set out in the 'Liberalisation' RIA. In summary:
- a) ComReg is of the view that Three is unlikely to be able to obtain a material advantage from liberalising an additional 2 x 15 MHz. For example:
 - i. Three is unlikely to provide additional high-speed services across its network using all 2 x 30 MHz rights of use, if the spectrum on which those services depend is due to expire in a short period.¹³⁹
 - ii. The Proposed Award would provide Vodafone and Eir with the opportunity to compete for 350 MHz of additional rights of use in other liberalised bands (e.g. 2.3 GHz and 2.6 GHz).
 - iii. Three has neither the ability nor incentive to materially exploit the advantages of an additional 2 x 15 MHz rights of use over a short period.
 - iv. In light of the latest common request received from each of the MNOs to extend the terms of the existing temporary licensing framework unchanged, ComReg assumes that the

¹³⁹ In particular, any 2.1 GHz liberalisation of existing rights of use that may occur prior to the Proposed Award is likely to be focussed on maintaining services to existing customers that has already been enabled by the Temporary Spectrum Management Measures that have been provided to, and supported by, all MNOs (including Eir).

MNOs are satisfied that any further licensing framework on such basis would be unlikely to materially distort competition between them.

b) In relation to Eir's view that it would have to determine whether to liberalise without any knowledge of the fee it may have to pay, ComReg notes that:

- i. a liberalisation fee would only be necessary if the prices achieved in the award for 2.1 GHz rights of use exceeded the current fees being paid by Eir, noting that the benchmarking data indicates that the price of the 2.1 GHz liberalised spectrum in the award is likely to be less than the fees for the current 3G licences that were set in 2002 and 2007.
- ii. it is highly unlikely that Eir would choose to invest in the rollout of temporary liberalised 2.1 GHz rights of use in the period up to January or April 2021 and subsequently choose not to liberalise existing rights of use, (at market rates) if temporary rights of use came to an end (when Three and Vodafone would likely liberalise their rights of use). ^{140 141}
- iii. ComReg has yet to consider any further extension to the Temporary Spectrum Management Measures beyond April and such concerns around timing would be moot if those measures were extended up to the time of the Proposed Award.

4.84 ComReg notes the circumstances surrounding COVID-19 have somewhat overtaken Three's previously expressed views on the need to liberalise the 2.1 GHz Band. In particular, ComReg notes that the Temporary Spectrum Management Measures and associated Regulations¹⁴² have already provided temporary liberalised rights of use, which would at a minimum be provided until January 2021 (and potentially until April) which is after the point at which Three (and other bidders) would be able to liberalise existing rights of use under ComReg's proposals (Option 2A – 'Liberalisation RIA').

4.85 In relation to the steps that should be taken to take to provide for that liberalisation, ComReg notes that this is a separate process to this consultation,

¹⁴⁰ [REDACTED]

¹⁴¹ [REDACTED]

¹⁴² <http://www.irishstatutebook.ie/eli/2020/si/407/made/en/pdf>

but further information will be provide to licensees in due course.

- 4.86 ComReg notes that the methodology for how 2.1 GHz liberalisation fees would be calculated was not included in the Draft IM (Document 20/32). ComReg will respond to same in its response to that consultation but notes that the methodology will be the same as that set out in in paragraph 5.58 of Document 19/59R save for changes to take account of using TS1 only instead of averaging across TS1 and TS2 as identified above:

1. Calculate the average 2 × 5 MHz Lot in Time Slice 1

- Sum the prices paid by each winning bidder to obtain total revenue for the award.
- For each lot category, multiply the final clock price for the category by the number of lots in that category awarded in the auction.
- Generate the proportion of the total revenue associated with each lot category; this gives an estimate for the auction revenue associated with the 2.1 GHz Time Slice 1 lot category.
- For the 2.1 GHz Band in Time Slice 1, divide the corresponding estimate of associated auction revenue by the number of lots in the category sold to give an average auction price per lot.

2. Calculate an equivalent price for a 2 × 5 MHz block including SUFs

- Add the discounted sum of SUFs for a 2 × 5 MHz licence (for Time Slice 1 only) for spectrum in the 2.1 GHz band to the average auction price to give a total price for a 2 × 5 MHz lot in the award; this is the 'current market price for Time Slice 1' of 2.1 GHz licences.
- Calculate an equivalent price for a 2 × 5 MHz block of 2.1 GHz spectrum using the discounted fees (SAFs and SUFs) for Eir's current 2.1 GHz licences, adjusting for inflation and differences in licence duration.

3. Assess whether any additional liberalisation fees are required and, if so, the amount of such fees.

- Use the difference between the current market price for Time Slice 1 and the equivalent price to assess the extent to which prices for new 2.1 GHz licences have exceeded Eir's fees for its current licence.

- If the market price for liberalised rights of use exceeds the current price for an unliberalised licence, amortise the difference (using a real discount rate of 4.35% per annum¹⁴³) to give a per year difference between the value of a liberalised licence and the current fee level for an unliberalised licence.
- Multiply the per year price difference by the number of 2x5 MHz lots Eir chooses to liberalise (i.e. three) and take the present discounted value (using a real discount rate of 4.35% per annum) over the years for which the early liberalisation is applicable. This is then the one-off premium payable for early liberalisation during the time period 16 October 2022 – 11 March 2027.

4.5.2 Assignment of the 2.1 GHz Band

- 4.87 ComReg's final position on licence alignment is that Three should be provided the option of applying for interim rights of use in order to support a common commencement date for new rights of use following the expiry of Vodafone's and Three's current licences. The commencement date of new 2.1 GHz rights of use (for those frequencies currently held by Vodafone and Three) would be 16 October 2022.¹⁴⁴ (See Annex 5).
- 4.88 Prior to setting out ComReg's assessment of views of respondents, ComReg notes that there are three broad assignment options related to the 2.1 GHz Band available.¹⁴⁵

¹⁴³ The real discount rate used (4.35%) is based on a mobile sector WACC of 5.85%, as per the estimates provided in 'Review of Weighted Average Cost of Capital', Document 20/96 and D10/20 (<https://www.comreg.ie/publication/review-of-weighted-average-cost-of-capital>) and estimated inflation of 1.5%

¹⁴⁴ The detailed proposals for which are set out in Annex 5.

¹⁴⁵ For completeness, ComReg also notes that it could just make 2 x 45 MHz available for assignment and the remaining 2 x 15 MHz would be made available for assignment in a separate award prior to expiry in 2027. However, this option is not appropriate for a number of reasons, including;

- It does not enable the assignment of the full 2 x 60 MHz of 2.1 GHz rights of use in the proposed award.
- Substitutable frequency lots are normally sold simultaneously to allow bidders to bid for different lots and switch their demand on the basis of their relative prices.
- If part of the band was sold sequentially, bidders would be exposed to substitution risks as bidders would be bidding on rights of use not knowing what it might win in a future 2027 award.

Further, DotEcon notes that it is not efficient to extend existing 2.1 GHz licences by five years, as this which would distort the market, conferring significant advantage on existing licensees. A later process to re-award some 2.1 GHz as Eir's existing licence expires is clearly inefficient, as then part of the 2.1 GHz band would be awarded in MBSA2 and part in a subsequent award process, despite this spectrum being perfectly substitutable. Eir would be particularly disadvantaged as it would have no certainty over long term rights of use going into the Proposed Award. (DotEcon Report, Document 20/122a, p35)

- a) **Option 1:** Use a two-lot category approach to assign the 2.1 GHz Band only. All lots in other bands would have common commencement and expiry dates.
- b) **Option 2:** Use a Time Slice approach to assign the 2.1 GHz Band only. All lots in other bands would have common commencement and expiry dates.
- c) **Option 3:** Use a Time Slice approach to assign the 2.1 GHz Band, 2.3 GHz Band and the 2.6 GHz Band

4.89 It is necessary to consider Option 3 because ComReg must also consider how the approach to making the 2.1 GHz Band available would impact the efficient assignment of other substitutable bands in the Proposed Award. In this way, Option 3 provides for the assignment of time slicing of the 2.3 GHz and 2.6 GHz Bands. No such consideration arises in respect of Option 1.¹⁴⁶

4.90 The three options are described below after which ComReg addresses the views of respondents.

Description of assignment options

Option 1: Use a two lot category approach to assign the 2.1 GHz Band only

4.91 Option 1 would involve the assignment of the 2.1 GHz Band across two lot categories:

- The first lot category would consist of 9 lots (October 2022 – November 2041)
- The second lot category would consist of 3 lots (March 2027 – November 2041)

4.92 All other bands would have an earlier commencement date but the same expiry date as the 2.1 GHz lots.

¹⁴⁶ Two lot categories for each of the other bands would serve no purpose and in any event would reduce the amount of spectrum made available in the Proposed Award.

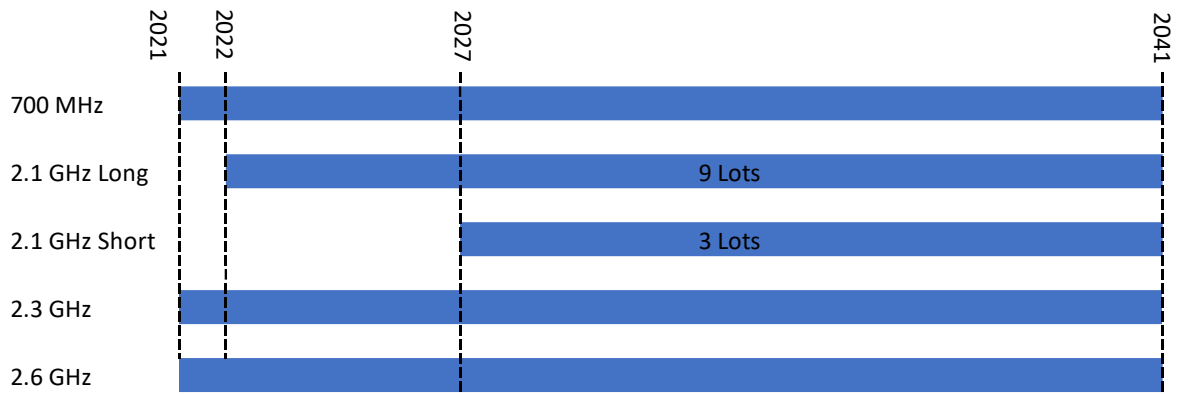


Figure 1. Two Lot Category Approach

Option 2: Time Slice the 2.1 GHz Band only

4.93 Option 2 involves the assignment of the 2.1 GHz Band across two Time Slices:

- the first time slice would consist of 9 lots (October 2022 – March 2027); and
- the second time slice would consist of 12 lots (March 2027 – November 2041).

4.94 Time slices would not apply to other bands.

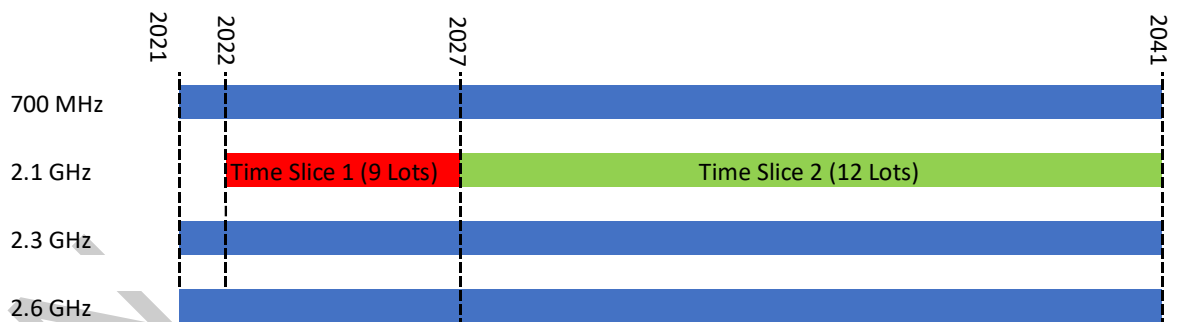


Figure 2. Time Slice the 2.1 GHz Band only

Option 3: Time Slice the 2.1 GHz Band, 2.3 GHz Band and the 2.6 GHz Band

4.95 Option 3 would involve the assignment of the 2.1 GHz Band, 2.3 GHz Band and the 2.6 GHz Band across two time slices.

4.96 As with Option 2, the 2.1 GHz Band would have two time slices with nine lots available in Time Slice 1 and 2 lots available in Time Slice 2 but the 2.3 GHz and 2.6 GHz bands would also be assigned in two Time Slices:

- Time Slice 1: 2021 – March 2027; and
- Time Slice 2: March 2027 – November 2041.

4.97 Under Option 3, Time Slice 1 for the 2.3 GHz and 2.6 GHz Bands would be longer than Time Slice 1 for the 2.1 GHz Band. However, the duration of Time Slice 2 would be the same for each of the 2.1 GHz, 2.3 GHz and 2.6 GHz bands.

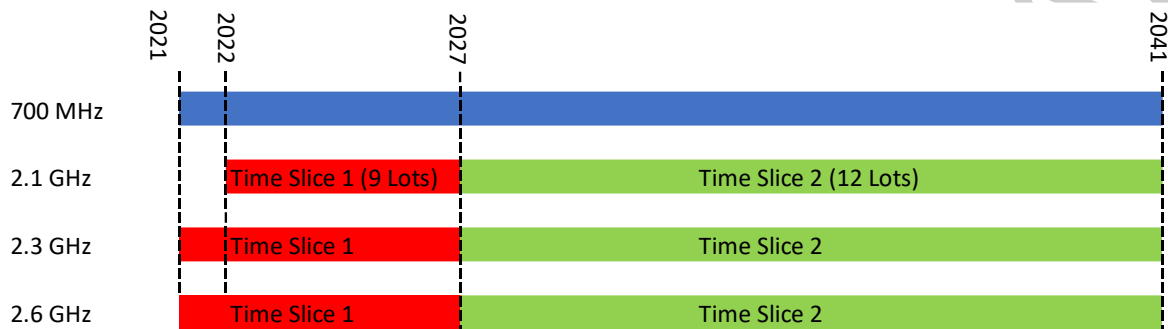


Figure 3. Time Slice the 2.1 GHz Band, 2.3 GHz Band and the 2.6 GHz Band

4.98 ComReg assesses each of the 2.1 GHz Assignment Options as follows:

- First**, ComReg assess the views of stakeholders and the impact on competition;
- Second**, ComReg explores whether any impacts on competition arising from an option could be removed or sufficiently mitigated by any Auction Format. ¹⁴⁷ (“Auction Mitigation”); and
- Third**, ComReg provides its final views on its preferred Assignment Option.

4.99 To the extent any impacts on competition could be mitigated by an auction format these Assignment Options would then be considered further in the Auction Format RIA.

ComReg’s assessment of respondent’s views

4.100 ComReg assesses the views of stakeholders under five headings:

- Eir’s 2.1 GHz Licence;
- Complexity;

¹⁴⁷ The extent to which any impacts described in the assessment arise independently of the auction format).

- Time Slicing in the 2.3 GHz and 2.6 GHz Bands;
- Impacts on competition;
- German spectrum award.

Eir's 2.1 GHz Licence

4.101 ComReg acknowledges Vodafone's view that it would be appropriate to use Time Slices in the 2.1 GHz Band if Eir decides to not surrender its 2.1 GHz rights of use early. ComReg previously expressed the view that such a scenario was unlikely to occur given the payments that would still be due by Eir (See Section 4.4.2 Document 19/124). In any event, Eir has not offered to surrender its 2.1 GHz rights of use and the issue of how to assign the 2.1 GHz Band remains.

Complexity

4.102 ComReg notes and agrees with DotEcon that time slicing is no more complex than having long and short licences in the 2.1 GHz band because in both cases bidders would have to consider their valuations, and surplus, from licences of difference length as prices evolve in the auction for the second period only as well as the full 18 years.¹⁴⁸ Moreover, ComReg's MBSA in 2012 used a CCA with similar complexity. Accordingly, ComReg has run two significant auctions using CCAs in which all bidders appear to have been able to participate without real difficulty. This is therefore a proven format of auction with which Three, Vodafone and Eir have significant experience.

4.103 Further, ComReg notes that these relatively small increases in mechanical complexity provide increased flexibility to bidders by allowing bidders to make bids for various options in a straight-forward manner. The Proposed Award should facilitate relatively small, manageable¹⁴⁹ increases in complexity in order to better provide for the efficient assignment of important rights that will remain for up to 20 years. While switching between Time Slices may not be a significant feature of the award, ComReg considers it prudent to provide for it as opportunities may arise for certain bidders, triggered by pricing as the award evolves.

4.104 In relation to respondents' view that there may be simpler ways to assign the 2.1 GHz Band, ComReg agrees that Option 1 (two lot category) and Option 2

¹⁴⁸ DotEcon Report, Document 20/122a, p37.

¹⁴⁹ ComReg is of the view that the detailed bidder training programme (including an auction workshop presentation, the use of bidder playgrounds (allowing bidders to run their own mock auctions), mock auctions, and access to the winner and price determination software) as previously used has been highly successful in ensuring bidders have a good understanding of the format and bidding process in advance of the auction.

(Time Slice 2.1 GHz Band) would make the Proposed Award less mechanically complex¹⁵⁰. For example:

- a) both Option 1 (two lot categories) and Option 2 (Time Slice 2.1 GHz only) have relatively simple lot structures and both would be relatively straightforward for all potential bidders to understand and implement. Option 1 would be marginally less complex with 9 fewer lots; and
- b) Option 1 and Option 2 do not involve additional lot categories for other bands which would reduce the number of lots available in the Proposed Award by 38 and 29 lots (compared to Option 3).

4.105 In relation to mechanical complexity, ComReg notes that it is conscious of the need for not unduly complicating the Proposed Award and that a large number of lots and lot categories may cause confusion for bidders, particularly less experienced bidders. However, the reduced number of lots arising from the adoption of Option 1 or Option 2 are not significant in the context of a large spectrum award. For example, under Option 3 (Time Slices in all performance bands) there would be 103 lots available in the Proposed Award (as set out in the Draft IM), which is relatively small when compared to the 2017 3.6 GHz Award which had 594 lots, that is almost six times as many as is the case here. That award had five successful bidders, both large and small, but all managed to participate successfully.

4.106 In relation to Three's submission that time slicing will create artificial short term lots in the 2.3 GHz and 2.6 GHz band that no one will want in isolation, ComReg notes that, depending on the evolution of prices during the award, opportunities for bidders may arise. Further, and while time slicing across all bands provides all bidders with flexibility to compete across all spectrum bands, it is particularly relevant for Eir given it would be the only bidder with existing spectrum holdings in Time Slice 1. The evolution of prices may present opportunities for Eir to bid for a single Time Slice in the 2.3 GHz or 2.6 GHz bands and so the additional flexibility may be required.

4.107 In relation to Eir's submission that time slicing should be removed if "*this is what tips the balance in favour of a CCA as opposed to a SCA*", ComReg recalls its previously stated views (paragraph 6.30 of Document 19/124) that even if time slices were not required in this award (e.g. if all existing 2.1 GHz licensees surrender its licenses), it would still be minded to provide for package bidding as complementarities within and across bands are likely to remain important for some bidders and a significant aggregation risk would remain for smaller

¹⁵⁰ The burden of computational complexity falls entirely on the auctioneer who typically uses algorithms to determine which of the bids will be winning bids and to determine what the winning bidders pay.

bidders and potential New Entrants. In any event, ComReg notes that a SCA (Eir's preferred auction format) is also a package bidding format. ComReg's views in relation to both a SCA (including Eir's variant) and a CCA are assessed separately in the 'Auction Format' RIA.

Time Slicing in the 2.3 GHz and 2.6 GHz Bands

4.108 In relation to Eir's submission that Time Slicing the 2.6 GHz and 2.3 GHz Bands is unnecessary because it maintains that [✂ ██████████ ██████████ ██████████ ██████████], ComReg notes that just because alternative bidders might not [✂ ██████████ ██████████ ██████████ ██████████], Any alternative bidders who were only interested in the full duration (i.e. combination of both Time Slices) would include Time Slice 1 and Time Slice 2 lots in their respective packages. Bidding is progressive in the open rounds and any competition for Time Slice 2 on its own (at a certain price) may cause others to reduce demand for same.

4.109 By way of example, ComReg notes that the use of Time Slices is comparable to the use of regions in the 3.6 GHz Award:

- a bidder in the 3.6 GHz Award that was only interested in a national licence would have made a package bid for all regions which is analogous to a bidder in the Proposed Award making a package bid for all Time Slices; and
- alternatively, a bidder that was only interested in certain region(s) would have made a package bid for those region(s) only which is analogous to a bidder only bidding for one Time Slice only.

4.110 In the 3.6 GHz Award, the winning outcome included both packages that included all regions (Vodafone, Eir, and Three) and some regions (Imagine). In the same way, outcomes with Time Slices packaged together or on their own are possible depending on competition during the award.

4.111 It is also unclear why Eir is of the view that [✂ ██████████ ██████████ ██████████ ██████████], Winner determination (whether in the counterfactual or not) involves finding a combination of bids for packages of lots that maximises the total value of winning bids.¹⁵¹ It is not clear why bids for Time Slice 2 only would not form part of a winning assignment in the counterfactual (if it could be in the factual described above) and used to determine other bidders prices. For example, there would likely already be packages with only Time Slice 2 lots

¹⁵¹ Subject to not assigning more than supply and that package bids by the same bidder being mutually exclusive.

given the asymmetry in lots available in the 2.1 GHz Band (i.e. 9 Time Slice 1 lots v 12 Time Slice 2 lots.) Because of the open nature of the award, Eir could switch to Time slice 2 lots and compete on that basis.

- 4.112 Further, it is not clear why the inclusion of a Time Slice 2 only bid would ‘*almost certainly*’ involve a corresponding Time Slice 1 lot being valued at reserve. A variety of bidders are likely to be interested in Time Slice 1 (either alone or more likely in conjunction with Time Slice 2). It is possible that Eir forms this view on the basis that if a bidder only bid on Time Slice 2 then there would potentially be an unsold Time Slice 1 lot in the counterfactual (absent that bidder) which is used to determine prices¹⁵². However, it is highly unlikely that an alternative winning assignment in the counterfactual would be one in which Time Slice 1 lots remained unsold. Even if some Time Slice 1 lots were unsold in the counterfactual it would not cause any harm to Eir (it would still be able to maximise its surplus) nor would it create an inefficient assignment of rights of use since such concerns only concern the price determination process.
- 4.113 In relation to Vodafone’s submission that BTS equipment has very limited flexibility to operate at multiple bands, ComReg notes that the rights of use are being offered are over a period of 20 years and operators intentions in relation to rolling out band specific or multiband BTS would be determined in part by the price of the associated spectrum. As previously noted, ComReg is aware that the bands are not absolute substitutes and switching between the 2.1 GHz Band and other bands may not be feasible in certain locations over the short term. However, at certain relative prices, bidders might be prepared to switch from the 2.1 GHz Band into those bands in order to promote more efficient long-term investments. ComReg again reminds bidders that there is no requirement to switch between bands and any combinatorial bid format allows bidders to switch between bands across one Time Slice only or both.
- 4.114 In relation to Vodafone’s submission that Time Slices in the 2.3 GHz and 2.6 GHz bands introduce a risk that someone might incorrectly value the spectrum due to the differentials that may occur between Time Slices, ComReg notes its previously stated views in paragraph 4.83 of Document 19/124 where it noted that bidders do not need to consider the value of licences over only one of the Time Slices unless that would be of interest; a bidder would only be assigned rights of use in one Time Slice (but not the other) if it explicitly expresses demand for spectrum in that Time Slice only.
- 4.115 ComReg notes and agrees with DotEcon’s assessment that this is not a significant issue, because it is always the case that if bidders do not know their valuations, we cannot discover an efficient outcome, but ComReg has proposed

¹⁵² The value of a winning assignment (both original and hypothetical) would be the total of winning bid amounts plus the value of any unassigned lots at corresponding reserve prices.

an open auction to mitigate this; and if valuations for some packages are inherently uncertain, we would expect cautious bids for these, therefore less likely to be high enough to be winning bids and less likely to affect the outcome.¹⁵³

- 4.116 Bidders are only required to have a valuation for their preferred package at a given set of prices which are provided in the open rounds. A bidder will be able to determine its preferred package by assessing the extent to which its valuation for a package compares to price of the components of that package. In that regard, ComReg agrees with DotEcon's view¹⁵⁴ that, if a bidder knows its valuation but considers that time slices are too short to make economic use of the spectrum, it should not bid for such a package. Additionally, there is no reason for bidders to value temporal subcomponents of packages if it requires rights of use for the full duration.
- 4.117 ComReg again refers to the 3.6 GHz Award where there were nine regions, each of which would likely have had different individual valuations in isolation (as reflected in the reserve prices). However, in that award, bidders interested in minimum combinations of regions (e.g. national licences, rural areas only) would not have needed to form a detailed assessment of the value of each individual region within those combinations (beyond what would have been required irrelevant of regionalisation as part of their valuation exercise). ComReg is not aware of any bidders having any difficulties in this regard. Similarly, there is no necessity for any bidder to value spectrum separately for each Time Slice if its intention is only to acquire spectrum rights of use across both.
- 4.118 In relation to Eir's submission that bidders may initially consider the reserve price for 2.3 GHz Band to be too high relative to its expected value and would subsequently have preferred to win, ComReg notes that issues related to reserve prices are assessed separately in Section 5.7. However, it is always possible that a bidder may subsequently discover that it has a requirement for a particular spectrum portfolio that it was not assigned in a spectrum award because its valuation at that time was not high enough. Such a scenario is true of any auction and the open nature of the Proposed Award provides all bidders with additional information and the opportunity to reassess their valuations as the award progressed, which should reduce this risk.
- 4.119 Further, ComReg notes and agrees with DotEcon's view¹⁵⁵ that, if the reserve price for a package of lots covering the entire duration in a band is low enough, then package bidding is effective to prevent this issue. In any event, it is not

¹⁵³ DotEcon Report, Document 20/122a, p40.

¹⁵⁴ DotEcon Report, Document 20/122a, p40.

¹⁵⁵ DotEcon Report, Document 20/122a, p40.

clear why offering 2.3 GHz and 2.6 GHz rights of use without Time Slices would remedy such a situation. As previously noted, any bidder who requires rights of use in those bands for the full duration can bid accordingly in a combinatorial award.

- 4.120 In relation to Three's suggestion that the 700 MHz Band should be time sliced (before and after 2030) because the 800 MHz and 900 MHz Bands are not reliable substitutes, ComReg is of the view that such an approach is unnecessary as Three already has the opportunity to be assigned 2 × 10 in the 700 MHz in the Proposed Award. Further, Three's proposal would only address concerns about the long term substitutability of those bands and there is likely to be significant technical convergence between the 700 MHz, 800 MHz, 900 MHz bands over the duration of the licence meaning these bands are likely to become even more substitutable in the longer term. (See Competition caps - Chapter 6).
- 4.121 Finally in relation to the substitutability of the Performance Bands, ComReg assessed this in the "Spectrum for Award" RIA. Further, ComReg notes and agrees with DotEcon's that view¹⁵⁶ that, because all supra-1 GHz FDD and TDD spectrum has similar propagation characteristics, it will likely be used for similar purposes in the long run, and therefore all of these bands should be considered substitutes.¹⁵⁷

Gaming concerns

- 4.122 ComReg's previously stated concerns in relation to gaming under Option 1 (two lot category approach) concerned two issues:
- a) it would fragment demand across two lot categories of different duration softening competition ("Collusive Outcomes"); and
 - b) it could encourage strategic bidding with the aim of increasing the prices Eir would need to pay in the second lot category ("Strategic Price Driving").

Collusive outcomes

- 4.123 Prior to assessing the submissions of respondents, ComReg refers to its previously stated concerns in relation to gaming as set out in Paragraph 4.87 - 4.88 of Document 19/124 wherein it noted that the two lot category approach would create obvious incentives for tacit collusion to occur with operators not competing too intensely, or at all, in both lot categories.

¹⁵⁶ Expressed in ComReg 19/124a, paragraph 66.

¹⁵⁷ DotEcon Report, Document 20/122a, p38.

4.124 DotEcon notes that Eir would clearly be more interested in the short licences than its rivals, which makes tacit collusion more likely as there is a natural divide in the lot categories that the bidders would be bidding in. This 'natural split' in lot categories of interest increases the risk of tacit collusion even if Eir wishes to win additional 2.1 GHz spectrum.¹⁵⁸

4.125 For example:

- Eir would only bid for the 3 lots (2 × 15 MHz) in the second lot category and not compete for more than one lot (2 × 5 MHz) in the first lot category; and
- Vodafone and Three would only compete for the 9 lots (2 × 45 MHz) in the first lot category and not compete for any lots in the second category.

4.126 It would be relatively easy for participants to monitor compliance¹⁵⁹ with any tacit agreement because the only information that would be required is whether prices on those lots are increasing or not. Compliance would be measured by the extent to which the price in either lot category rose above a level that any bidder deemed excessive relative to the gains from the collusive behaviour (i.e. prices would not necessarily need to stay exactly at reserve).

4.127 Alternatively, under Time Slicing (Option 2 and 3) multiple bidders are likely to have similar interest in the same lot categories. Bidders would need to bid for lots in both Time Slices to be assigned right of use for the full available duration which significantly mitigates gaming risks as all bidders would be competing for Time Slice 2 lots in addition to Eir's requirement for same. For example, while Eir may only have a requirement for Time Slice 2 (because it already has 2 × 15 MHz of existing rights of use up to the end of Time Slice 1) Vodafone and Three would also need to bid for same in order to be assigned rights of use to cover the full duration (i.e. 2041).

4.128 ComReg acknowledges Vodafone's submission that Option 2 (two lot categories) is not appropriate for the reasons previously described by DotEcon.

4.129 In relation to Three's submission that concerns around collusion are misplaced given the role of reserve prices, ComReg notes that reserve prices are set conservatively and below the market value of the spectrum (See Section 5.7). The two lot categories provides bidders with the opportunity to keep prices close to reserve but significantly below prices that would occur in an open competitive auction.

¹⁵⁸ DotEcon Report, Document 20/122a, p36.

¹⁵⁹ Assuming other bidders were not competing for those lots in which case the tacit agreement may not hold in any event.

4.130 In relation to Three's submission that bidders segmenting demand to avoid competition is a general issue regardless of how lots are packaged, ComReg notes that while such concerns are a possibility in any spectrum award, the risk is substantially higher under Option 1 (two lot category) because only Eir would likely be interested in the short duration lots and this situation would be common knowledge amongst bidders which exposes the award to the risk of tacit collusion and strategic bidding. The fact that this option identifies a natural split that is particularly relevant for one bidder but not others separates it from Option 2 and 3 where multiple bidders are likely to have similar interest across all Time Slices (removing the ability of operators to target bids or orchestrate collusive agreements).

4.131 Further, creating a split of the available spectrum into overlapping shorter and longer duration lots also increases the scope for gaming and/or tacitly collusive outcomes, as switching impediments would prevent bidders being brought into effective competition with each other. Conversely, offering all the available spectrum across sequential Time Slices should allow for the award process to determine the assignment of the 2.1 GHz Band on the basis of demand by allowing bidders to combine Time Slices if preferred.

4.132 In relation to Eir's submission that [] which would undermine any collusive agreement, ComReg notes that:

a) Eir obtaining an additional 2×5 MHz in the first lot category could be accommodated under a tacit agreement where each MNO would potentially receive 2×20 MHz each. The likelihood of this is only enhanced by [];

b) even if bidders have a requirement for more than 2×20 MHz, bidders have a strong incentive to not compete for more than 2×20 MHz, if those rights of use were assigned at close to reserve and significantly below what it would have paid for amounts above 2×20 MHz.¹⁶⁰

4.133 Finally, ComReg notes and agrees with DotEcon that it may be in the interests of all MNOs to avoid destabilising a settled arrangement of spectrum holdings above 1 GHz once Eir's 2.1 GHz licence expires in 2027. In this scenario, competition for first time slice lots at the same time settles second time slice lots. This avoids a further element of competition regarding the second time

¹⁶⁰ For example, ComReg notes that Three previously suggested that, there is a strong case for an administrative award of 2.1 GHz rights directly to MNOs with 2×20 MHz assigned directly to each operator. Similarly, Eir suggests that 2×15 MHz of spectrum in the 2.1 GHz Band be directly assigned to each of the three MNOs with the remainder assigned by way of auction. See 'Assignment Process' RIA.

slice.¹⁶¹

Strategic price driving

- 4.134 Eir notes that the risk of strategic price driving also exists under the Time Slice proposal (Option 2 and 3). However, ComReg is of the view that the risk of strategic price driving under Option 2 and 3 (Time Slicing) is significantly lower because all bidders would compete for all Time Slice 2 lots whereas under Option 1 (two lot category) it is likely only Eir would have an interest in the second lot category meaning Eir could be accurately targeted with strategic price driving. Furthermore, while a bidder could still attempt to strategically increase the price of Time Slice 2 lots knowing that Eir likely has a requirement for those lots, ComReg notes that such an approach risks that bidder winning unwanted lots.
- 4.135 In that regard, ComReg notes Eir's submission on how price driving of Time Slice 2 would occur.
- 4.136 *"Time-slicing the 2.1GHz spectrum will not prevent bidders from driving up the price that eir has to pay for 2.1GHz spectrum in time-slice 2 – all that they will have to do is [✕ [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] ✕] [Emphasis added].*
- 4.137 This is consistent with ComReg's and DotEcon's previously stated views in Document 19/124 that, while theoretically susceptible, it relies on unrealistic assumptions about the information that one bidder has about the likely valuations and bidding strategy of other bidders. Eir's assessment immediately raises the question as to how a bidder would be careful that it does not [✕ [REDACTED] [REDACTED] ✕] noting that each bid in a CCA is binding and could become a winning bid. Further, if such a bid became the final primary package it could restrict the options that bidder has in the supplementary bids round.
- 4.138 For any price driving strategy to be successful a bidder needs to have sufficient information about their competitors' likely demand/valuations, so that they can be relatively assured that they will not win with price-driving bids (i.e. [✕ [REDACTED] [REDACTED] ✕]. Eir has not indicated how other bidders would have accurate information on Eir's valuation for Time Slice 2 lots. While the same deterrent effect also exists under Option 1 (two lot category) it would be easier to increase prices in that scenario because only Eir

¹⁶¹ DotEcon Report, Document 20/122a, p38.

is likely interested in the shorter lot category, which others know and provides a focus for price driving bids.

- 4.139 In relation to Three's submission that strategic price driving of the second lot category is unlikely because Eir could tactically switch to the longer duration lot categories (which Three considers superior substitutes), ComReg notes that this envisages a situation where Eir would prefer to have certain rights of use begin in 2027 but would instead switch to more expensive rights of use beginning in 2022 because of price driving. Such an approach is not plausible because Eir may not have any requirement for rights of use in the period up to 2027 due to holding existing rights of use. Even if Eir decided to pursue such a strategy, ComReg is of the view that it would not lead to the efficient assignment and use of spectrum rights of use because Eir would hold rights of use beginning in 2022 when rights of use beginning 2027 would have been preferable (i.e. it is unlikely that the band would be used efficiently in the period up to 2022). Further, if Eir had a requirement for additional rights of use in the period up to 2027, it would already be competing in the first lot category. In that regard, ComReg notes and agrees with DotEcon's view¹⁶² that the auction design should not create gaming opportunities when there are reasonable methods available to avoid them (in this case, time slicing).
- 4.140 ComReg agrees that there is a risk in any bidders switching back and forth as part of a price driving strategy, however as noted above, there is notably more scope to pursue such a strategy under the two lot category proposal because is potentially only of interest to Eir compared to Time Slices where prices would likely be much higher reflecting competition from other bidders who require rights of use in both Time Slices.
- 4.141 In relation to Eir's submission that strategic price driving would occur with a uniform price auction, ComReg agrees that Eir would be at risk of price driving strategies if the two lot category proposal (i.e. Option 1) was used with a uniform price auction format. Further, ComReg notes that such risks also arise in relation to a second price auction (e.g. CCA) although these risks are somewhat less and in any event are not ComReg's primary concern in relation to the two lot category proposal. (i.e. tacit agreement more likely to occur – see ComReg's final position below).
- 4.142 ComReg notes Eir's submissions that price driving opportunities would be reduced using a uniform auction format and Time Slices. ComReg agrees that such an approach would reduce the potential for price driving opportunities compared to a SMRA (rather than a CCA , for example) and notes that the pricing impacts referred to by Eir are assessed across all Award Risks in the

¹⁶² DotEcon Report, Document 20/122a, p37.

'Auction Format' RIA.

4.143 In relation to the competition assessment provided above, ComReg notes Eir's preference for Option 1, however ComReg cannot rule out the possibility that there may be a need for switching out of the 2.1 GHz Band in the period up to 2041 and under Option 1 and 2, Eir would have no alternatives other than the 2.1 GHz Band when at relative prices it may be preferable to switch to other candidate bands (and in particular 2.6 GHz Band which has a well-developed ecosystem and could be rolled out relatively quickly). ComReg acknowledges that this approach adds some complexity but considers this to be very manageable.

Auction Mitigation

4.144 Considering the assessment above, ComReg is of the view that there are significant gaming risks associated with the two lot category proposal. However, prior to making a final determination on how the 2.1 GHz Band should be made available, ComReg assesses whether those competition concerns could be removed or mitigated by using a particular Auction format.

4.145 **First**, ComReg notes that incentives for collusion (as described) can be reduced by setting a higher reserve price. By reducing the difference between the minimum price and the valuations of bidders, the payoff to a bidder or bidders from acting strategically to soften competition is correspondingly reduced. ComReg notes that such an approach could be used regardless of the auction format and such an approach is assessed separately in Section 5.7.3 where ComReg concludes that such an approach is not appropriate for the Proposed Award.

4.146 **Second**, ComReg notes that the impact on competition under Option 1 arises because of the strong incentives for bidders to behave in a certain manner (i.e. for Eir to only place bids primarily in the second lot category and Vodafone and Three to reciprocate by bidding only in the first lot category)¹⁶³. Therefore, the relevant question is whether there are auction formats or design features that could remove or significantly mitigate the incentives for bidders to behave in such a manner (i.e. engage in described gaming strategies).

4.147 To be clear, no auction format can force bidders to compete¹⁶⁴ for some lots but not other lots. Regardless of whether the auction format uses a combinatorial or non-combinatorial approach, bidders can avoid bidding for certain lot

¹⁶³ Note the tacit agreement would be unlikely to require an absolute requirement for lot prices to remain at reserve but alternatively that prices would remain below a certain level.

¹⁶⁴ ComReg notes that while spectrum awards often include competition caps that could in principle prevent certain bidders from bidding for certain spectrum this relates to accumulations of rights of use.

categories. For example:

- in a non-combinatorial award (e.g. SMRA), bidders can either bid (or not bid) for the relevant lot categories; and
- in a combinatorial award (e.g. CCA), bidders can either include (or not include) the relevant lot categories in their preferred package in each round.

4.148 However, given that any tacit agreement requires bidders to observe whether others are behaving in line with the agreement, an alternative approach would be to assess whether there are auction mechanisms that prevent or reduce a bidder's ability to observe compliance with the tacit agreement, thereby undermining it.

4.149 There are two main features of spectrum auctions worth discussing in that regard¹⁶⁵.

1. Open v sealed bid auctions.
2. Auction Information Policy.

1. Open v sealed bid auctions

4.150 In an open round format, if bidders have strong incentives to tacitly collude, the open rounds will provide them with the ability to observe whether participating bidders are behaving in line with or deviating from the tacit agreement. Under Option 1 all bidders would be able to observe the extent of price increases in both lot categories.

4.151 Alternatively, because sealed bid auction involves just a single round of bidding and there is no opportunity to observe whether other parties to a tacit agreement will behave in line with or deviate from the agreement, the potential for successful collusion is reduced. A sealed-bid process withholds information about demand, which could otherwise be used by some bidders in order to steer the outcome to restrict competition or monitor the terms of a tacit agreement.

4.152 ComReg notes that only two of the award formats being considered have a sealed bid component:

- a) a Sealed Bid Combinatorial Auction (SBCA); and
- b) a Combinatorial Clock Auction (CCA).

¹⁶⁵ ComReg provides a more detailed assessment of the features of auctions in the 'Auction Format' RIA.

- 4.153 In relation to (a) a SBCA could be effective in undermining the potential for collusive outcomes under Option 1 because bidders could include bids for a large number of packages, including packages with or without the relevant lots. Bidders would be unable to monitor compliance (i.e. whether other bidders were placing bids on the relevant lot categories) thereby undermining any tacit agreement. ComReg notes while a collusive agreement could still occur, the risk of same is significantly reduced in a sealed bid award.
- 4.154 In relation to (b), a CCA has both an open stage (primary bid rounds) and sealed bid stage (the supplementary bids round). In relation to the sealed bid stage, the main difference compared to a SBCA is that the CCA constrains all bids for packages except the package for which each bidder bid in the last clock round (the final clock package)¹⁶⁶. However, the SBCA does not constrain any packages (subject to caps) which are all submitted on application.
- 4.155 While a SBCA could mitigate concerns around collusive outcomes under Option 1 (two lot categories), a CCA is unlikely to do so because bidders would have knowledge about compliance with the tacit agreement up to the final primary bid round. At which point, deviation from the agreement, even if it could be permitted under the price caps, would be risky because it could end up winning unwanted lots when compliance with the agreement as preserved up until the final primary bid round would have resulted in a significantly better outcome. In any event, ComReg would note that even if any bidder attempted to deviate, this would pollute the price discovery reducing the benefit of having an open round to begin with.

2. Auction Information Policy

- 4.156 The information policy in a spectrum auction refers to the information made available to bidders during the auction (e.g. lot prices, aggregate demand, eligibility points etc). Even within an open award format, the information policy can set limits on the information made available throughout the award process with the aim of, among other things, limiting the ability of bidders to act strategically during the auction based on what they observe of other bidders. An information policy can be applied to any award format and aims to achieve the right balance between providing information that helps bidders to adjust their demand towards a market clearing efficient outcome and limiting the opportunity for strategic bidding and tacit collusion.
- 4.157 Previous ComReg awards provided aggregate demand information but not

¹⁶⁶ In the supplementary bids round, bidders can make bids on packages which they have not placed bids in the clock round (and increase their clock bids, as necessary), subject to caps on the bid amounts that are derived from the preferences already revealed through their clock bids.

detailed information on the specific bids of each bidder. This information is of significant benefit in reducing common value uncertainty and assessing the packages a bidder might win given the demand from others, but its presentation in aggregated form prevents bidders conditioning their bids on the specific behaviour of one or more rivals, be this to sustain a tacitly collusive outcome or to follow 'predatory' bidding strategies.

- 4.158 Additional information restrictions could be introduced considering the competition concerns arising under Option 1. For example, it may be preferable to only disclose aggregate demand across all categories rather than individual bands. However, in the case to hand, prevailing prices (which would increase if there were excess demand in the previous round) would be sufficient information for bidders to know whether the tacit agreement is being adhered to. (i.e. if prices were rising or rising too much in certain lot categories it would be clear the tacit agreement is not being adhered to or there is demand from other bidders in which case the tacit agreement may become infeasible).
- 4.159 Finally, ComReg notes and agrees with DotEcon that the segmentation of demand for post 2027 usage rights at 2.1 GHz is *in itself* problematic, and our concerns about using long and short licences are not limited to gaming opportunities resulting from the interaction of this lot structure with the caps and it not dependent on the use of a CCA.¹⁶⁷
- 4.160 Therefore, a more restricted information policy for any open auction format would be unlikely to mitigate or remove the competition concerns arising under Option 1.

ComReg's final position on the 2.1 GHz Assignment Options

- 4.161 Having considered the submissions of respondents and the expert views of DotEcon, ComReg confirms its view that, on balance, time slicing the 2.1 GHz Band, 2.3 GHz Band and the 2.6 GHz Band would best ensure the efficient assignment and use of those bands in the Proposed Award.
- 4.162 Option 1 would substantially increase the risk of distortions to competition compared to either Option 2 or 3 (Time Slicing approaches). In particular:
- a) it would fragment demand across two lot categories creating obvious incentives for tacit collusion to occur with operators not competing too intensely, or at all, in both lot categories;
 - b) other bidders may attempt to artificially bid up the price of the shorter licences, with the aim of either maximising the amount Eir would need

¹⁶⁷ DotEcon Report, Document 20/122a, p36.

to pay or restricting Eir's spectrum holdings over the longer term; and

c) these risks arise regardless of the what open auction format is used.

4.163 ComReg would clarify that its primary gaming concerns in relation to Option 1 (two lot category) concerns the potential for tacit agreements as this is more likely to arise compared to strategic price driving¹⁶⁸ because:

a) the gains arising from a successful tacit agreement (being assigned harmonised rights of use at a price below the market value) are significantly larger compared to strategic price driving where the gains relate to increasing the price a rival would have to pay in one Time Slice; and

b) a tacit agreement would be relatively risk free from an assignment perspective. There is little danger that bidders who participate in this would end up with unwanted lots unlike strategic price driving where there is a risk of being assigned unwanted lots. Though ComReg would again note that the risk of strategic price driving is higher than in the time slicing approach for the reasons stated above.

4.164 In competitive auctions, bidders will be less able to distort prices and are less likely to reduce demand or under/overstate their requirements. Conversely, in auctions where some lots are likely to be favoured by a small number of bidders (i.e. three existing rights holders are primarily interested in the 2.1 GHz Band) we need to be much more concerned about the potential for tacit collusion to keep prices low. Therefore, making rights of use available in a way that promotes competition in the auction (rather than encouraging collusive behaviour) helps generate efficient outcomes.

4.165 While the potential distortions to competition facilitated by Option 1 do not arise under Option 2 and 3, ComReg notes that Option 2 creates substitution risks¹⁶⁹ for any bidder than may wish to switch across bands in an individual time slice restricting the ability of those bidders to switch demand in response to changes in prices of either Time Slice¹⁷⁰. In particular:

¹⁶⁸ ComReg would also note that these gaming concerns might not operate independently of one another (though they could). For example, strategic price driving could be used as a punishment mechanism or a method to signal about deviating from the tacit agreement.

¹⁶⁹ Substitution risks arise when a bidder or bidders view a spectrum band as substitutable but cannot or will not switch due to some impediment to switching. This leads to inefficiencies as a bidder or bidders could end up with spectrum rights of use that do not reflect the greatest available value to that bidder. Substitution risks can arise in several different ways, much of which can be mitigated or removed through the choice of auction format.

¹⁷⁰ This only concerns substitution between individual time slices where bidders are only interested in the full duration the substitution risks would be relatively minor. The long duration lot (2021 – 2040)

- a) ComReg notes and agrees with DotEcon that providing opportunities to switch between bands freely is good for competition and more likely to achieve an efficient award, and is clearly appropriate given that we are not convinced that there is any obvious cost or increased complexity that would outweigh this¹⁷¹;
- b) it is important for the efficiency of the Proposed Award more generally that bidders have flexibility to switch easily between bands in response to the evolution of prices during the award;
- c) under Option 1 and 2, if Eir wishes to bid for an amount of spectrum that is within 30 MHz of the overall cap, it would be forced to include bids for 2.1 GHz spectrum in Time Slice 2¹⁷²; and
- d) the ability of operators to compete for different packages of spectrum promotes competition in downstream markets as it supports an efficient outcome in a setting where different bidders are likely to have different requirements across the various bands.

4.166 Alternatively, Option 3 provides all bidders with flexibility to compete across all spectrum bands which will facilitate a broad range of bidding behaviour and outcomes. Option 3 is slightly more mechanically complex, however ComReg considers, on balance, that this additional complexity is manageable for the reasons stated above and would be justified based on the need to provide for the efficient assignment of the radio spectrum for up to 20 years.

4.167 The main switching scenarios (i.e. switching between bands for the full duration) would likely be provided by Option 1 and 2, however Option 3 provides bidders with greater flexibility to account for any situations that may arise. In this way, Option 3 would better promote switching between substitutable bands as bidders would be able to effectively react to relative price changes by switching into or out of the 2.3 GHz and 2.6 GHz Bands in response to changes in the price of the 2.1 GHz Band.

4.168 Therefore, ComReg's consideration of other matters in this consultation will be on the basis that the 2.1 GHz Band, 2.3 GHz Band and the 2.6 GHz Band will be time sliced in line with Option 3 above.

(under Option 1) and a package bid for Time Slice 1 and 2 for the 2.1 GHz Band together (under Option 2) would be substitutable to other candidate bands of similar duration.

¹⁷¹ DotEcon Report, Document 20/122a, p38.

¹⁷² ComReg notes that while this provides Eir with flexibility to switch away from the 2.1 GHz Band to other bands with the same duration, this feature is not just exclusive to Eir and is available to all bidders to compete for spectrum across all supra 1 GHz Bands.

Chapter 5

5 Key aspects of the Award Process

Introductory remarks

What are the key issues? The key issues arise in the context of the need to set several key aspects in the Award Process, including nature of the rights of use, band plans, technical conditions, duration, lot sizes and their nature, and minimum price. These are independent of the award type and format chosen.

What did ComReg propose?

ComReg proposed:

1. the granting of a **limited number of individual rights of use** on a national basis;
2. **band plans** in keeping with the relevant EC Decisions for the 700 MHz Duplex, 2.1 GHz Band and the 2.6 GHz Band, and as per the relevant ECC Decision in relation to the 2.3 GHz Band
3. **technical conditions for the 2.3 GHz and 2.6 GHz bands** to facilitate **compatibility and coexistence** with (i) Eir's existing RurTel network in the 2.3 GHz band (ii) WLANs in the 2.4 GHz band, and (iii) IAA's aeronautical primary radars operating in the 2700 – 2900 MHz frequency range.
4. a **20 year duration** for spectrum rights in the 700 MHz Duplex, 2.3 GHz Band and the 2.6 GHz Band, and a corresponding shorter duration for new rights of use in the 2.1 GHz Band such that all spectrum rights in the Proposed Award would have a common termination date;
5. **Lot sizes** of the smallest usable blocks sizes to provide bidders flexibility in the Award.
 - Frequency-generic lot sizes would be 5 MHz in the case of Time Division Duplex (TDD) and 2 × 5 MHz in the case of Frequency Division Duplex (FDD) spectrum.
 - Frequency-specific lots size would depend on the specific circumstance, being 5 MHz, 10 MHz or 30 MHz as appropriate to the case;
6. **frequency-generic lots** for the 700 MHz Duplex, 2.1 GHz Band, the 2330 – 2390 MHz frequency range of the 2.3 GHz band, and the 2500 – 2570 MHz, 2575 – 2615 MHz and 2620 – 2690 MHz frequency ranges of the 2.6 GHz Band;

7. **frequency-specific lots** for the 2300 – 2300 MHz and 2390 – 2400 MHz frequency range of the 2.3 GHz Band, and the 2570 – 2575 MHz and 2615 – 2620 MHz frequency ranges of the 2.6 GHz band;
8. the setting of **minimum price** fees at a conservative level based on a benchmarking methodology where a 40/60 split would be used to apportion the reserve prices of the Lots and the ongoing spectrum usage fees (SUFs). The Spectrum Access Fee (SAF) would be determined by the auction itself but would not be lower than the reserve price; and
9. to retain its discretion regarding how it might treat any **unsold Lots** depending on the factual circumstances arising from the Proposed Award, save that it intends that unsold Lots will not be considered for assignment for a reasonable period after the process, and, in any event, will not be considered for a period of at least 2 years after the award process.

What Respondents said?

Respondents were in general agreement or did not submit a view in relation to ComReg's proposals for items 1, 2, 3, 4, 6, 7 and 9

For **item 5 (Lot Sizes)**, Vodafone agreed with ComReg's proposal, while Eir and Three submitted that larger lots sizes could be used for certain bands and for certain auction formats.

For **item 8 (minimum prices)**, Eir, Three and Vodafone agreed that the minimum prices should be conservative and split on a 40/60 basis (reserve price / SUF), but also submitted that the minimum prices should be reduced for various reasons. Imagine preferred a larger proportion to be paid by SUF rather than the proposal of a 40/60 basis.

What has ComReg finally decided, and why?

In light of careful consideration of the views of respondents and together with more recent developments ComReg maintains its proposal as set out in Document 19/124 for items 1, 2, 4, 5, and 9 and has updated its position as follows:

- for item 3, the size of the coordination area to ensure co-existence with RurTel is now much reduced compared to that set out in Documents 19/59R and 19/124. This follows the decommissioning of the Kerry RurTel network in 2019 and the non-renewal of RurTel licences in Galway from 31 January 2021;
- for items 6 and 7, the 2300 – 2330 MHz frequency range will now be offered on a frequency-generic basis instead of a frequency-specific basis; and
- for item 8, the minimum price fees for the 2.6 GHz Band frequency-specific lots will be reduced.

5.1 This chapter sets out ComReg's final position on several key aspects of the Award Process, specifically:

- the proposed grant of a limited number of individual rights of use in respect of the Award Bands, where such individual rights would be national in scope;
- the band plans and compatibility considerations;
- the duration of the spectrum rights that would be awarded;
- the lot sizes for all lots in the Award, including the Frequency-Generic and Frequency-Specific Lots;
- the minimum prices and fees for lots; and
- the approach to dealing with unsold lots.

5.2 ComReg notes that these are all key issues of the award process which its consideration of and final position on is independent of the award type and format chosen. However, because ComReg's final position on these matters necessarily informs the "Auction Format" RIA in Chapter 7, they are discussed in this chapter.

5.1 Limited number of individual rights on a national basis

5.1.1 Summary of ComReg's view in Document 19/124

5.3 In Section 5.1 of Document 19/124 and having considered the views of respondents¹⁷³, ComReg set out its preliminary view (see in particular paragraph 5.41) that it was appropriate to make available a limited number of individual rights of use in the Proposed Bands on a national basis.

5.4 ComReg reflected these proposals in paragraphs 3.3, 3.6 and 3.12 of its Draft Decision (Chapter 9 of Document 19/124).

5.1.2 Summary of Respondents Views to Document 19/124, 20/32, 20/56 and 20/78

5.5 No views were submitted to the above documents on ComReg's proposals for making a limited number of individual rights of use available.

5.6 Vodafone in its response to Document 19/124 submitted that it strongly agrees with ComReg's proposal to award rights of use on a national basis. In support of this, it noted that the existing national mobile licences have supported the

¹⁷³ Dense Air, Eir and Vodafone supported the award of rights of use on a national basis while Imagine did not (see section 5.1.2 of Document 19/124).

development of common services with a common price plan on a national basis which has ensured consistent service for customers in all parts of the country.

- 5.7 Similarly, Eir, in response to Document 19/124, is also supportive of the proposal to award rights of use on a national basis stating that this is the most efficient geographic scope for the bands in question.

5.1.3 ComReg's Assessment and Final position

- 5.8 Considering the above, and noting the additional material provide by Vodafone and Eir, ComReg's final position is that it is appropriate to make available a limited number of individual rights of use in the Award Bands on a national basis.

5.2 Band plans and compatibility considerations

5.2.1 Summary of ComReg's view in Document 19/124

- 5.9 In Section 5.2 of Document 19/124, and having considered the views of respondents^{174,175} ComReg set out its proposed band plans and compatibility considerations for each of the Proposed Bands.

- 5.10 In summary, ComReg proposed the use of:

- a) frequency arrangements and band plans¹⁷⁶ as per the relevant EC Decisions for the 700 MHz Duplex, 2.1 GHz Band and the 2.6 GHz Band, and as per the relevant ECC Decision in relation to the 2.3 GHz Band;
- b) Block Edge Masks (BEMs) as per the relevant EC Decisions and ECC Decision to ensure coexistence between neighbouring networks and to protect other services and applications in adjacent bands¹⁷⁷. The details of these BEMs were set out in Section 7.9 and Annex 14 of Document 19/124;

¹⁷⁴ Eir, Three and Vodafone supported the proposed band plans while Imagine did not support a FDD band plan for the 2.6 GHz Band (see paragraphs 5.53, 5.63, 5.80, 5.132 of Document 19/124).

¹⁷⁵ In their responses to Document 19/59R, Imagine, Three and Vodafone submitted that the 2.3 GHz band restrictions in respect of RurTel were excessive (see paragraphs 5.82 to 5.84 of Document 19/124).

¹⁷⁶ As a general point, in relation to guard bands ComReg set out its view in Document 19/59R that it does not propose to implement guard bands between assignments be that on a FDD or TDD or other mode basis.

¹⁷⁷ In relation to the 700 MHz Duplex, and in line with the relevant EC Decision, ComReg noted that if a bidder was to win more than 2×10 MHz of the available spectrum in the 700 MHz Duplex the winning bidder would be prevented, by way of licence condition, from deploying a channel bandwidth greater than 2×10 MHz starting at 703 MHz unless it can demonstrate that it can meet the unwanted emission power of -42 dBm/8MHz in the frequency range 470-694 MHz.

- c) other technical conditions¹⁷⁸ in the 2.3 GHz Band, as detailed in Section 5.2.4 of Document 19/124 in order to facilitate compatibility and coexistence with (i) Eir's existing RurTel network in the 2.3 GHz band and (ii) WLANs in the 2.4 GHz band. This included that licensees obtaining spectrum rights in:
- i. the 2307 – 2327 MHz frequency range¹⁷⁹ would be required to coordinate with Eir's RurTel system before the deployment of base stations within the coordination zone identified in Document 19/124c (as may be updated by ComReg). This coordination would be required until Eir migrates its RurTel network from the 2.3 GHz Band (as may be specified in any Transition Plan developed for the 2.3 GHz Band);
 - ii. the 2390 – 2400 MHz frequency range¹⁸⁰ would be required to comply with a reduced in-block EIRP limit and additional baseline BEM out-of-band EIRP limits applicable above 2403 MHz, as detailed in technical conditions set out in Annex 14 of Document 19/124.
- d) other technical conditions in the 2.6 GHz Band, as detailed in Section 5.2.5 of Document 19/124, in order to ensure compatibility and coexistence with the IAA's aeronautical primary radars operating in the 2700 – 2900 MHz frequency range. This included the use of in-band and out-of-band power flux density (pfd) limits¹⁸¹ recommended by Plum in its updated Report (Document 19/124c) and a 1km coordination zone at each radar location.

5.11 In Chapter 9 of Document 19/124, the above draft proposals were set out in ComReg's draft decision (see paragraphs 3.7 and 3.10):

3.7: to implement band plans, including the relevant guard band/s, for each of the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands as identified in Annex A to this decision instrument; and

3.10: to attach conditions to rights of use to the Award Spectrum as generally described in Chapter [XX] of Document 20/XX [document to

¹⁷⁸ In relation to the 700 MHz Duplex and 2.1 GHz Band, ComReg anticipated that there was no need for other technical conditions.

¹⁷⁹ In Section 6.3 of Document 19/124, ComReg proposed the use of a fixed frequency for spectrum in the 2300 – 2330 MHz frequency range, i.e. the "2.3 GHz Band Fixed Frequency Block (Lower)".

¹⁸⁰ In Section 6.3 of Document 19/124, ComReg proposed the use of a fixed frequency lot for spectrum in the 2390 – 2400 MHz frequency range, i.e. the "2.3 GHz Band Fixed Frequency Block (Upper)".

¹⁸¹ Specific pfd limits were indicated in Document 19/124. As these pfd limits may vary depending on the number of licensees in the 2.6 GHz Band and the quantum of spectrum assigned to each licensee in the downlink part of the 2.6 GHz Band (2570-2690 MHz), the pfd limit per licensee is derived by the formulae set out in the draft MBSA2 Licence Regulations set out in Annex 2 Document 20/32.

which the final decision will be attached] and which will be further particularised in the MBSA2 Licence Regulations;

5.12 In the Draft IM (Document 20/32) the draft rules and procedures to implement the above preliminary positions and draft decisions were set out in Section 2.2 (“The spectrum in the Award Process, Lots and Lot Categories”), Section 2.3 (“MBSA2 Liberalised Use Licence – Terms and Conditions”) and Annex 2 (“Draft MBSA2 Licensing Regulations and Draft 2.1 GHz Early Liberalisation and Interim Licensing Regulations”).

5.2.2 Updated EC Decisions on the 2.1 GHz and 2.6 GHz bands

5.13 Since the publication of Document 19/124, the following EC Implementation Decisions have been amended:

- 2.1 GHz EC Decision 2012/688/EU is amended by 2.1 GHz EC Decision 2020/667, which includes provision of BEMs facilitating Active Antenna Systems (“AAS”) in the 2.1 GHz Band; and
- 2.6 GHz EC Decision 2008/477/EU is amended by 2.6 GHz EC Decision 2020/636/EU, which includes provision of BEMs facilitating AAS in the 2.6 GHz Band.

5.2.3 Updated Information – Eir’s RurTel Network and the 2.3 GHz Band

RurTel Galway

5.14 Since Document 19/124 was published, ComReg has continued to engage with Eir regarding its RurTel migration activities¹⁸².

5.15 In February¹⁸³ and March 2020, ComReg completed a survey of Eir’s RurTel network in Galway for the 4 remaining customers identified, using information provided by Eir¹⁸⁴. ComReg’s survey was completed in two parts¹⁸⁵:

- a) ComReg’s desktop survey – based on ComReg’s mobile coverage map (completed February/March 2020) in relation to the 4 remaining RurTel customers; and
- b) ComReg’s field survey in relation to 2 customers (completed 10 March 2020).

¹⁸² See Annex 17 for non-confidential correspondence between Eir and ComReg in relation to RurTel.

¹⁸³ ComReg requested a further update from Eir by email on 6 February 2020 and again on 28 February 2020 but received no response.

¹⁸⁴ Eir Correspondence of 5 December 2019.

¹⁸⁵ ComReg surveys and correspondence with Eir is available in Annex 17 of this document.

- 5.16 On 29 July 2020, ComReg wrote to Eir setting out the high-level results of its surveys and ComReg's staff observations in relation to the four customers, being that all 4 customers could be served by an alternative service. ComReg requested Eir's comments on same.
- 5.17 In its response of 28 August 2020, Eir stated that it has carried out further surveys and that the number of customers in Galway has reduced to 2 customers.
- 5.18 On 2 November 2020, ComReg wrote to Eir¹⁸⁶ setting out its detailed survey results for the two remaining customers and requested Eir to promptly:
- a) migrate Customer 2 from RurTel to an alternative service such as FCS; and
 - b) take action to licence the Exicom Condor system operating in the VHF band which, in ComReg's view, provides service to Customer 3.
- 5.19 In this letter, ComReg also set out its view that it will cease issuing renewal licences to Eir in respect of the Galway network from 31 January 2021, and it stated “[s]hould Eir wish to respond to any of the other points made in this letter, it is requested to so by 12 November 2020”.
- 5.20 On 18 November 2020, Eir stated that it had submitted incorrect information to ComReg on the location of Customer 3, and that there is in fact a Customer 3 using the Galway RurTel network at another location to that provided in previous communications.¹⁸⁷
- 5.21 In relation to this customer, Eir in correspondence on 19 November noted that service at the corrected location of Customer 3 was “*very weak*” and it stated that its next step would be to assess further from “*higher up on the customer house (outside gable) or vicinity*” and to inform ComReg when it has a further update.
- 5.22 On 1 December 2020, and as indicated in ComReg's letter of 2 November 2020, ComReg notified Eir that the Galway RurTel network will no longer be licensed in the 2.3 GHz band from 31 January 2021.

RurTel Donegal

- 5.23 In relation to Donegal, Eir's response of 28 August 2020 indicates there are 57

¹⁸⁶ ComReg letter to Eir dated 2 November 2020 is available in Annex 17.

¹⁸⁷ Eir also confirmed in its response of 18 November 2020 that, “*the location originally given by eir to ComReg for Customer 3 does have a (non-RurTel) active customer [X [REDACTED] X] served by an Exicom VHF Link*”. Eir stated that it will engage with ComReg to obtain a licence for this system.

active customers (down from 76 customers in December 2019);

5.24 In its further correspondence dated 8 October 2020, Eir provided information on its potential migration strategy for each of these 57 customers. In this Eir indicates that of the 57 customers:

- 25 had good in-building mobile coverage;
- 5 had good outdoor mobile coverage;
- 6 were potentially serviceable by installing mobile repeaters on the RurTel poles (currently out for field survey);
- 11 should be within mobile coverage as Eir rolls out new sites planned in its mobile network expansion;
- 3 are still being analysed for a potential mobile solution; and
- 7 have been identified with no existing or planned mobile coverage.

5.25 ComReg, in its letter of 2 November 2020, has indicated that it will reply to Eir regarding the Donegal RurTel network in due course.

5.2.4 Information Update – IAA Radars and the 2.6 GHz band

5.26 Since Document 19/124, ComReg has continued to engage with the IAA regarding:

- 1) its implementation of filters on three Star 2000 radars in Shannon, Cork and Dublin airports; and
- 2) the decommissioning of its older TA10M radar in Dublin and the installation of a new Star 2000 radar which ComReg understands will have an appropriate filter.

5.27 In relation to (1), ComReg understands that the IAA is finalising an agreement for the installation of new filters at the three locations.

5.28 Regarding timelines, ComReg understands that it would take approximately 12 months from date of signature (subject to any suspensions as a result of, for example, COVID-19) to complete the installation of filters on all three radar sites.

5.29 On the working assumption that the contract(s) would be signed during Q1 2021, this would mean a completion date of Q1 2022. In relation to these timelines, ComReg understands that the IAA is requesting lead times to be reduced where possible, and that the filter provider would assess same once the agreement is signed.

5.30 In relation to (2) above, ComReg observes that:

- on 11 August 2020, the IAA submitted a planning application to Fingal County Council regarding a site for its new radar, to be located at Hollywood Great (Tooman), Naul, Co Dublin;
- on 17 August 2020, ComReg provided supporting documentation¹⁸⁸ to the IAA's application; and
- on 5 October 2020, Fingal County Council requested further information be provided by the IAA¹⁸⁹. ComReg understands that the IAA have responded to these requests in order to ensure planning is approved in a timely manner.

5.31 Assuming approval of the IAA's planning application occurs in early Q1 2021 and that decision is not appealed, ComReg understands that the following approximate timelines would apply:

- building and site work to be completed by November 2021;
- radar installation, regulatory and safety requirements, technical assessments and operations validation will take 12 months from the building and site work completion date.
- the IAA expect the new (filtered) Star 2000 radar to be commissioned in November 2022. The decommissioning of the TA10M radar would take place immediately afterwards.

5.2.5 Updated Plum Report

5.32 Plum has completed a further report, published alongside this document as Document 20/122b, updating its co-existence analysis for the deployment of MFCN networks in the:

- 2.3 GHz Band with Eir's RurTel network; and
- 2.6 GHz Band with IAA aeronautical primary radars operating in the 2700 – 2900 MHz frequency range.

RurTel and the 2.3 GHz band

5.33 In Document 20/122b, Plum has updated its co-existence analysis of the RurTel network to account for recent information, and in particular, the non-renewal of licences for Eir's Galway RurTel network from 31 January 2021. This means that only the Donegal portion of Eir's network would be operational at the time

¹⁸⁸ ComReg supporting documentation available at <http://documents.fingalcoco.ie/NorthgatePublicDocs/00669859.pdf>

¹⁸⁹ A very substantial amount of information was provided on 4 December 2020, see <https://planning.agileapplications.ie/fingal/application-details/87420>. However, ComReg is not clear if all of the requested information has been provided, as yet.

that any new spectrum rights of use commence in the 2.3 GHz Band.

5.34 Noting the above, Plum, in Document 20/122b, state that the conclusions and recommendations provided in its previous analysis set out in Document 19/59d and 19/124c still apply to Donegal's RurTel network, as summarised below:

- a) for MFCNs using co-channel frequencies to be deployed in areas surrounding RurTel base station receivers, a coordination procedure should be defined to ensure coexistence between proposed MFCN deployments and existing RurTel networks;
- b) in the event that the RurTel network is further reduced in Donegal or retired from the 2.3 GHz Band, the requirement for a co-channel coordination procedure should be assessed, and modified as appropriate, to reflect any changes; and
- c) in the case of adjacent channel co-existence, the results show that adjacent channel coexistence between MFCN and RurTel is likely to be feasible in practice without any coordination requirements for most deployment scenarios.

5.35 Figure 4 below illustrates the updated co-channel interference (CCI) coordination contour relevant to Eir's RurTel network in Donegal.

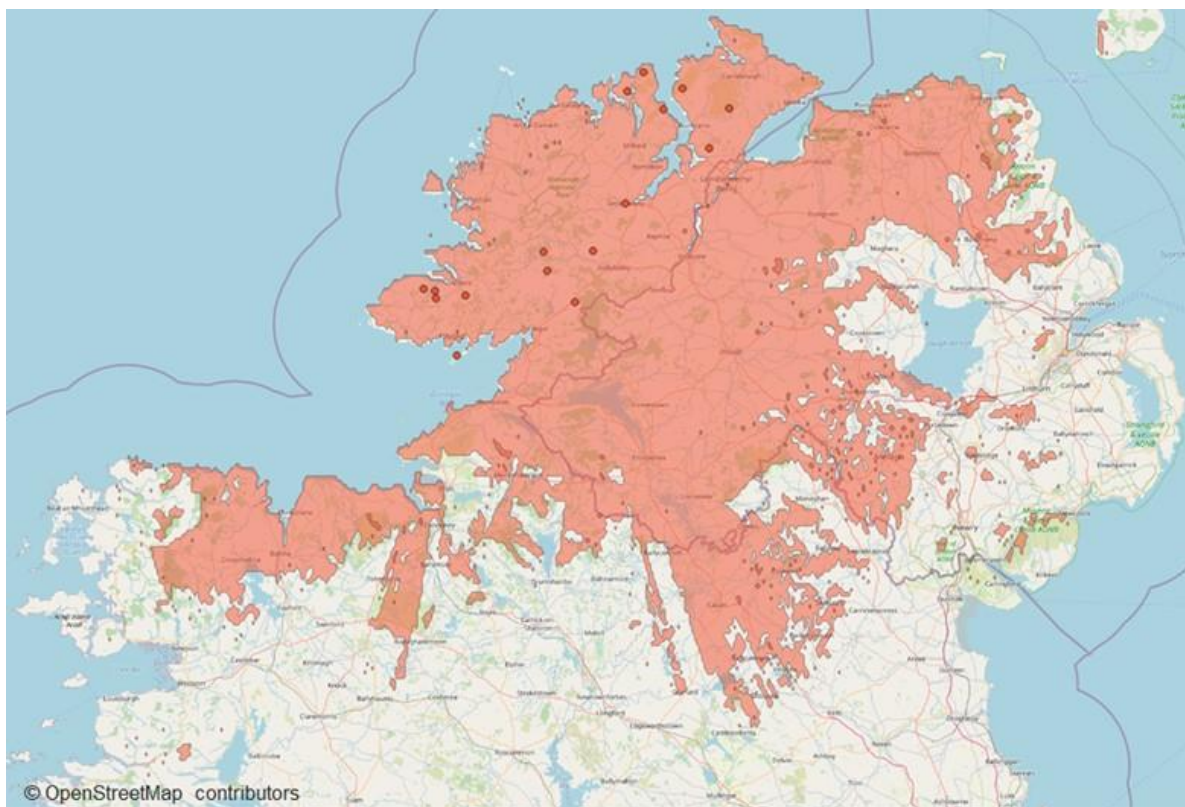


Figure 4. Co-ordination Contour (co-channel Interference) for Donegal RurTel network

IAA radars and the 2.6 GHz band

- 5.36 In Document 20/122b, Plum updated its compatibility and co-existence analysis (previously set out in ComReg Document 19/59d and 19/124c) to account for new information received in relation to the proposed location of the new Star 2000 radar at Tooman, Naul, Co Dublin, which is set to replace the old TA10M¹⁹⁰.
- 5.37 ComReg understands from correspondence with the IAA that this new Star 2000 radar will be installed with an appropriate filter providing mitigation against blocking and intermodulation effects. Spurious emissions from MFCN base stations in the 2.6 GHz Band will remain a relevant issue, similar to existing Star 2000 radars at Shannon, Cork and Dublin airports.
- 5.38 In this regard, Plum states that the recommendations set out in Document 19/124c remain relevant and extend to the new Star 2000 radar proposed at Tooman, Naul, Co Dublin. This includes implementing:

¹⁹⁰ The IAA currently operate three unfiltered Star 2000 radars and one TA10M radar which is to be decommissioned once a new filtered Star 2000 radar is installed.

- a pfd limit at the antenna of the radar receiver to address the impact of MFCN spurious emissions; and
- a 1 km coordination zone around the radar, to ensure protection of the radar from MFCN base stations where they are operating in close proximity.

5.39 Figure 5 below illustrates the potential impact of MFCN spurious emissions¹⁹¹ at the proposed location of the new Star 2000 radar receiver as well as a 1 km coordination zone around the radar:

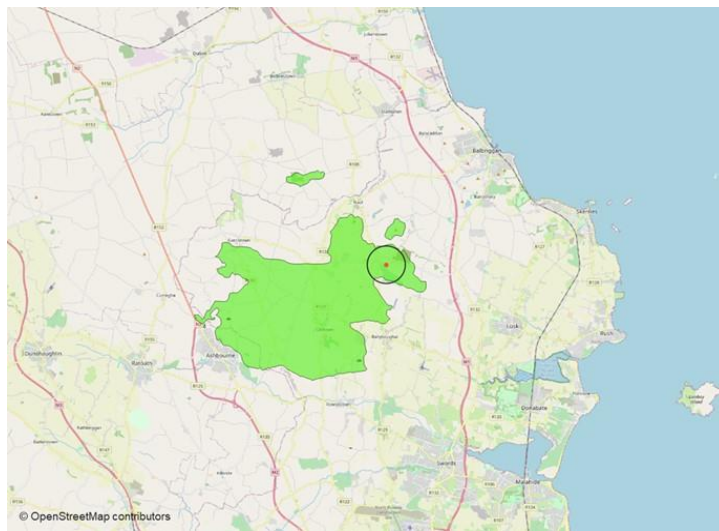


Figure 5. Potential impact of spurious emissions on the new Dublin (Tooman) radar, and 1 km coordination zone

5.40 Regarding the impact that the 2020 amending EC decision on the 2.6 GHz band could have on Plum's technical analysis, which assumes MFCN parameters set out in the 2008 2.6 GHz EC Decision, Plum clarifies that:

“Because the interference limits specified in Section 3.4 of the Plum report are derived from the radar protection requirements, rather than any assumption about MFCN radiated power, they remain valid under the new Decision.

The plots showing areas of potential interference (Figures 3.1, 3.3 – 3.6) relate to the original worst-case of base stations with 61 dBm EIRP. Should base stations of higher power be deployed, the potential interference areas will be correspondingly larger.

5.41 In all cases the radar installations will be protected by the power flux density (pfd) limits originally specified by Plum.”.

¹⁹¹ Plums modelling parameters are set out in the updated Plum Report Document 20/122b which assumes a max MFCN in-block EIRP of 61 dBm/5MHz based on EC Decision 2008/477/EC.

5.2.6 Summary of respondents views to Document 19/124, 20/32, 20/56 and 20/78

- 5.42 Vodafone in its response to Document 19/124 submitted that it strongly supports ComReg's approach in aligning with European standard band plans:

"This is key to having effective networks in Ireland, as the scale of our customer base cannot drive technology development of base-station or terminal equipment. We therefore must make maximum use of international standards to benefit from the rapid developments that are being made in new technologies."

- 5.43 Eir, in its response to Document 19/124, submits that whilst it has no material concerns regarding ComReg's previous proposals on band plans and relevant guard bands it was unable to comment further as it was unable to locate Annex A as referred to in paragraph 3.7 of the draft Decision.
- 5.44 No further views were submitted on ComReg's proposals in the responses to Documents 20/32, 20/56 and 20/78. However from the responses to Document 19/59R, ComReg observes that Three and Vodafone agreed with the band plan proposals for the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz bands, while Imagine disagree with the band plan proposal for the 2.6 GHz Band, asserting that it would be more efficient, in its view, for this to be fully assigned on a TDD basis¹⁹².

5.2.7 ComReg's assessment of respondents' views and updated information

Updated EC Decisions for the 2.1 GHz and 2.6 GHz bands

- 5.45 ComReg notes Vodafone's and Eir's support for the proposed band plans and agrees that there is merit in aligning with European standard band plans given the benefits of international standardisation including a wider availability of base station and terminal equipment.
- 5.46 In relation to the updated EC Decisions for the 2.1 GHz Band and the 2.6 GHz Band, ComReg's band plan and technical conditions (as set out in Annex 13 of this document) have been updated to reflect same.
- 5.47 Finally, regarding Eir's submission that it was unable to locate Annex A of the draft Decision, ComReg clarifies that this reference was incorrect, as this reference should have been to Section 5.2 of Document 19/124 instead of Annex A. ComReg observes that the proposed Band Plans in Section 5.2 of

¹⁹² ComReg's consideration of Imagine's view is addressed in Section 5.2.5 (paragraphs 5.141 and 5.142) of Document 19/124.

Document 19/124 were the same as those proposed in Document 19/59R, to which Eir states that it no material concerns.

Eir's RurTel network and the 2.3 GHz band

5.48 In relation to the use of the 2.3 GHz Band by RurTel, ComReg observes the updated information in Section 5.2.3 above, noting in particular:

- a) ComReg's notification to Eir on 1 December 2020, that the Galway RurTel network will no longer be licensed in the 2.3 GHz band from 31 January 2021;
- b) Eir's correspondence of 28 August indicating that there are 57 active customers in the Donegal RurTel network (down from 76 customers in December 2019) and its correspondence of 8 October 2020 suggesting a potential migration strategy for each of these 57 customers; and
- c) Plum's updated analysis of the RurTel network (Document 20/122b) which considers the impact of RurTel in Donegal only and sets out a revised composite interference plot recommending co-channel¹⁹³ coordination within the area of the interference plot.

5.49 Having regard to the above, ComReg:

- a) remains of the view that co-channel coordination with the RurTel network is still required, albeit that the co-channel coordination area (see Figure 1.7 of Document 20/122b) has now been reduced to account for just the Donegal portion of the RurTel network;
- b) will continue to engage with Eir on progressing the migration of customers from the RurTel network and the decommissioning of the remaining Donegal parts of the network. If the RurTel network is notably reduced in Donegal, ComReg will modify the co-channel coordination area as appropriate. When the network is fully decommissioned ComReg intends to inform the relevant licensee(s).

IAA's aeronautical radars and the 2.6 GHz Band

5.50 In light of the approaches taken in the benchmark countries¹⁹⁴ and the analysis and recommendations from Plum in Document 19/59c, Document 19/124c and Document 20/122b, ComReg is of the view that it remains appropriate to apply

¹⁹³ Co-channel means any block overlapping RurTel operating in 2307 – 2327 MHz.

¹⁹⁴ In its report, Plum notes that its recommendations, "follow implementations and standards already adopted in other administrations, such as the UK, Belgium and France considered in Document 19/59d, where MFCN are currently operational in the 2.6 GHz spectrum, to protect aeronautical radar systems."

the mitigation measures recommended by Plum to ensure coexistence between aeronautical radars operating in the 2700 - 2900 MHz band and new MFCN base stations in the 2.6 GHz Band.

5.51 ComReg notes that the pfd limits derived in the Plum report assume three licensed operators with equal amount of assigned spectrum. As the outcome of the Proposed Award may provide for different numbers of operators and/or a different amount of spectrum assigned to each operator, for clarity, the corresponding pfd limits to be implemented by each network operators are as follows:

- a) in relation to Star 2000 Aeronautical Primary Radars, the licensee shall:
 - i. comply with an out-of-band pfd limit given¹⁹⁵ by $-140 \text{ dBW/m}^2/\text{MHz} + (10 \times \text{Log}_{10} (\text{Bop}/120))$, where Bop is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the licensee in the 2.6 GHz Band, to address the impact of MFCN spurious emissions at the radar antenna receiver location; and
 - ii. until notified by the Commission in writing that filters are installed at the Aeronautical Primary Radar, comply with an in-band pfd limit, given¹⁹⁶ by $-78 \text{ dBW/m}^2 + (10 \times \text{Log}_{10} (\text{Bop}/120))$, where Bop is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the licensee in the 2.6 GHz Band, to address the impact of blocking and intermodulation effects at the Aeronautical Primary Radar receiver.
- b) in relation to the TA10 Aeronautical Primary Radar, the licensee shall, until otherwise notified by the Commission in writing:
 - i. comply with an out-of-band pfd limit given¹⁹⁷ by $-151 \text{ dBW/m}^2/\text{MHz} + (10 \times \text{Log}_{10} (\text{Bop}/120))$, where Bop is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the licensee in the 2.6 GHz Band, to address the impact of MFCN spurious emissions at the Aeronautical Primary Radar antenna receiver location; and

¹⁹⁵ Where $-140 \text{ dBW/m}^2/\text{MHz}$ is the absolute limit required to protect the Star2000 Aeronautical Primary Radar installations from emissions by all operators for out-of-band (i.e. $>2700 \text{ MHz}$) power.

¹⁹⁶ Where -78 dBW/m^2 is the absolute limit required to protect the Star2000 Aeronautical Primary Radar installation from emissions by all operators for in-band (i.e. $2570 - 2690 \text{ MHz}$) power.

¹⁹⁷ Where $-151 \text{ dBW/m}^2/\text{MHz}$ is the absolute limit required to protect the TA10 Aeronautical Primary Radar installation from emissions by all operators for out-of-band (i.e. $>2700 \text{ MHz}$) power.

- ii. comply with an in-band pfd limit given¹⁹⁸ by $-88 \text{ dBW/m}^2 + (10 \times \text{Log}_{10} (\text{Bop}/120))$, where Bop is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the licensee in the 2.6 GHz Band, to address the impact of blocking and intermodulation effects at the Aeronautical Primary Radar antenna receiver.

5.52 In relation to other models of Aeronautical Primary Radars other than the Star 2000 and TA10, the licensee shall comply with conditions as may be determined by ComReg.

5.53 To provide additional protection from MFCN base station emissions at the Aeronautical Primary Radar receiver, a coordination zone of one-kilometre radius shall apply around the location of each Aeronautical Primary Radar.

5.54 These technical conditions are set out in Annex 13 of this document.

5.2.8 ComReg's final position

5.55 In light of the above, ComReg's final position is to:

- a) set out frequency arrangements and band plans as per the relevant EC Decisions for the 700 MHz Duplex, 2.1 GHz Band and 2.6 GHz Band and the ECC Decision in the case of the 2.3 GHz Band. These band plans are set out in Figure 6, Figure 7, Figure 8 and Figure 9 below;
- b) use Block Edge Masks (BEMs) as per the relevant EC Decisions and ECC Decision to ensure coexistence between neighbouring networks and to protect other services and applications in adjacent bands¹⁹⁹. The details of these BEMs are set out in Section 8.9 and Annex 13 of this document;
- c) apply other technical conditions in the 2.3 GHz Band, as detailed in Annex 13 of this document, in order to ensure compatibility and coexistence with (i) Eir's existing RurTel network in the 2.3 GHz Band and (ii) WLANs in the 2.4 GHz band. This includes requiring licensees obtaining spectrum rights in:
 - i. the 2307 – 2327 MHz frequency range to coordinate with Eir their deployment of base stations within the coordination zone identified in Document 19/124c (as may be updated by ComReg). This

¹⁹⁸ Where -88 dBW/m^2 is the absolute limit required to protect the TA10 Aeronautical Primary Radar installation from emissions by all operators for in-band (i.e. 2570 – 2690 MHz) power.

¹⁹⁹ In relation to the 700 MHz Duplex, and in line with the relevant EC Decision, this includes a requirement that if a licensee wins more than $2 \times 10 \text{ MHz}$ of the available spectrum in the 700 MHz Duplex it will be prevented, by way of licence condition, from deploying a channel bandwidth greater than $2 \times 10 \text{ MHz}$ starting at 703 MHz unless it can demonstrate that it can meet the unwanted emission power of $-42 \text{ dBm}/8\text{MHz}$ in the frequency range 470 – 694 MHz.

coordination would be required until Eir migrates its RurTel network from the 2.3 GHz Band (as may be specified in any Transition Plan developed for the 2.3 GHz Band); and

- ii. the 2390 – 2400 MHz frequency range to comply with a reduced in-block EIRP limit and additional baseline BEM out-of-band EIRP limits applicable above 2403 MHz, as detailed in technical conditions set out in Annex 13 of this document.
- d) apply other technical conditions in the 2.6 GHz Band, as detailed in Annex 13 of this document, in order to ensure compatibility and coexistence with the IAA's aeronautical primary radars operating in the 2700 – 2900 MHz frequency range. This includes the use of in-band and out-of-band power flux density (pfd) limits²⁰⁰ recommended by Plum in its updated Report (Document 19/122b and a 1km coordination zone at each radar location.

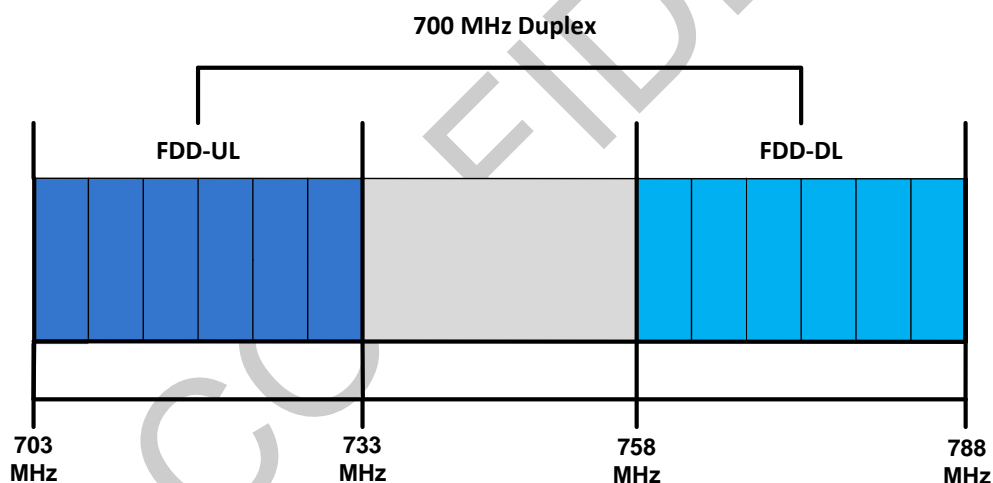


Figure 6. The 700 MHz Duplex Band Plan

²⁰⁰ Specific pfd limits were indicated in Document 19/124. As these pfd limits may vary depending on the number of licensees in the 2.6 GHz Band and the quantum of spectrum assigned to each licensee in the downlink part of the 2.6 GHz Band (2570 – 2690 MHz), the pfd limit per licensee is derived by the formulae set out in the draft MBSA2 Licence Regulations (Document 20/32).

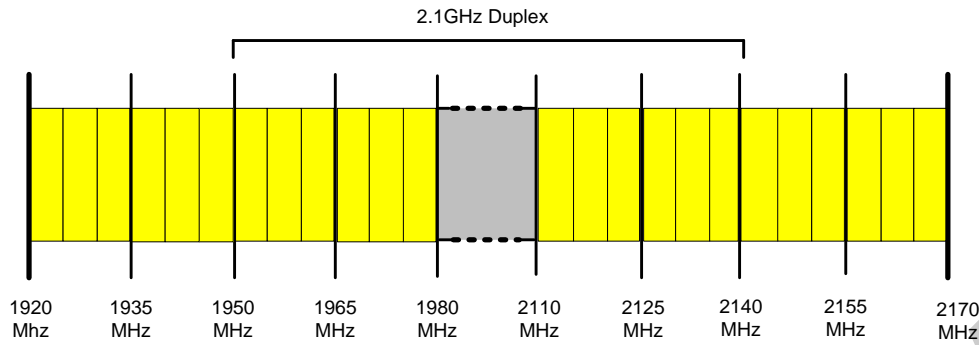


Figure 7. The 2.1 GHz Band Plan

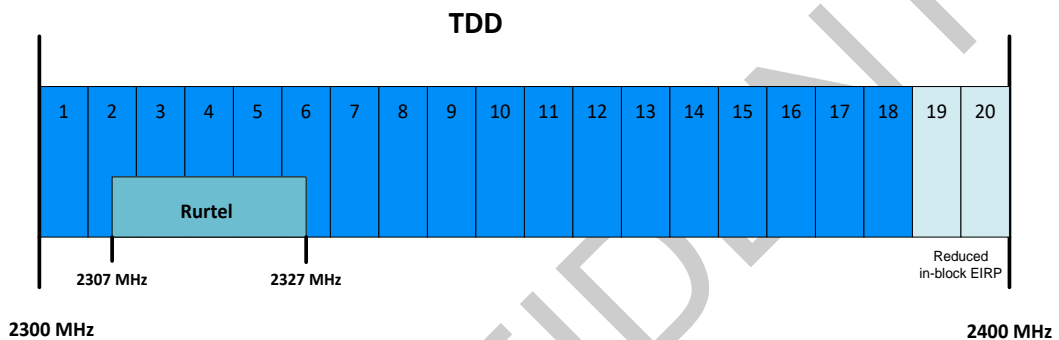


Figure 8. The 2.3 GHz Band Plan

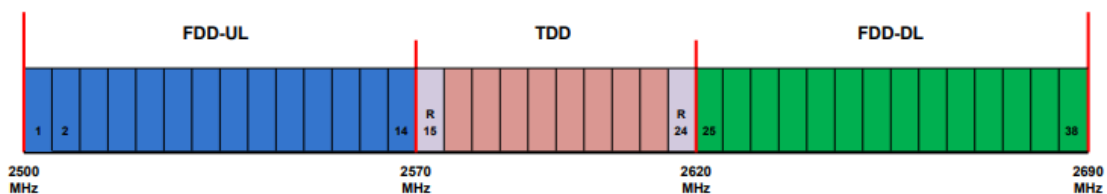


Figure 9. The 2.6 GHz Band Plan

5.3 Licence duration

5.3.1 Summary of ComReg’s proposal in Document 19/124

5.56 In Section 5.3 of Document 19/124 and in particular paragraph 5.165, ComReg set out its revised preliminary view that the appropriate duration for rights of use awarded under the Proposed Award is 20 years for rights of use in the 700 MHz Duplex, 2.3 GHz and 2.6 GHz Bands and a corresponding shorter duration for new rights of use in the 2.1 GHz Band.

5.57 For illustrative purposes, Document 19/124 assumed a nominal

commencement date for these rights of use of 1 December 2020, which would result in:

- a) 700 MHz Duplex, 2.3 GHz and 2.6 GHz Band rights of use commencing on 1 December 2020 and fully expiring on 30 November 2040, i.e. an overall period of 20 years; and
- b) new 2.1 GHz Band rights of use commencing on 16 October 2022 (i.e. the beginning of Time Slice 1 for the 2.1 GHz Band) and fully expiring on 30 November 2040, corresponding to an overall duration of approximately 18 years and 1.5 months.

5.58 ComReg reflected these proposals in paragraphs 3.13 and 3.14 of its Draft Decision (Chapter 9 of Document 19/124).

5.3.2 Summary of Respondents Views to Document 19/124

5.59 In its submission to Document 19/124, Vodafone welcomed ComReg's revised proposals in Section 5.3.4 of Document 19/124 to establish a licence duration of 20 years. Vodafone submitted that this is in line with the European Electronic Communications Code and will support network investment. Eir also agrees licences awarded should cover a 20 year period, be co-terminus, and that the 700 MHz Band should be awarded for one temporal period.

5.3.3 ComReg's Final Position

5.60 In light of the above, ComReg's final position is that the appropriate duration for rights of use awarded under the Award is 20 years for rights of use in the 700 MHz Duplex, 2.3 GHz and 2.6 GHz Bands and a corresponding shorter duration for new rights of use in the 2.1 GHz Band.

5.61 Where the commencement date for these rights of use is 1 December 2021²⁰¹ (noting, however, that ComReg may specify a different date in, or in accordance with, the Information Memorandum), this would result in:

- a) 700 MHz Duplex, 2.3 GHz and 2.6 GHz Band rights of use commencing on 1 December 2021 and fully expiring on 30 November 2041, i.e. an overall period of 20 years; and
- b) new 2.1 GHz Band rights of use commencing on 16 October 2022 (i.e. the beginning of Time Slice 1 for the 2.1 GHz Band) and fully expiring

²⁰¹ This date is estimated considering amongst other things, an envisaged publication of the IM and start of the Proposed Award in Q1 2021 and the time required to complete comparable award processes (e.g. 2012 MBSA).

on 30 November 2041, corresponding to an overall duration of approximately 19 years and 1.5 months.

5.4 Lot Size

5.4.1 Summary of ComReg's views to date

5.62 In Section 7.4 of Document 19/59R, and having considered the views of respondents as summarised in Section 6.2.2 of Document 19/124, ComReg set out its preliminary view that it would be appropriate to offer spectrum in its smallest usable blocks to provide bidders with greater flexibility to aggregate spectrum to fit a bidder's demand profiles. In summary, ComReg noted:

- a) if lots are offered in lot sizes greater than the smallest usable block, it could result in lots being inefficiently distributed across bidders or remaining unsold;
- b) the relevant European harmonisation measures for mobile broadband use of the proposed bands specify frequency arrangements of 5 MHz blocks; and
- c) package bids allow for the aggregation of lots that would constitute larger blocks, in line with bidders' respective business plans.

5.63 ComReg was therefore of the preliminary view that frequency-generic spectrum should be offered using lot sizes of 5 MHz, or 2 × 5 MHz in the case of Frequency Division Duplex (FDD) bands, because such lot sizes best accommodate all likely types of users and technology.

5.64 Having considered the responses to Document 19/59R, ComReg reaffirmed its view in Document 19/124, that is to make rights of use available in Frequency-Generic (of 5 MHz size) and Frequency-Specific Lots (of 5 MHz, 10 MHz or 30 MHz depending on the band).

5.65 ComReg reflected this position in its Draft Decision as follows:

3.15.3 700 MHz Duplex Frequency Generic Lots²⁰² being made available in one temporal period from [1 December 2020] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to [30 November 2040] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum);

²⁰² Where a 700 MHz Duplex Frequency Generic Lot means "a right of use in respect of a 2x5 MHz block of spectrum in the 700 MHz Duplex, with the specific frequencies of such Lots being determined in the assignment stage of the competitive selection procedure"

3.15.4 2.3 GHz Band Fixed Frequency Lot (Lower)²⁰³, 2.3 GHz Band Fixed Frequency Lot (Upper)²⁰⁴, 2.3 GHz Band Frequency Generic Lots²⁰⁵, 2.6 GHz Band FDD Frequency Generic Lots²⁰⁶, 2.6 GHz Band TDD Fixed Frequency Lot (Lower)²⁰⁷, 2.6 GHz Band TDD Fixed Frequency Lot (Upper)²⁰⁸ and 2.6 GHz Band TDD Frequency Generic Lots²⁰⁹ being made available in two “time slices”, viz:

3.15.5 2.1 GHz Band Frequency Generic Lots²¹⁰ being made available in two “time slices”, viz:

5.66 Finally, ComReg reflected this position in its Draft IM and Draft Regulations where it stated that:

- “700 MHz Duplex Block” means a 5 MHz paired block of radio frequency spectrum in the 700 MHz Duplex;
- “2.1 GHz Band Block” means a 5 MHz paired block of radio frequency spectrum in the 2.1 GHz Band;
- 2.3 GHz Band Fixed Frequency Block (Lower)” means the 30 MHz unpaired block of radio frequency spectrum in the range 2300 to 2330 MHz
- 2.3 GHz Band Fixed Frequency Block (Upper)” means the 10 MHz unpaired block of radio frequency spectrum in the range 2390 to 2400 MHz;
- “2.3 GHz Band Generic Frequency Block” means a 5 MHz unpaired

²⁰³ Where a 2.3 GHz Band Fixed Frequency Lot (Lower) means “a right of use in respect of the 1x30 MHz block of spectrum from 2300 – 2330 MHz”

²⁰⁴ Where a 2.3 GHz Band Fixed Frequency Lot (Upper) means “a right of use in respect of the 1x10 MHz block of spectrum from 2390 – 2400 MHz”

²⁰⁵ Where a 2.3 GHz Band Frequency Generic Lot means “a right of use in respect of a 1x5 MHz block of spectrum in the range 2330 – 2390 MHz, with the specific frequencies of such Lots being determined in the assignment stage”

²⁰⁶ Where a 2.6 GHz Band FDD Frequency Generic Lot means “a right of use in respect of a 2x5 MHz block of spectrum in the range 2500 – 2570 MHz paired with 2620 – 2690 MHz, with the specific frequencies of such Lots being determined in the assignment stage”

²⁰⁷ Where a 2.6 GHz Band TDD Fixed Frequency Lot (Lower) means “a right of use in respect of the 1x5 MHz block of spectrum from 2570 – 2575 MHz”

²⁰⁸ Where a 2.6 GHz Band TDD Fixed Frequency Lot (Upper) means “a right of use in respect of the 1x5 MHz block of spectrum from 2615 – 2620 MHz”

²⁰⁹ Where a 2.6 GHz Band TDD Frequency Generic Lots means “a right of use in respect of a 1x5 MHz block of spectrum in the range 2575 – 2615 MHz, with the specific frequencies of such Lots being determined in the assignment stage”

²¹⁰ Where a 2.1 GHz Band Frequency Generic Lot means “a right of use in respect of a 2 x 5 MHz block of spectrum in the 2.1 GHz Band, with the specific frequencies of such Lots being determined in the assignment stage”

block of radio frequency spectrum in the range 2330 to 2390 MHz;

- *“2.3 GHz Band Blocks” means the 2.3 GHz Band Fixed Frequency Block (Lower), 2.3 GHz Band Fixed Frequency Block (Upper) and 2.3 GHz Band Generic Frequency Blocks;*
- *“2.6 GHz Band FDD Generic Frequency Block” means a 5 MHz block of radio frequency spectrum in the range 2500 to 2570 MHz paired with a 5 MHz block of radio frequency spectrum in the range 2620 to 2690 MHz;*
- *“2.6 GHz Band TDD Fixed Frequency Block (Lower)” means the 5 MHz unpaired block of radio frequency spectrum in the range 2570 to 2575 MHz;*
- *“2.6 GHz Band TDD Fixed Frequency Block (Upper)” means a 5 MHz unpaired block of radio frequency spectrum in the range 2615 to 2620 MHz;*
- *“2.6 GHz Band TDD Generic Frequency Block” means a 5 MHz unpaired block of radio frequency spectrum in the range 2575 to 2615 MHz;*
- *“2.6 GHz Band Blocks” means the 2.6 GHz Band FDD Generic Frequency Block, 2.6 GHz Band TDD Fixed Frequency Block (Lower), 2.6 GHz Band TDD Fixed Frequency Block (Upper) and 2.6 GHz Band TDD Generic Frequency Blocks;*
- *“2.6 GHz Band TDD Blocks” means the 2.6 GHz Band TDD Fixed Frequency Block (Lower), 2.6 GHz Band TDD Fixed Frequency Block (Upper) and 2.6 GHz Band TDD Generic Frequency Blocks;*

5.4.2 Summary of Respondents Views to Document 19/124 and 20/56

5.67 In response to Document 19/124:

- a) Vodafone agreed with the proposed Frequency-Generic Lot sizes;
- b) Eir agreed with the proposed lot definitions; and
- c) Three submitted that ComReg could always increase the lot size to 20 MHz if it was concerned that the minimum usable threshold for some bidders in some bands could be greater than 10 MHz.

5.68 In response to Document 20/56:

- a) Three suggested a hybrid SMRA and, in that regard, proposed that

generic lots in the 2.3 GHz Band would be best assigned as 10 MHz lots, due in its view to the likely low interest in 5 MHz lots and also to ensure consistency with the duplex bands in the award so as to facilitate switching;

- b) Eir submitted that it may be appropriate to increase the size of the lots in some categories, in particular those that are currently proposed to be just 5 MHz, so as to reduce the risk that a bidder wins an inefficiently small amount of spectrum in a band.²¹¹; and
- c) Eir submitted an alternative option might be to allow each bidder to specify if they would prefer to win no lots at all rather than just one lot (i.e. to win a minimum of two lots) and that ComReg could change the rules to reflect same.

5.69 In response to Document 20/56, and in relation to its proposed SMRA format, Three submitted that:

- a) the 2.6 GHz TDD rights of use should be made available in two blocks of 25 MHz in order to remove any risk that a bidder wins an inefficiently small amount of TDD spectrum in this band; and
- b) the 2.3 GHz Band be made available in six 10 MHz lots, given the likely low interest in 5 MHz units and for consistency with other categories, as this would best facilitate switching.

5.70 In response to Document 20/78, Eir commented on the enhanced SCA proposed by Three in its response to Document 20/56. Eir submitted that, in the context of the enhanced SCA:

- a) it may be appropriate to increase the size of the lots in some categories, in particular those that are currently proposed to be just 5 MHz, so as to reduce the risk that a bidder wins an inefficiently small amount of spectrum in a band²¹²; or
- b) an alternative option might be to allow each bidder to specify if they would prefer to win no lots at all rather than just one lot (i.e. to win a minimum

²¹¹ In response to Document 20/32, Eir notes an inconsistency between paragraph 3.12, which states that the end date for Time Slice 2 will be 30 November 2040, and Tables 17 and A3.4 where the end date is stated as being 30/11/2035. These views relate to issues in the draft IM and will be addressed in ComReg's response to Document 20/32 and the Final IM.

²¹² In response to Document 20/32, Eir notes an inconsistency between paragraph 3.12, which states that the end date for Time Slice 2 will be 30 November 2040, and Tables 17 and A3.4 where the end date is stated as being 30/11/2035. These views relate to issues in the draft IM and will be addressed in ComReg's response to Document 20/32 and the final IM but would refer Eir to ComReg's final position on licence duration.

of two lots) and that ComReg could change the rules to reflect same.

- 5.71 ComReg received no further response in relation to lot sizes in submission to Document 20/32 or 20/78.

5.4.3 ComReg's Assessment

- 5.72 ComReg notes Vodafone's agreement with the proposed Frequency-Generic Lot sizes.
- 5.73 ComReg's views in relation to increasing the minimum lot size have been previously addressed in Section 7.4 of Document 19/59R and Section 6.23 of Document 19/124.
- 5.74 ComReg acknowledges that it is unlikely that any bidder would require only 5 MHz. However, the use of a 5 MHz lot size is not intended to address such an unlikely scenario. Rather, and as bidders reach their demand limit, an additional 5 MHz of spectrum might fall within this demand, whereas a larger block size would fall outside that range and a bidder might have to overstate or hold back this marginal demand. A lower lot size (e.g. the smallest useable lot)²¹³ increases the range of bids that can be made by bidders, which in turn augments the potential outcomes and the chances of a more efficient outcome (particularly in a format that facilitates a large amount of spectrum, such as the Proposed Award).
- 5.75 Further, ComReg is conscious of the possibility of participation from a range of bidders (large and small and across different uses) who will likely have different bandwidths requirements. A larger lot size might be a suitable building block for some (e.g. mobile users) but not all bidders and could deny such bidders the opportunity to build packages incrementally using a smaller block size thereby leading to the possibility of some spectrum being assigned inefficiently or even remaining unsold. A smaller lot size allows bidders to better meet their minimum requirement as the award develops and prices rise. This is likely to be important to smaller bidders because it provides more opportunities to compete for a variety of different spectrum requirements, noting that an additional 5 MHz would likely be of more importance to a smaller, rather than a larger, bidder.
- 5.76 Even for spectrum awards with larger amounts of spectrum on offer, such as the case in the Proposed Award, different bidders (large and small) may well have a requirement for spectrum in multiples lower than 10 MHz. A good practical example of this can be found in the recent Irish 3.6 GHz Award (which made available 350 MHz). Three of the five winning bidders, Eir, Vodafone and

²¹³ As described in paragraph 7.127 of Document 19/59R, ComReg notes that the relevant European harmonisation measures for mobile broadband use of the proposed bands specify frequency arrangements formed of 5 MHz blocks.

Airspan, all had winning packages in multiples of less than 10 MHz and likely competed with other bidders for same. Alternatively, if lot sizes were 10 MHz, some bidders would have won fewer rights of use (and others more) in order to accommodate for reductions in demand for 10 MHz rather than 5 MHz. Moreover, if Dense Air's minimum requirement was 35 MHz (which it was assigned) a larger lot size would have precluded that outcome (particularly if that lot size was 20 MHz as suggested by Three).

5.77 It will also be apparent from the above, that a smaller lot size also promotes competition during the award, particularly competition for marginal spectrum:

- a) First, it creates competition for marginal spectrum (from a position where the bidder is relatively confident it'll win something). For instance, if a bidder's minimum requirement was 25 MHz but the lot size was 10 MHz, then such a bidder would be unable to compete at the margin for 25 MHz and would instead have to compete for 30 MHz as it would be unable to reduce demand to 25 MHz in the face of rising prices. The effects (particularly under certain auction formats) from such a scenario can be significant; and
- b) Second, it increases competition where minimum requirements are not multiples of lot sizes. By way of example, in an auction with a lot size of 10 MHz, a bidder that would have won 25 MHz, if it was allowed to express a valuation for 25 MHz could end up winning nothing, simply due to the selection of lot size.

5.78 Separately, if bidders were forced to bid for more spectrum than they required, this could lead to them winning rights of use of spectrum for which they have no use. This would not be compatible with the efficient use of spectrum.

5.79 In relation to Three's view that the lot size of the 2.3 GHz Band could be increased to 10 MHz (with 2.1 GHz remaining at 2 x 5 MHz but the 2.6 TDD rising to 25 MHz), ComReg notes that such an approach of varied lot sizes would most likely introduce restrictions on switching between lots of different sizes, thereby creating auction design challenges and unnecessary complexity in the bid decisions, which in turn could adversely affect competition both in the award and subsequently.

5.80 There is a further benefit of using 5 MHz block sizes in TDD spectrum as bidders may have different demand patterns on their networks and by having spectrum in multiples of 5 MHz it can allow it to deploy different uplink downlink patterns outside of the default synchronisation profile and internally mitigate any issues of inter network interference.

5.81 In relation to Eir's suggested alternative option, ComReg understands that

bidders' minimum requirements would be applied as a constraint in the selection of winning exit bids, and that Eir is not advocating this option if a format other than the enhanced SCA is used.

5.82 In that regard, ComReg notes and agrees with DotEcon that increasing the size of lots is not appropriate. In general, it is desirable to award lots in the smallest usable unit, which gives flexibility for bidders to acquire bandwidths in line with their specific usage requirements and supports efficient assignment of the frequencies across bidders. Rather than increasing the lot sizes and reducing the flexibility that comes with smaller lots, a better solution would be to use an auction format that supports full package bidding and is generally better able to deal with complementarities across lots and not face bidders with aggregation risk.

5.83 If this option was proposed independently of the auction format, ComReg would note the following:

- a) it would appear to strongly resemble package bidding which is assessed separately in Chapter 7 and Annex 7; and
- b) it is similar to a feature of the SMRA format used in the UK assignment of 2.3 GHz and 2.6 GHz rights of use in 2015. This allowed bidders to optionally specify a minimum spectrum requirement at the start of the award, below which a bidder would not be awarded any lots. However, such an approach would not be appropriate in the Proposed Award as it would significantly raise the risk of inefficiently unsold lots arising from winning withdrawal bids.

5.84 In relation to Eir's concerns that a bidder could win an inefficiently small amount of spectrum, ComReg notes that such aggregation risks are assessed separately in Chapter 7 and Annex 7 but observes that in the Proposed Award, a winning bidder can only win a bid in its entirety and not in part.

5.4.4 ComReg's final position

5.85 ComReg notes that it did not receive any other submissions from respondents in relation to the packaging of spectrum, nor is ComReg aware of any other information which would warrant an amendment to these proposals.

5.86 Accordingly, ComReg's final position is to make frequency-generic spectrum available in lot sizes of 5 MHz (TDD) or 2 × 5 MHz (FDD).

5.5 Frequency-generic or Frequency-Specific Lots

5.5.1 Summary of ComReg's views in Document 19/124

5.87 In Section 7.5 of Document 19/59R, and having considered the views of respondents²¹⁴, ComReg set out its view as to whether it would be appropriate to offer lots on a frequency-specific or frequency-generic basis.²¹⁵

700 MHz Duplex

5.88 ComReg was of the preliminary view that there is no material or systematic differences in the characteristics or value of different blocks in the 700 MHz Duplex, i.e. each. 2 x 5 MHz lot is likely to be of similar value.

5.89 Therefore, ComReg proposed that all rights of use in the 700 MHz Duplex would be assigned on a frequency-generic basis.

2.1 GHz Band

5.90 Eir's existing 2.1 GHz licence of 2 x 15 MHz of spectrum, which expires in 2027, would necessitate splitting the remaining frequencies in Time Slice 1 into two categories (3 blocks below and 6 blocks above the spectrum use by Eir). ComReg observed that this would limit the scope for a winning bidder to be assigned contiguous spectrum within the band. This could create several issues, including:

- a) adding complexity to the award and reducing the scope for assigning contiguous spectrum;
- b) presenting bidders with the issue of needing to decide how much Frequency-Generic Lots in the 2.1 GHz Band would be worth to them, without knowing whether those frequencies would be assigned on a contiguous or non-contiguous basis; and
- c) if Eir was assigned 2.1 GHz rights of use in Time Slice 2, it would likely be required to transition from its existing frequencies.

5.91 In order to address such matters, ComReg proposed that Eir would be required to participate in the assignment stage of the Proposed Award to determine the location of Eir's current spectrum rights in the 2.1 GHz Band. Further, ComReg noted that any relocation costs incurred by Eir would be examined by ComReg

²¹⁴ Eir and Vodafone agreed with the proposed Lot categories (see Section 6.3.2 of Document 19/124)

²¹⁵ Finally, following the main stage (i.e. the primary and supplementary bid rounds of the Proposed Award) ComReg proposes that the award would proceed to the assignment of frequency-generic Lots to winners.

to determine if such costs are objectively justified and proportionate.

5.92 This would permit all lots to be assigned on a frequency-generic basis.

2.3 GHz Band

5.93 In relation to the 2.3 GHz Band, ComReg was of the preliminary view that a Frequency-Specific Lot may be necessary for two frequency ranges.

- a) the frequency range 2390 – 2400 MHz has a lower in block EIRP limit of 45 dBm / 5 MHz to ensure coexistence with systems above 2.4 GHz; and
- b) the frequency range 2307 – 2327 MHz is used by Eir's RurTel network to provide fixed telephony services in rural areas as part of its Universal Service Obligation.

5.94 In relation to (a), ComReg notes that using a lower maximum EIRP would give reduced coverage range and therefore may better lend itself to some uses than others. Therefore, ComReg was of the preliminary view that a Frequency-Specific Lot may be the most appropriate approach for those frequencies.

5.95 In relation to (b), ComReg observed that the preferred packaging approach (frequency-specific or generic) would depend on the nature and extent of any movement by Eir of its RurTel network from the 2.3 GHz band, in advance of the Proposed Award. ComReg envisaged several migration scenarios, all contingent on the specific circumstances that might pertain at the time of the award.

5.96 In relation to RurTel ComReg noted that:

- a) in the event of full migration by Eir sufficiently in advance of the Proposed Award then the lots in the frequency range 2307 – 2327 MHz could be treated as frequency-generic spectrum; and
- b) in the event of partial migration:
 - i. should Galway and Kerry be fully migrated before the Proposed Award or even shortly afterwards, then the lots in the frequency range 2307 – 2327 MHz could be treated as frequency-generic spectrum; and
 - ii. all other partial migrations or the no migration scenario would require the 2300 – 2330 MHz range to be treated as a Frequency-Specific Lot available to all bidders.

2.6 GHz Band

- 5.97 Two 5 MHz restricted blocks (2570 – 2575 MHz and 2615 – 2620 MHz) would be required in the 2.6 GHz Band where FDD and TDD spectrum blocks are adjacent to one another. Given that bidders may value the 2570 – 2575 and 2615 – 2620 frequency ranges differently to the other lots in the 2.6 GHz Duplex Gap, ComReg was of the preliminary view this spectrum should be assigned on a frequency-specific basis.
- 5.98 Having considered the responses to Document 19/59R, ComReg reaffirmed its preliminary view, in Document 19/124, that it would be appropriate to make rights of use available in frequency-generic (of 5 MHz or 2 × 5MHz) and Frequency-Specific Lots (of 5 MHz and 30 MHz depending on the band).
- 5.99 ComReg reflected its position on Frequency-Specific and Frequency-Generic Lots in its Draft Decision as follows:
- 5.100 3.15.3 700 MHz Duplex Frequency Generic Lots²¹⁶ being made available in one *temporal period from [1 December 2020] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to [30 November 2040] (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum);*

3.15.4 2.3 GHz Band Fixed Frequency Lot (Lower)²¹⁷, 2.3 GHz Band Fixed Frequency Lot (Upper)²¹⁸, 2.3 GHz Band Frequency Generic Lots²¹⁹, 2.6 GHz Band FDD Frequency Generic Lots²²⁰, 2.6 GHz Band TDD Fixed Frequency Lot (Lower)²²¹, 2.6 GHz Band TDD Fixed Frequency Lot (Upper)²²² and 2.6 GHz Band TDD Frequency Generic Lots²²³ being made available in two “time

²¹⁶ Where a 700 MHz Duplex Frequency-generic Lot means “a right of use in respect of a 2x5 MHz block of spectrum in the 700 MHz Duplex, with the specific frequencies of such Lots being in the assignment stage of the competitive selection procedure.”

²¹⁷ Where a 2.3 GHz Band Fixed Frequency Lot (Lower) means “a right of use in respect of the 1x30 MHz block of spectrum from 2300 – 2330 MHz”.

²¹⁸ Where a 2.3 GHz Band Fixed Frequency Lot (Upper) means “a right of use in respect of the 1x10 MHz block of spectrum from 2390 – 2400 MHz”

²¹⁹ Where a 2.3 GHz Band Frequency Generic Lot means “a right of use in respect of a 1x5 MHz block of spectrum in the range 2330 – 2390 MHz, with the specific frequencies of such Lots being determined in the assignment stage”

²²⁰ Where a 2.6 GHz Band FDD Frequency Generic Lot means “a right of use in respect of a 2x5 MHz block of spectrum in the range 2500 – 2570 MHz paired with 2620 – 2690 MHz, with the specific frequencies of such Lots being determined in the assignment stage”

²²¹ Where a 2.6 GHz Band TDD Fixed Frequency Lot (Lower) means “a right of use in respect of the 1x5 MHz block of spectrum from 2570 – 2575 MHz”

²²² Where a 2.6 GHz Band TDD Fixed Frequency Lot (Upper) means “a right of use in respect of the 1x5 MHz block of spectrum from 2615 – 2620 MHz”

²²³ Where a 2.6 GHz Band TDD Frequency Generic Lots means “a right of use in respect of a 1x5 MHz block of spectrum in the range 2575 – 2615 MHz, with the specific frequencies of such Lots being determined in the assignment stage”

slices”, viz:

3.15.5 2.1 GHz Band Frequency Generic Lots²²⁴ being made available in two “time slices”, viz:

5.101 Finally, in Document 20/32 ComReg reflected this position in its Draft IM and Draft Regulations where:

- *“700 MHz Duplex Block” means a 5 MHz paired block of radio frequency spectrum in the 700 MHz Duplex;*
- *“2.1 GHz Band Block” means a 5 MHz paired block of radio frequency spectrum in the 2.1 GHz Band;*
- *2.3 GHz Band Fixed Frequency Block (Lower)” means the 30 MHz unpaired block of radio frequency spectrum in the range 2300 to 2330 MHz*
- *2.3 GHz Band Fixed Frequency Block (Upper)” means the 10 MHz unpaired block of radio frequency spectrum in the range 2390 to 2400 MHz;*
- *“2.3 GHz Band Generic Frequency Block” means a 5 MHz unpaired block of radio frequency spectrum in the range 2330 to 2390 MHz;*
- *“2.3 GHz Band Blocks” means the 2.3 GHz Band Fixed Frequency Block (Lower), 2.3 GHz Band Fixed Frequency Block (Upper) and 2.3 GHz Band Generic Frequency Blocks;*
- *“2.6 GHz Band FDD Generic Frequency Block” means a 5 MHz block of radio frequency spectrum in the range 2500 to 2570 MHz paired with a 5 MHz block of radio frequency spectrum in the range 2620 to 2690 MHz;*
- *“2.6 GHz Band TDD Fixed Frequency Block (Lower)” means the 5 MHz unpaired block of radio frequency spectrum in the range 2570 to 2575 MHz;*
- *“2.6 GHz Band TDD Fixed Frequency Block (Upper)” means a 5 MHz unpaired block of radio frequency spectrum in the range 2615 to 2620 MHz; “2.6 GHz Band TDD Generic Frequency Block” means a 5 MHz unpaired block of radio frequency spectrum in the range 2575 to 2615 MHz;*

²²⁴ Where a 2.1 GHz Band Frequency Generic Lot means “a right of use in respect of a 2 x 5 MHz block of spectrum in the 2.1 GHz Band, with the specific frequencies of such Lots being determined in the assignment stage”

- “2.6 GHz Band Blocks” means the 2.6 GHz Band FDD Generic Frequency Block, 2.6 GHz Band TDD Fixed Frequency Block (Lower), 2.6 GHz Band TDD Fixed Frequency Block (Upper) and 2.6 GHz Band TDD Generic Frequency Blocks;
- “2.6 GHz Band TDD Blocks” means the 2.6 GHz Band TDD Fixed Frequency Block (Lower), 2.6 GHz Band TDD Fixed Frequency Block (Upper) and 2.6 GHz Band TDD Generic Frequency Blocks.”

5.5.2 Summary of Respondents Views to Document 19/124

5.102 In response to Document 19/124:

- a) Vodafone supported running a primary round followed by an assignment round for generic lots;
- b) Vodafone also submitted that the varying lot sizes in the 2.3 GHz band would add complexity to the award. Notwithstanding, Vodafone acknowledges that the Frequency-Specific Lots proposed for the 2.3 GHz Band are appropriate, if sufficient progress cannot be made on an alternative solution for RurTel; and
- c) Eir agreed with the proposed definition of the Award Bands in respect of the 700 MHz, 2.3 GHz and 2.6 GHz bands and the proposed lot categories.

5.103 In response to Document 20/56, and in relation to its proposed SMRA format, Three appears to propose that all rights of use should be made available on a frequency-generic basis with the exception of the 2300 – 2330 frequency range which would, in its view, need to be made available on a frequency-specific basis.

5.104 ComReg received no further responses in relation to the Frequency-Generic and Frequency-Specific Lots.

5.5.3 Updated Information

5.105 In Chapter 5, ComReg provides a full Eir RurTel network update. In summary, this notes that:

- a) in relation to Kerry, there are no longer any active RurTel customers, all base station sites have been deactivated and RurTel licences have been cancelled;
- b) in relation to Galway, while there remains 2 active RurTel customers (down from 4 customers in December 2019), ComReg has written to Eir (in its letter of 2 November 2020) stating that it will cease issuing point-

to-multipoint renewal licences in the 2.3 GHz band for the Galway RurTel network from 31 January 2021 given the availability of alternative services to these customers; and

- c) in relation to Donegal, there are 57 active customers in the Donegal area (down from 76 customers in December 2019). These customers are supported by 21 licences, and ComReg understands that this is a more complex network consisting of several repeater stations and customer stations and consequently its excising presents a greater challenge than that experienced in Kerry or Galway. Eir is continuing to assess opportunities to provide alternate voice solutions for these customers and ComReg will engage further with Eir on the Donegal RurTel network in due course.

5.106 Plum's updated report identifies a potential interference contour for the remaining Donegal RurTel network. ComReg has identified this contour as a coordination contour, where an operator wishing to deploy a site in this area must first coordinate with Eir prior to deployment. The updated coordination contour covers approximately 285,057 of the population which accounts for around 6% of the population of the State.

5.5.4 ComReg's Assessment

5.107 Arising from the above update, the frequency range 2307 – 2327 MHz will be treated as frequency-generic spectrum in the Proposed Award. ComReg considers the restrictions on those frequencies to be minor such that bidders other than Eir could be assigned those frequencies in the same way as other generic lots:

- a) the Eir RurTel customers are very sparse and the affected population within the coordination zone (which is conservative and allows usage with coordination) is around 6% of the total population of the State. Therefore, those lots are unlikely to have a substantially different value compared to other generic lots;
- b) any restrictions of use would be temporary, and lots would likely become unrestricted over the duration of the licence;
- c) if Eir wins 2.3 GHz rights of use, then the assignment stage will maximise the extent to which Eir's winning 2.3 GHz lots, if any, overlap with those RurTel frequencies as Eir would be best placed to manage any interference issues.²²⁵ The Information Memorandum will be updated to

²²⁵ In particular, ComReg notes that regardless of how many blocks it won, Eir's assignment would be contiguous beginning at 2300 MHz, and assignments to all other winning bidders would begin immediately above Eir's spectrum rights of use.

reflect same; and

- d) ComReg made clear that this was the approach it would take in Document 19/59R, Document 19/124 and Document 20/32, and it has not received any concerns or objections regarding same.

5.5.5 ComReg's final position

5.108 ComReg notes that it did not receive any other submissions from respondents in relation to the packaging of spectrum, nor is ComReg aware of any other information which would warrant an amendment to these proposals.

5.109 Accordingly, ComReg's final position is as follows:

- a) To make the 700 MHz Band available in the form of six five 5 MHz paired Frequency-Generic Lots (between 703 – 733 / 758 – 788 MHz);
- b) To make the 2.1 GHz Band available in the form of twelve 5 MHz paired Frequency-Generic Lots (between 1920 – 1980 / 2110 – 2170 MHz);
- c) To make the 2.6 GHz Band available in the form of fourteen 5 MHz paired Frequency-Generic Lots (2500 – 2570 MHz and 2620 – 2690 MHz), eight 5 MHz unpaired Frequency-Generic Lots (between 2575 – 2615 MHz) and two Fixed Frequency Lots (between 2570 – 2575 and 2615 – 2620); and
- d) To make the 2.3 GHz Band available in the form of eighteen 5 MHz unpaired Frequency-Generic Lots (between 2300 – 2390 MHz); and one Fixed Frequency Lot (between 2390 – 2400 MHz).

5.6 Unsold Lots

5.6.1 Summary of ComReg's view in Document 19/59R and 19/124

5.110 In Section 7.6 of Document 19/59R, ComReg outlined its preliminary view that it should retain its discretion regarding how it might treat any unsold spectrum lots depending on the factual circumstances arising from the Proposed Award, save that it intends that unsold lots will not be assigned for a reasonable period after the process has ended.

5.111 ComReg did not receive any responses in relation to unsold lots in 19/59R.

5.112 In Document 19/124, ComReg reiterated its preliminary view set out in Document 19/59R.

5.113 ComReg reflected its preliminary view on unsold lots in its Draft Decision as follows:

“3.19 to retain its discretion regarding how it might treat any unsold Lots depending on the factual circumstances arising from the competitive selection procedure described herein, save for the decision that unsold Lots will not be considered for assignment for a reasonable period after the process, and, in any event, will not be considered for a period of at least 2 years after the award process.”

5.6.2 Summary of Respondents Views to Document 19/124

5.114 In response to Document 19/124, Eir agrees with ComReg's approach that consideration of unsold lots would take place at least two years after the award process has concluded.

5.6.3 ComReg's Assessment

5.115 ComReg acknowledges Eir's view that unsold lots should not be assigned for a period of two years.

5.116 Any views in respect of a potential future award process will be addressed, as appropriate, at the time of any future consultation process.

5.6.4 ComReg's final position

5.117 ComReg's final position is that it will retain its discretion regarding how it might treat any unsold lots depending on the factual circumstances arising from the award process, save for the decision that unsold lots will not be considered for assignment for a reasonable period after the process, and, in any event, will not be considered for a period of at least 2 years.

5.7 Fees

5.7.1 Summary of ComReg's views in Document 19/124 and Document 20/32 and Document 20/56.

5.118 In Sections 6.6 of Document 19/124, and having considered the views of respondents as summarised in Section 6.6.2 of Document 19/124, ComReg set out its response to the issues raised by respondents to its Document 19/59R relating to fees.

5.119 Having carefully considered those views and together with the updated views of DotEcon, ComReg was of the preliminary view that the conservative ranges as recommended by DotEcon remained appropriate, save for any changes that may arise as a consequence of any revised benchmarking and taking into account any new WACC²²⁶ as may be published by ComReg, along with any population changes in the 2.3 GHz Band (arising from progress in relation to RurTel).

5.120 In Section 3.1 of Document 20/32, Tables 16 and 17 set out the proposed reserve price per lot and the associated annual Spectrum Usage Fees (SUFs) before indexation. These prices used the conservative ranges recommended by DotEcon and reflected the updated 20-year licence duration as outlined in Section 5.3 of Document 19/124.

5.121 ComReg reflected its position on fees in its Draft Decision as follows:

“3.15.10 winning bids and prices in the assignment stage which are determined in accordance with the winner and price determination methodology set out in the Information Memorandum; ...

3.15.12 reserve prices and spectrum usage fees (SUFs) for the MBSA2 Liberalised Use Licences described herein, to be determined in accordance with the methodology referred to in Chapter [XX] of Document 20/XX [document to which the final decision will be attached] and with the [Benchmarking Report] prepared by DotEcon and which accompanies Document 20/[XX] [document to which the final decision will be attached], where the final reserve prices and SUFs will be set out in the Information Memorandum, taking account of any additional relevant data at that time;”

5.122 Finally, ComReg in Document 20/32 reflected this position in its Draft IM and Draft Regulations where it stated that the fee for a MBSA2 Liberalised Use

²²⁶ ComReg noted that was then conducting a review of the Weighted Average Cost of Capital (“WACC”) which included an assessment of the mobile WACC and that the latest updated WACC was preliminary. In that regard, ComReg noted that it intended to update minimum prices once the new and final WACC estimates were available.

Licence would consist of an upfront fee which is paid at the end of the Award Process and Spectrum Usage Fees (“SUFs”) which are paid prior to the first grant of a MBSA2 Liberalised Use Licence and then over its duration, and where the reserve price per lot is set out in Schedule 6 of the Draft Regulations.

Information Notice

5.123 In Document 20/56 and in the context of considering other potential means by which to mitigate Three’s stated concerns, ComReg sought views on several sub-options including:

- the increase of the proposed 700 MHz Duplex reserve prices; and
- the introduction of non-linear 700 MHz Duplex reserve prices.

5.7.2 Summary of Respondents Views

Document 19/124

5.124 ComReg received 4 responses to Document 19/124 (Vodafone, Three, Eir and Imagine) in relation to fees.

5.125 Three submitted that:

- a) in its view the risks of setting fees too high (unsold lots) outweigh that of setting fees too low (as low bidders would be outbid anyway);
- b) ComReg does not have a revenue-raising objective;
- c) using benchmarks of market clearing prices from other auctions to set minimum prices sets them at the market clearing price, not a conservative estimate;
- d) ComReg has set valuations by reference to clearing prices from other auctions with no discount for price discovery; and
- e) all the above could be resolved by the application of a margin for caution. Three proposed this be one standard deviation below the market clearing prices as determined by DotEcon.

5.126 Eir noted ComReg’s intention to set reserve prices and SUFs by way of benchmarking and stated that its position is reserved until the details can be seen in the draft IM.

5.127 Imagine agreed with ComReg’s proposal for a two-part payment structure but would prefer a larger proportion to be paid by SUF rather than the current proposal of a 40/60 basis.

Document 20/32

- 5.128 In response to Document 20/32, Three states that ComReg must consider the impact of COVID-19 on economic conditions in its award proposals. In that regard Three submitted that:
- a) ComReg should avoid excessive pricing for spectrum and design its award process in a fair and non-discriminatory manner and must calculate minimum prices that ensure an efficient outcome;
 - b) ComReg must take it into account the economic uncertainty arising from COVID-19 in its award proposals including the avoidance of excessive spectrum pricing; and
 - c) ComReg should consider the increased network investment required by wireless operators to support both the increased reliance on working from home and what it considers to be the potential regional divide in the ability of workers to work from home.
- 5.129 Three submitted that in the case of the 2.6 GHz band, the reserve price for the TDD guard band lots (in Table 13 and in Table 16 of Document 20/32) are given as €216,000 for TS1 and €245,000 for TS2 and that an annual SUF of €61,515 applies to each of these lots. Three states that this is equivalent to a reserve price of EUR 1.5 million for a 20-year licence, or €0.06 /MHz/pop (using a WACC of 7.13%).
- 5.130 Three stated that this is an exceptionally high reserve price for acquiring spectrum rights of use that are restricted and thus cannot be fully deployed for high-power mobile services. Three stated that in other European countries, such blocks were bundled with adjacent TDD spectrum at no additional cost. Three requested that ComReg review this price and outline the rationale for such high reserve prices for these guard band blocks.
- 5.131 Three stated that ComReg should explain the changes to the reserve prices for each lot category in Tables 12 and 13.
- 5.132 Eir submitted that ComReg offers no explanation for the changes in reserve prices as set out in Document 20/32.
- 5.133 Eir noted that as the SUFs remain unchanged and both are derived from the minimum price calculations, it believes that the changes can only be explained if there has been a change in ComReg's approach to the calculation of spectrum fees, which would require consultation in its view.

Vodafone:

- a) agreed with ComReg's proposal to split minimum prices between an upfront fee ("minimum SAF") and an on-going stream of indexed Spectrum Usage Fees apportioned on a 40/60 basis;
- b) submitted that ComReg should ensure that minimum prices are conservative;
- c) submitted that the value of the 2.3 GHz Band is diminished by the co-ordination measures and the uncertainty regarding the transition, and that the benchmark exercise did not adequately account for this; and
- d) agreed with the point made by Nera (Three's Consultants) that ComReg should expect prices per MHz to fall (relative to the 2012 MBSA) as a result of the increase in supply of spectrum and limited ability to monetise 5G.

Document 20/56

5.134 In response to Document 20/56, Three stated that it would not be supportive of the introduction of 700 MHz Duplex non-linear reserve prices. In this regard Three submitted that:

- a) they do not directly address its discrimination concern. While they would reduce the magnitude of its perceived discrimination against Three, they would not remove it;
- b) as ComReg has a legal and regulatory duty to ensure a fair and non-discriminatory process it must remove what Three asserts to be the flawed discrimination and consequently this proposed approach would be insufficient;
- c) they are inconsistent with best practice on setting reserve prices. Three submits that standard practice in spectrum auctions is to adopt a linear reserve price across generic lots and to set it conservatively relative to the estimated market value. Three submits that setting a higher price for larger packages is inconsistent with this approach and that, in its view, there is a risk that this approach could inefficiently choke off demand for larger packages and subvert price discovery; and
- d) although the risk of spectrum going unsold is less than under Option 5(d), if bidders have ascending values for a second 700 MHz Duplex lot, this approach could eliminate winning bids.

5.135 Three also submitted that this approach would be arbitrary, potentially

inconsistent with some bidders' valuation structures and may impact the auction outcome.

5.136 In response to Document 20/56, Eir raises questions on the possible implementation of non-linear pricing:

- Would the round price for 700 MHz be non-linear in the first round and if so how would ComReg propose to increase prices thereafter?
- Would non-linear reserve prices only apply to the pricing of winning bids?
- If they would only apply to the pricing of winning bids what ComReg would propose to do if a winning bid is less than the non-linear reserve price for the winning package?

5.137 Eir submits that non-linear reserve prices applying only to the pricing of spectrum would only have an impact on the final price of a winning package if the opportunity cost of the overall package were below the (non-linear) reserve price of the package. It is therefore unlikely, in Eir's view, that this option would do much if anything to address Three's concern except in very limited circumstances.

5.138 Eir further submits that this option, if adopted, would, in its view, represent the introduction of a new objective for reserve prices, namely, to extract value from bidders. Eir submits that the promotion of efficient spectrum only requires that the adoption of a reserve price be set at a price that is somewhat below the likely marginal value of the spectrum. It submits that there is a risk, that in such an approach, ComReg could mis-price marginal lots and thus choke off incremental demand when estimating the value of incremental lots to a bidder.

5.139 Eir's preliminary position is therefore that it does not support the use of non-linear reserve prices for any lot category.

5.140 In response to Document 20/56, Imagine strongly opposes the possibility of adopting non-linear reserve prices for any other (i.e. non 700 MHz) bands.

5.7.3 ComReg's Assessment

5.141 ComReg addresses the concerns raised in relation to fees under the following headings:

- Minimum price structure;
- Setting conservative minimum prices;

- Increase reserve prices;
- Non-linear reserve prices;
- Fees set out in the draft IM;
- 2.3 GHz & RurTel; and
- 2.6 GHz Frequency-Specific Lots.

Minimum price structure

5.142 ComReg notes that Imagine agrees with the proposed apportionment of the minimum price into an upfront SAF and ongoing SUFs. In relation to increasing the SUF proportion, as set out at Section 7.8.5 of Document 19/59R, ComReg is of the preliminary view that there is a risk that a lower SAF would mean that bidders could be assigned a large amount of spectrum at a low upfront cost, and could return some spectrum at a later date to avoid any outstanding SUFs. The risk of such behaviour is greater where important harmonised bands are available because there is a reduced risk of such spectrum subsequently going unsold in secondary markets, if required.

5.143 ComReg also notes that the 2012 MBSA had a 50/50 split. However, having taken account the approach used and the outcome of the 3.6 GHz Award and the assignment of rights of use to non-MNO bidders (Imagine and Airspan), ComReg was of the view that a similar minimum price split would be appropriate for this award given that potential users may well be similar. In doing so, ComReg noted that this split balances the need to impose a sufficiently high upfront fee to deter non-serious bidders and strategic bidding, and the benefits of spreading a proportion of the fees across the licence term.

Setting conservative minimum prices

5.144 In relation to Three's observation that ComReg does not have a revenue raising objective, ComReg notes that this matter was previously addressed in paragraph 6.32 of Document 19/124 where ComReg confirmed that it does not have a revenue raising objective. Consequently, revenue generating issues are not relevant in determining an appropriate award format.

5.145 ComReg would however once again remind interested parties that Regulation 19 of the Authorisation Regulations permits ComReg to impose spectrum fees for rights of use for ECS which reflect the need to ensure the optimal use of the radio frequency spectrum, where such fees are objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose and take into account the objectives of ComReg as set out in Section 12 of the 2002 Act and regulation 16 of the Framework Regulations. In that regard, ComReg

would additionally note that the proposed pricing methodology (minimum revenue core) seeks to **minimise** auction revenue subject to winners paying enough that no other combination of bidders would have been willing to pay more.²²⁷

5.146 ComReg agrees with the views of Vodafone that minimum prices should be set at a conservative level. ComReg recalls that it has on more than one occasion set out and clarified its views on benchmarking and minimum prices in relation to specific awards.²²⁸ Interested parties will also be aware that the benchmarking approach proposed has sought to estimate a minimum price that would be below final prices and, at the same time, sufficiently high to reduce incentives for distorted bidding behaviour such as those described above (e.g. gaming and speculative bidding).

5.147 ComReg previously addressed Vodafone's concerns in relation to the effect that increased supply of spectrum could have on spectrum valuations in paragraph 7.318 of Document 19/59R (raised by Nera at that time) where it noted that ComReg does not set out to predict the final winning price but simply derives a conservative estimate of the minimum price (as described above).

5.148 DotEcon notes although there may have been a decline in prices in some bands, this remains valuable spectrum, and we can be reasonably confident that the minimum prices will be below market value in this award. While there will always be uncertainty in relation to benchmarking, DotEcon is confident that the proposed minimum prices are set sufficiently conservatively so as to avoid the risk of inefficiently choking off demand (even if the value of spectrum has fallen).²²⁹

5.149 In that regard, ComReg agrees with DotEcon and notes that there are various demand and supply factors that might affect spectrum valuations, including increasing demand for bandwidth and increased supply of spectrum and ability to monetise new technologies (as noted by Vodafone). ComReg is mindful of these uncertainties when setting minimum prices but such factors are for bidders to consider when setting their private valuations for spectrum rights of use. ComReg's proposed minimum prices are set conservatively and below the market value of the spectrum (e.g. the 2012 MBSA and the 3.6 GHz Award). The final prices (and actual differences between bands) are not determined by ComReg but by the interaction of bidders during the award, all of which would be informed by private valuations each bidder has for different spectrum

²²⁷ For further discussion see Annex 12, Document 20/32.

²²⁸ Document 14/101, p114, Document 15/70, p 126, Document 15/140, p132, Document 19,59R, p14 – among other documents.

²²⁹ DotEcon Report, Document 20/122a, p 149.

portfolios.

5.150 In relation to the economic uncertainty arising from COVID-19, ComReg notes the following:

- a) the COVID-19 pandemic is likely to be temporary and the duration of rights of use in the Proposed Award are 18 – 20 years²³⁰;
- b) economic growth and in particular consumer demand, is forecasted to recover sharply following the removal of restrictions²³¹;
- c) internet and telecommunications services are not discretionary and spending on same is likely to be at a minimum stable over the period of the pandemic²³²; and
- d) mobile revenues over the first three quarters of 2020 have remained stable and in line with previous years.²³³

5.151 Finally, as noted above, final prices are determined by the interaction of bidders during the award whose bids are based on private valuations which are typically based on estimates of profits that can be generated from using the spectrum for the provision of services over the duration of the licence. These valuations are solely a matter for bidders noting that the open award format provides additional information in order to deal with any common value uncertainty that may arise.

5.152 In relation to network investment, ComReg acknowledges the network investment made by wireless operators to support the increased reliance on mobile services. However, this investment arose in order to make use of the COVID-19 Temporary Spectrum Management Measures made available by ComReg²³⁴. In that regard, ComReg notes that:

- a) investments already made by MNOs were able to facilitate a significant amount of the rollout of temporary rights of use, as evidenced by the short time between rights of use being assigned and services provided.

²³⁰ As of September 2020, the weekly aggregate voice and data peak traffic remains circa 8% and 24% greater than the base pre-COVID-19 level. Document D08/20.

²³¹ ESRI Quarterly Economic Commentary, October 2020. Available at: https://www.esri.ie/system/files/publications/QEC2020AUT_0.pdf

²³² For example, the ESRI's modelling on the impacts of COVID-19 assumes that "Spending on housing costs, fuel and light, insurance, **telecommunications, internet**, other utilities, education expenditure (given fees etc. are already paid), home help, charitable donations, maintenance payments, elderly care costs and baby equipment are **all kept constant**" [Emphasis added]. See ESRI Quarterly Economic Commentary – Spring 2020.

²³³ ComReg Quarterly Key Data Report, 2020 Q3.

²³⁴ <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/covid-19-temporary-spectrum-management-measures/>

- b) any additional investment made to facilitate the rollout of temporary rights of use would likely have been made following the Proposed Award anyway (if providers were assigned rights of use) and the investment was not additional but rather brought forward.
- c) in applying for the temporary rights of use each holder of such rights confirmed in its application that the applicant was:

“fully aware that the Licences are being made available solely to accommodate the claimed unanticipated spike in demand arising from the extraordinary situation relating to COVID-19, that all Licences granted or renewed under the Regulations will expire on or before 6 months from the date of the Regulations and that the longer term questions of assignment of spectrum rights of use in the 700MHz Duplex and 2.6 GHz Band, liberalisation of rights of use in the 2.1 GHz Band and assignment of new rights of use in that band will be determined through such an award process as ComReg shall determine to be appropriate. I further confirm that the Applicant identified herein will take full account of this in making any investment or marketing decisions and will not seek to argue that any such decisions made as a result of the grant of a Licence give it any expectation of favourable treatment with regards to access to liberalised rights of use in those bands.”

- 5.153 In that regard, the temporary rights of use would effectively extend the period over which such investments could be recovered by the duration of the Temporary Spectrum Management Measures (if the same licensees are assigned rights of use).
- 5.154 ComReg would also note that the spectrum fees associated with the Temporary Spectrum Management Measures were set at a nominal basis of €100. In doing so, ComReg noted that issuing temporary licences of very short duration with no or minimal charges is compatible with ComReg’s typical approach of opportunity-cost based charges²³⁵.
- 5.155 In relation to Three’s submission that minimum prices are set at the market clearing price, ComReg notes that it does not set minimum prices at the market clearing price. The benchmarking approach used by ComReg has not been used to estimate the final prices that should be paid by bidders in auctions and ComReg again recalls that it is the function of an auction, where it is required, to determine the actual market value of particular spectrum rights.
- 5.156 In that regard, and in response to the various responses on the level of minimum prices ComReg is satisfied that the proposed benchmarks are sufficiently

²³⁵ ComReg was of the understanding that only MNOs have existing base station equipment capable of delivering services over the duration of the Temporary Situation. Therefore, MNOs are also likely to be the most efficient users of the liberalised rights of use over that duration.

conservative because the proposed approach:

- a) uses competitive auctions in the last 10 years in Europe, which may be considered more likely to reflect the value of spectrum in the Irish market;
- b) uses relevant prices and data from the bands that are being awarded in the Proposed Award and data from the award of bands that are technically and commercially comparable to the bands being made available and particularly the 700 MHz Duplex frequencies;
- c) is consistent with previous benchmarking approaches which resulted in minimum prices being set lower than final prices e.g. the 2012 MBSA and the 3.6 GHz Award;
- d) takes account of the differences between jurisdictions and makes appropriate adjustments;
- e) gives a range of estimates that allows ComReg to establish a conservative lower bound estimate of value most relevant to Ireland;
- f) uses an objective and transparent rule to identify outliers²³⁶ in order to remove data points that could have pushed the price per MHz per capita higher;
- g) also utilises a geometric mean²³⁷ in order to account for any additional variation in benchmarks, further reducing the risks of minimum prices being set too high or too low; and
- h) the expert views of DotEcon²³⁸ that if minimum prices are set close to the geometric mean it can be reasonably confident that actual clearing prices will likely be above minimum prices.
- i) The expert views of DotEcon which notes that *“we recognise that there will always be uncertainty in relation to benchmarking, we are confident that the proposed minimum prices are set sufficiently conservatively so as to avoid the risk of inefficiently choking off demand (even if the value*

²³⁶ In that regard, DotEcon excluded observations that:

- lie more than three standard deviations away from the sample mean; or
- lie more than three times the interquartile range away from the 75th percentile.

²³⁷ The geometric mean is similar to the arithmetic mean but the data points are multiplied rather than added, and it uses the number of data points to find the root of that product of the number of data points rather than dividing the sum by the number of data points. It may be appropriate to use the geometric mean to determine the average of a data set that might not strictly be normal. In effect, it provides additional protection (beyond excluding outliers) against the estimate being skewed by higher data points.

²³⁸ DotEcon Report, Document 20/122a, p148

of spectrum has fallen)."²³⁹

5.157 Finally, ComReg notes that:

- a) the price per capita for the 700 MHz Band is of the same magnitude as the minimum price for the 800 MHz and 900 MHz Band in the 2012 MBSA, which was concluded successfully, and all lots were sold above the reserve price;
- b) the price per capita for the 2.1 GHz Band is of the same magnitude as the minimum price for the 1800 MHz Band in the 2012 MBSA, which was concluded successfully, and all lots were sold above the reserve price; and
- c) given that the proposed 2.3 GHz and 2.6 GHz minimum prices are lower than the 2.1 GHz Band, and the three bands share similar (although not identical) characteristics, bidders are unlikely to view such minimum prices as excessive.²⁴⁰

5.158 ComReg previously addressed Three's view that minimum prices should be reduced by one standard deviation in paragraph 6.294 of Document 19/124 where it noted that no convincing evidence has been presented by any respondent to demonstrate that the proposed minimum prices are too high or why reducing minimum prices by one standard deviation would resolve the unspecified issue. No further evidence has been presented in response to Document 19/124.

5.159 In relation to Three's submission that the risks of setting fees too high outweigh that of setting fees too low, ComReg recognises that there is some level of uncertainty when setting minimum prices. In that regard, interested parties will recall that minimum prices have to-date typically been set conservatively in relation to the benchmarking estimates to mitigate the risk of setting excessively high prices that could choke-off demand. Further, where there is reason to believe that there is greater uncertainty about the value of spectrum rights to be awarded, ComReg observes that even more conservative prices can be adopted to appropriately address this issue.

5.160 For example, and as Three will be aware, in Document 15/140 ComReg considered that there was enough uncertainty surrounding the value of the 3.6 GHz spectrum rights to justify proposing a lower minimum price for said rights

²³⁹ DotEcon Report, Document 20/122a, p149

²⁴⁰ ComReg would also note that a benchmark of €0.04 per MHz per capita is significantly below the final price of €0.078 per MHz per capita for the 2.3 GHz band in the UK 2018 award. Similarly, it is below the final prices achieved in ComReg's 3.6 GHz Award which was assigned on a TDD basis and has less favourable propagation characteristics than the 2.3 GHz band.

than originally considered. However, in this award there is a higher degree of certainty about the value of the spectrum given the widespread use of the 2.1 GHz and 2.6 GHz Band to deliver MBB services and the large number of results feeding into the benchmarks used to determine the minimum price.

- 5.161 Furthermore, the 700 MHz Band is widely recognised as an important coverage band in the provision of mobile services. Accordingly, the risks associated with setting prices too low are raised in the Proposed Award because the incentives to collude to keep the price low are higher for more valuable spectrum such as the 700 MHz Band. Bidders may be happy to reduce competition during award, if the price of that spectrum is sufficiently below the price it would have to pay in a competitive award. Minimum prices set at an appropriate level i.e. a conservative estimate of minimum prices should encourage competition because the amount “saved” would be less than the benefit of potentially acquiring an additional lot at a price determined by competition.
- 5.162 ComReg also notes and agrees with DotEcon that Three’s views on the minimum prices are inconsistent with its view that it will be unfairly exposed to paying substantially more than its rivals due to its inability to express a value for a third 700 MHz block. In particular, if the minimum price for 700 MHz lots cannot be described as conservative, but is instead close to market value, then Three would expect to pay a similar amount to the other MNOs for these lots, regardless of any interaction between the format and the caps.²⁴¹

Increase reserve prices

- 5.163 In Document 20/56, ComReg suggested that increasing reserve prices for 700 MHz lots could potentially reduce pricing asymmetry by increasing the value of an unsold lot in the price determination process described earlier (see Section 2.3.5).
- 5.164 DotEcon notes that this proposal risks choking off demand, and therefore leaving spectrum inefficiently unsold. The conservative minimum prices set using the benchmarking methodology aim to balance this risk of choking off demand against the risk of encouraging tacit collusion or speculative participation that comes with setting prices too low. Any proposal to increase minimum prices relative to those that would otherwise be set implies moving away from the level that ComReg deems optimal based on this trade-off. Therefore, DotEcon recommends that ComReg should not increase 700 MHz prices as there is no reason to believe this will lead to a more efficient award.²⁴²
- 5.165 In that regard, and having carefully considered the views of respondents and

²⁴¹ DotEcon Report, Document 20/122a, p149.

²⁴² DotEcon Report, Document 20/122a, p112.

DotEcon, ComReg is of the view that while there is scope for increasing reserve prices (given the already conservative level) such an approach is not necessary as it could run a higher risk of choking off demand and each incremental lot (and particularly the third 700 MHz lot) would have to cover a higher amount (i.e. the increased reserve price). Therefore, the scope for certain bidders to be assigned additional spectrum rights of use could be reduced.

Non-linear reserve prices

- 5.166 In relation to the possible introduction of non-linear prices, ComReg notes and agrees with DotEcon that while non-linear reserve prices might reduce price asymmetry in some circumstances, they would also risk choking off demand, and restrict competition for third lots, as the surplus associated with the third lot would be reduced. DotEcon also notes that this is a departure from ComReg's well founded reasoning for setting reserve prices to balance risks and is not conducive to an efficient outcome.²⁴³
- 5.167 In that regard, ComReg notes that such an approach would serve little purpose in preventing strategic and speculative bidding which is the main purpose of minimum prices as ComReg set out in Document 19/59R. Increasing marginal valuations would need to be large and continue across multiple lots in order to justify non-linear prices as an approach to reduce strategic or speculative bidding. However, in the current situation a conservative minimum price for one lot is likely to be sufficient to deter strategic behaviour.
- 5.168 ComReg notes that non-linear reserve prices would be consistent with the view that the 700 MHz Band is likely to exhibit increasing marginal valuations due to synergies across lots. However, such an approach would be disproportionately complex to implement. In particular, it would require an assessment of the extent to which two 700 MHz lots would be worth more than double the value of one lot. Further, it is not clear whether marginal valuations would continue to increase after two lots noting that different bidders are likely to have very different valuations.

Minimum Prices as set out in Document 20/32

- 5.169 In relation to Eir and Three's suggestion that there appears to be a change to the reserve prices in the draft IM, ComReg notes that matters in relation to the draft IM will be addressed separately on publication of the final IM. However, in order to provide clarity, ComReg notes that the reserve prices in Document 20/32 reflect a 20-year duration (as supported by all respondents) rather than a 15 year duration, which had previously been the case. The benchmarks are the same as those set out in Document 19/124 and Document 19/59R but the

²⁴³ DotEcon Report, Document 20/122a, p115.

minimum prices were adjusted to account for the longer licence duration.

5.170 In relation to Eir's observation that the SUF's remained unchanged when only the reserve price increased, ComReg notes that the SUF would be the same regardless of the duration of the licence reflecting the fact that the proportion of the minimum price attributed to SUFs is constant (i.e. 60%) and there is a constant stream of annual SUFs over the duration of the licence whereas the SAF is paid upfront and can vary depending on the outcome of the auction.

2.3 GHz Minimum Prices

5.171 As set out in Section 5.5 above, the frequency range 2307 – 2327 MHz will be treated as Frequency-Generic Lots rather than a single Frequency-Specific Lot. In that regard, ComReg notes that the current benchmarks as applied to existing frequency-generic spectrum would apply to six additional Frequency-Generic Lots.

5.172 ComReg notes that while the population of these lots would be marginally less, (i.e. 6%) the fees for the 2.3 GHz paid are already conservative and no further adjustment would be required because the additional amounts are small and would be highly unlikely to choke off demand. For example, reducing the fees for those lots would reduce the reserve price by €6,000 and €8,000 per 5 MHz lot in Time Slice 1 and 2. This measure would increase the complexity of the process as 6 additional lots must be introduced in a new lot category in order to facilitate reduced fees. Finally, ComReg notes that Eir's use of RurTel in the affected areas is likely to be transitioned over the duration of the licence.

5.173 Therefore, on balance, ComReg is of the view that such increases in complexity would not be justified by the relatively marginal difference that could be made to reserve prices that have already been set conservatively.

2.6 GHz Frequency-Specific Lots

5.174 In the 2.6 GHz Primary Band Plan, restricted blocks would be required where FDD and TDD spectrum blocks are adjacent to one another. (See Annex 14 Document 19/124). Three is of the view that the fees associated with these blocks are too high given that the rights of use are restricted and cannot be deployed for high-power mobile services.

5.175 Having considered the power limits which give rise to different implementation scenarios for the 2.6 GHz Frequency-Specific Lots²⁴⁴ and the fees as currently

²⁴⁴ The 2.6 GHz Fixed Frequency Lot (Lower) has a restricted in block power of 25 dBm/5MHz (Non-AAS EIRP limit per antenna) or 22 dBm/ 5 MHz (AAS TRP limit per cell), while the 2.6 GHz TDD Fixed Frequency Lot (Upper) is not restricted in its in-block EIRP/TRP, rather it will have certain restrictions on the practical implementation. For example, it can be used for downlink only

proposed for these lots, ComReg is of the view there is a high level of uncertainty associated with the benchmark estimates and concerns about the valuation placed on these blocks in other jurisdictions in the past adds to this uncertainty. ComReg is therefore of the view that such factors should be further reflected in the minimum price.

- 5.176 In order to reflect the uncertainty regarding the value of these restricted lots, ComReg considers it appropriate to reduce the reserve price for these lots to €25,000 for Time Slice 1 and €35,000 for Time Slice 2. This is approximately a 90% reduction relative to the 5 MHz 2.6 GHz TDD lot.
- 5.177 In that regard, DotEcon notes that there may be an argument for setting lower minimum prices for these blocks to reduce the risk of them going unsold and does not see any issues with reducing the reserve price of the 2.6 GHz TDD guard band blocks to €25,000 for the first time slice and €35,000 for the second time slice.²⁴⁵

2.3 GHz Frequency-Specific Lots

- 5.178 The frequency range 2390 – 2 400 MHz has a lower in block EIRP limit of 45 dBm / 5 MHz to ensure coexistence with systems above 2.4 GHz. This represents a 23 dB reduction compared to all other blocks in the 2.3 GHz band, In Document 19/59R, ComReg considered that it was appropriate that these lots be assigned on a frequency-specific basis because the power limits meant that the potential uses of the band are more limited compared to the rest of the band.
- 5.179 In light of the fee adjustments to the restricted 2.6 GHz TDD lot above²⁴⁶, ComReg also considers it appropriate to adjust the fees associated with the 2.3 GHz Frequency-Specific Lots since these lots will give a lower transmission and coverage range compared to the generic lots.
- 5.180 In determining an appropriate fee level, ComReg also notes the in-block EIRP limit of 45 dBm / 5 MHz is more than double the corresponding limits in the restricted 2.6 GHz TDD lots. In that regard, ComReg notes that the considers it appropriate to reduce the reserve price for these lots to €197,000 for Time Slice 1 and €285,000 for Time Slice 2. This is a 50% reduction relative to the fee schedule laid out in Document 20/32.
- 5.181 In that regard, DotEcon note that these reductions reflect the expected lower value of those lots relative to the rest of the band as a result of the lower EIRP

transmissions at full power, but if used for uplink transmission would be subject to a greater level of interference from upper adjacent FDD usage.

²⁴⁵ DotEcon Report, Document 20/122a, p150.

²⁴⁶ ComReg notes that no respondent raised any issue in relation to these fees.

limit imposed on the associated frequencies and see no reason not to make these proposed adjustments to the minimum fees.²⁴⁷

Updated Information

- 5.182 ComReg has recently completed a review of the Weighted Average Cost of Capital (“WACC”) which includes an assessment of the mobile WACC. In that regard, ComReg notes that the new mobile WACC is 5.85%²⁴⁸ and the minimum prices will be updated to reflect the new discount rate.
- 5.183 ComReg also notes that a number of spectrum awards have taken place since the publication of Document 19/59R and further spectrum awards are planned in the run up to the Proposed Award, which might have some limited effect on current benchmarks, DotEcon will update all benchmarks prior to the commencement of the Proposed Award, to take account of all new relevant award information, and the minimum prices will be revisited and finalised in the final Information Memorandum in light of any DotEcon recommendations.
- 5.184 For information, ComReg sets out below a revised fees table which takes account of recent changes to the WACC.

²⁴⁷ DotEcon Report, Document 20/122a, p150.

²⁴⁸ <https://www.comreg.ie/publication/the-cost-of-capital-for-the-irish-communications-sector-final-report>

Table 3. Minimum SAF and SUF

Bands	Lot Size	Time Slice	Minimum SAF €	SUF €
700 MHz	2 × 5 MHz	1 & 2	9,158,000	988,931
2.1 GHz	2 × 5 MHz	1	1,327,000	525,753
2.1 GHz	2 × 5 MHz	2	2,849,000	525,753
2.3 GHz	5 MHz	1	197,000	52,575
2.3 GHz	5 MHz	2	285,000	52,575
2.3 GHz	10 MHz	1	197,000	52,575
2.3 GHz	10 MHz	2	285,000	52,575
2.6 GHz	2 × 5 MHz	1	394,000	105,151
2.6 GHz	2 × 5 MHz	2	570,000	105,151
2.6 GHz	5 MHz	1	197,000	52,575
2.6 GHz	5 MHz	2	285,000	52,575
2.6 GHz ²⁴⁹ (R)	5 MHz	1	25,000	5,000
2.6 GHz (R)	5 MHz	2	35,000	5,000

5.7.4 ComReg's final position

5.185 Having carefully considered the views of respondents and the expert views of DotEcon, ComReg's final position is that:

- a) minimum prices will be determined in accordance with the methodology set out in the Benchmarking Report prepared by DotEcon (Document 19/59b); and
- b) reserve prices and spectrum-usage fees (SUFs) for the Liberalised Use Licences described herein will be determined in accordance with the methodology set out above. The final prices for same will be set out in the final Information Memorandum, taking due account of any additional relevant data at that time.

²⁴⁹ 2.6 GHz (R) here refers to the 2.6 GHz TDD Guard Bands.

Chapter 6

6 Spectrum Competition Caps

Introductory remarks

What are the Issues?

A number of separate but related issues and concerns arise. ComReg is obviously mindful that actual or potential competitors in the Proposed Award should have freedom to acquire spectrum rights of use. On the other hand, spectrum is a finite resource and its absence may give rise to an entry barrier for a new entry or expansion barrier for an existing operator. Asymmetric spectrum holdings therefore have the potential to give rise to distortions of competition. The potential for such distortions will depend *inter alia* on how much spectrum rights the communications provider in question already holds, what additional spectrum rights that provider could potentially acquire in a scenario where the Proposed Award placed no upper limit on spectrum acquisitions, and how this situation compares to the situations of other actual or potential competitors in the Proposed Award (both in terms of their existing spectrum holdings and potential to acquire additional holdings via the Proposed Award). ComReg briefly summarised these issues as follows²⁵⁰:

“...while ComReg aims to provide bidders with flexibility to acquire additional spectrum rights of use, it is particularly concerned with preventing distortions to competition given the changes to market structure since the 2012 MBSA. In particular, the reduction of MNOs from four to three since the 2012 MBSA (following the EC’s approval of the merger of Three and Telefonica O2) means that the potential impacts of distortions to competition arising from any extreme asymmetries in spectrum holdings following the Proposed Award are likely to be higher, including the risk of the MNO with the smallest spectrum holding not being able to effectively compete, thereby leading to the possible creation of an effective duopoly.”

What did ComReg propose?²⁵¹

- A sub-1 GHz Cap of 70 MHz where existing spectrum rights of use in the 800 MHz and 900 MHz bands would be taken into account in determining the maximum amount of 700 MHz Duplex holdings any bidder can acquire in the Proposed Award

²⁵⁰ Paragraph 6.239 of Document 19/124.

²⁵¹ As outlined by ComReg in its draft Decision document 19/124

- On Overall Cap of 375 MHz across the 700 MHz Duplex, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and 3.6 GHz bands, taking into account all existing holdings in those bands (excluding existing holdings in the 2.3 GHz Band and, in the case of 3.6 GHz Band holdings, the highest holding in any 3.6 GHz Band Region held by that Qualified Bidder), in each of Time Slice 1 and 2.

**What
Respondents
said?**

Eir:

- did not object to the Proposed Sub-1 GHz Cap and agreed with the Proposed Overall Cap;
- did not agree with Three's proposal of a joint cap of 2 x 25 across any two bidders.

Imagine reiterated its previous view that an overall cap of lower than that proposed by ComReg would be more appropriate;

Vodafone:

- broadly agreed with ComReg's proposals; and
- did not agree with Three's proposal.

Three raised a number of objections, including:

- Primarily, that a combination of the Proposed Sub-1GHz Cap and a CCA could result in it paying a higher price than its competitors for equivalent 700 MHz Duplex spectrum;
- That existing holdings should not be taken into account;
- That ComReg had not provided any objective justification, including assessing the effects upon competition;
- That the Proposed Sub-1 GHz Cap, including in combination with a CCA, is discriminatory; and
- That ComReg had not demonstrated that the imposition of the Proposed Sub-1 GHz Cap is proportionate.

Three also proposed:

- A joint cap of 2 x 25 MHz of 700 MHz Duplex across any two bidders; and
- 700 MHz Duplex only caps of 2 x 10 MHz or 2 x 15 MHz.

What has ComReg finally decided, and why?

Having carefully considered

- the submissions received, including Three's proposals;
- the views of its expert advisers,

and examined the potential impacts on downstream retail competition for mobile telecommunications services, ComReg's final position is that it is appropriate to apply:

1. A sub-1 GHz Cap of 70 MHz (in total) where existing spectrum rights of use in the 800 MHz and 900 MHz frequency bands should be taken into account in determining the maximum amount of 700 MHz Duplex holdings any undertaking can acquire in the Proposed Award; and
2. A 375 MHz overall cap across the 700 MHz Duplex, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and 3.6 GHz Bands, taking into account all existing holdings in those bands (excluding existing holdings in the 2.3 GHz Band and, in the case of 3.6 GHz Band holdings, the highest holding in any 3.6 GHz Band Region held by that Qualified Bidder), in each of Time Slice 1 and 2.

6.1 Background and overview of respondents' views

6.1 In Section 6.5 of Document 19/124, ComReg set out its consideration and assessment of the views of interested parties received regarding its Proposed Sub-1 GHz Cap of 70 ("Proposed Sub-1 GHz Cap") and Proposed Overall Cap of 375 MHz ("Proposed Overall Cap") (together the "Proposed Spectrum Competition Caps"), as set out in Document 19/59R, including in light of other relevant material before it, including DotEcon's Report (Document 19/124a), the reports comprising the "Connectivity Studies" and the LS Telcom Report .

6.2 In this chapter, ComReg further considers the Proposed Spectrum Competition Caps, as described in Document 19/124, in light of the views of interested parties received on same since the publication of Document 19/124 and other relevant material before it. ComReg then sets out its final position on its Proposed Spectrum Competition Caps.

6.1.1 Background - overview of Proposed Spectrum Competition Caps as set out in Document 19/124

6.3 ComReg does not reiterate the detailed analysis set out therein and interested parties are referred to same. However, relevant extracts from this and earlier analysis may be provided by way of background and context to its consideration of views of interested parties on its Proposed Spectrum Competition Caps (or

any other matters particularly relevant to same, including alternative/additional proposals from interested parties²⁵²).

6.4 At a very high level, significant factors informing the **Proposed Sub-1 GHz Cap of 70 MHz** included the following:

- that existing spectrum rights of use in the 800 MHz and 900 MHz frequency bands should be taken into account in determining the maximum amount of 700 MHz Duplex holdings any undertaking can acquire in the Proposed Award;
- compared to a sub-1 GHz cap of below 70 MHz, it would not unduly restrict the range of demand and, by minimising the potential for lots to be inefficiently unsold and therefore unused, it would better ensure the efficient use of the relevant spectrum rights;
- a sub-1 GHz cap of above 70 MHz (i.e. 80 MHz) could result in a highly asymmetric outcome where the two larger MNOs (i.e. Three and Vodafone) could each acquire 2 × 15 MHz of 700 MHz Duplex rights making the smallest MNO (i.e. Eir) a more marginal player by denying it 700 MHz Duplex rights and thereby distorting downstream competition for mobile telecommunications services.

6.5 ComReg also considered that a **Proposed Overall Cap of 375 MHz** would, compared to alternative levels within the 380 – 420 MHz range consulted upon in Document 19/59R, better guard against potential distortions to competition arising from extreme asymmetries in post-award spectrum holdings, particularly in light of:

- the post-Merger MNO market structure, including the risk of the MNO with the smallest spectrum holding not being able to effectively compete, thereby leading to the possible creation of an effective duopoly; and
- the significant potential for non-MNO bidders to acquire spectrum in the Proposed Award and thereby exacerbate the level of asymmetry

²⁵² In particular, the following proposals were received from Three:

- “Option 5(a)” as outlined in Document 20/56, noting that this proposal by Three represents a spectrum cap additional to the proposed sub-1 GHz cap and would be specific to the 700 MHz Duplex band; and
- “Option 6” as described in Three’s submission to Document 20/56 as follows:

“6. CCA with symmetric in-auction caps

[Summary Description]: CCA as proposed by ComReg, but with caps that only take into account spectrum that is available in the award.

[Three Comment]: This is the minimalist and most effective modification to ComReg’s proposed CCA while ensuring compliance with statutory functions and objectives. The CCA rules remain unchanged and only a change to application of the caps is needed. It gives non-discriminatory treatment to all bidders.”

between Three and Eir post-award.

6.6 ComReg also clarified that any 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz holdings obtained under the Proposed Award may be taken into account for a competition cap/s for the award of sufficiently substitutable and/or complementary spectrum bands in the future.

6.7 At paragraph 3.15.11 of Chapter 9 of Document 19/124, ComReg set out its draft decision in relation to its Proposed Spectrum Competition Caps as follows:

“3.15.11 spectrum caps, which will apply to each Qualified Bidder in the competitive selection procedure, and only for the duration of that procedure, as follows:

i. 70 MHz (unpaired) in aggregate across the 700 MHz Duplex, 800 MHz and 900 MHz Bands, taking into account all existing holdings in these bands at the time of the procedure; and

ii. 375 MHz (unpaired) in aggregate across the 700 MHz Duplex, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and 3.6 GHz Bands, taking into account all existing holdings in these bands at the time of the procedure (with the exception of existing holdings in the 2.3 GHz Band and, in the case of 3.6 GHz Band holdings, the highest holding in any 3.6 GHz Band Region held by that Qualified Bidder), in each of Time Slice 1 and 2;”.

6.1.2 Overview of responses received since the publication of Document 19/124

6.8 Four interested parties provided submissions on the Proposed Spectrum Competition Caps since the publication of Document 19/124 (Eir, Imagine, Three and Vodafone). ComReg is grateful for same and provides below an introductory overview of those submissions:

(i) **Eir:**

- does not object to the Proposed Sub-1 GHz Cap;
- does not agree with Three’s proposed additional sub-1 GHz sub-cap of 2×25 MHz for winner and price determination (i.e. “Option 5(a)” as outlined in Document 20/56);
- agrees with the Proposed Overall Cap; and
- sought clarification in the event of any return of spectrum rights of use.

(ii) **Imagine** reiterated its previous view that an overall cap of lower than that proposed by ComReg would be more appropriate;

(iii)Vodafone:

- supports the inclusion of existing spectrum in the Proposed Spectrum Competition Caps;
- agrees with the Proposed Sub-1 GHz Cap but does not agree with the methodology used by ComReg for the calculation of the Proposed Overall Cap value;
- does not agree with Three's Option5(a); and
- does not agree with Eir's proposed 2.1 GHz Band-specific cap.

6.9 In relation to **Three**, ComReg notes that Three, in its most recent submission to ComReg (i.e. its response to Document 20/78), states that "*We also reiterate that Three has not objected to ComReg's proposed spectrum caps on their own, it is the combination of the caps and the CCA auction mechanism which is our main objection.*" (page 2).

6.10 This appears to contrast with apparently standalone concerns previously raised by Three regarding the Proposed Spectrum Competition Caps (as set out in Document 19/59R), in its response to Document 19/59R, and ComReg's detailed analysis of these concerns as set out in section 6.5 of Document 19/124²⁵³.

6.11 In any case, since Three has raised various concerns regarding the Proposed Spectrum Competition Caps, and the Proposed Sub-1 GHz Cap in particular, in its response to Document 19/124 and subsequent submissions (albeit it now appears no longer to object to the Proposed Spectrum Competition Caps "*on their own*"), and for the sake of completeness, ComReg addresses these submissions below, including by reference to previous consideration by ComReg of the same or similar concerns previously raised by Three (in its response to Document 19/59R).

6.12 Three's submissions since the publication of Document 19/124 can be summarised and broadly grouped together under the following headings (noting there will be overlaps between these groupings):

²⁵³ Where ComReg concluded that it had "*not received any information that would reasonably require a modification to its sub-1 GHz cap proposals as set out in Document 19/59R, except to clarify that any 700 MHz Duplex holdings obtained under the Proposed Award may be taken into account for a competition cap/s for the award of sufficiently substitutable spectrum bands in the future*".

- concerns expressed of a more general nature;
- more specific concerns raised / proposals regarding the Proposed Sub-1 GHz Cap, including:
 - a. that the 800 MHz and 900 MHz bands are not reliable substitutes for the 700 MHz Duplex, including requests for clarification and other issues raised on how the Proposed Spectrum Competition Caps would operate;
 - b. concerns and queries regarding ComReg's competition analysis informing the Proposed Sub-1 GHz Cap; and
 - c. Three's additional/alternative proposals for the 700 MHz Duplex band (i.e. Option 5(a) and 700 MHz Duplex-only cap of 2 × 10 MHz or 2 × 15 MHz);
- query regarding the Proposed Overall Cap;
- other issues raised, including comments on submissions made by other interested parties.

6.13 For the avoidance of doubt, Three's concerns regarding the combination of the Proposed Spectrum Competition Caps and the proposed CCA format (and opportunity cost pricing proposed by ComReg for same), including its concerns regarding the pricing effects on Three and vis-à-vis its competitors, are addressed in Chapter 7 – Auction Format. That said, to the extent that such claims also appear to be directed at the Proposed Spectrum Competition Caps themselves, then they are also addressed in this chapter in the context of the Proposed Spectrum Competition Caps.

6.1.3 DotEcon Report (Document 20/122a)

6.14 In its report accompanying this document, DotEcon considers the views of interested parties on the Proposed Spectrum Competition Caps. ComReg refers to and considers this material in the relevant sections below.

6.1.4 Structure of Section

6.15 Given the broad range of issues raised by interested parties in relation to the Proposed Spectrum Competition Caps, ComReg summarises and addresses the views of interested parties under the following broad headings:

- Three's submissions on the Proposed Spectrum Competition Caps of a more general nature;

- Proposed Sub-1 GHz Cap - whether existing holdings in the 800 MHz and 900 MHz bands should be taken into account for the award of 700 MHz Duplex Spectrum rights and related issues;
- Proposed Sub-1 GHz Cap – ComReg’s competition analysis informing the Proposed Sub-1 GHz Cap;
- Proposed Sub-1 GHz Cap – Three’s alternative proposals;
- Proposed Sub-1 GHz Cap – updated consideration of Proposed Sub-1 GHz Cap against various regulatory obligations and principles;
- Proposed Overall Cap; and
- Other issues raised.

6.16 ComReg then sets out its final position on this aspect of the Proposed Award.

6.2 Three’s submissions of a more general nature

6.2.1 Summary of Three’s submissions of a more general nature

6.17 In summary, Three raises a number of concerns and points of a more general nature, including that, in its view:

- i. ComReg has not identified any legal basis (or objectively justifiable basis) for the inclusion of the Proposed Spectrum Competition Caps²⁵⁴;
- ii. ComReg’s proposals are discriminatory and Three claims that it is only “*seeking a level playing field*” and “*seeking to be able to participate in the auction on an equal basis*”²⁵⁵;
- iii. ComReg’s proposal to apply a spectrum cap based on existing holdings (in combination with a CCA) places Three at a material disadvantage with respect to its ability to access spectrum through the auction (and exposes it to paying a significant premium over its competitors²⁵⁶) and is unfair²⁵⁷;
- iv. Three queries why ComReg has persisted with its spectrum cap proposals given Three’s view that²⁵⁸:
 - “ComReg’s stated position that the current asymmetry in

²⁵⁴ Page 8 of Three’s response to Document 20/56.

²⁵⁵ See, for example, page 8 of Three’s response to Document 20/56.

²⁵⁶ For the avoidance of doubt, Three’s claim in brackets is addressed in **Chapter 7 – Auction Format**.

²⁵⁷ Page 2 of Three’s response to Document 19/124.

²⁵⁸ Page 19 of Three’s response to Document 19/124.

spectrum holding between MNOs is not harmful to competition”²⁵⁹; and

- ComReg sees “no justification for either effectively reserving spectrum for entrants or non-mobile operators, or for seeking to reduce asymmetry between MNOs”,
- v. ComReg’s proposals are disproportionate and ComReg has not carried out the analysis required to demonstrate that the cap proposed is a proportionate remedy given the discriminatory impact²⁶⁰;
- vi. ComReg has not carried out a Regulatory Impact Assessment on its spectrum cap proposals²⁶¹;
- vii. *It is not for ComReg to “pick winners”.*²⁶² *One of the stated benefits of an open and non-discriminatory auction is in:*

“removing the burden on the regulator to make complex judgements (based on incomplete/imperfect information) in relation to assigning the spectrum and the suitable level of fees”.
- viii. *The aim in designing the process should be to deliver an auction that is open and non-discriminatory, and that delivers an efficient outcome through competition among bidders. ComReg seems to have a preference to avoid certain outcomes which conflicts with these objectives*²⁶³:

“ComReg would be primarily concerned with a situation where the two larger MNOs could bid up to a sub-1 GHz cap in order to make the smallest MNO (i.e. Eir) a more marginal player by denying it 700 MHz rights of use. [ComReg 19/124, paragraph 6.186].”
- ix. *It is important to note that the bidder caps only apply during the auction – there is no impediment to Three or any other bidder obtaining spectrum that is greater than the cap immediately after the auction (though some competition analysis by ComReg might be carried out at that stage) as ComReg has not specified that any particular spectrum holding should*

²⁵⁹ Three similarly submitted at page 10 of its response to Document 20/56:

“ComReg has not identified any competition concerns arising from the current distribution of sub-1 GHz spectrum. To the contrary, ComReg has stated (including most recently in paragraph 6.184 of 19/124) that “the existing spectrum asymmetry does not appear to be harming competition.”

²⁶⁰ Page 8 of Three’s response to Document 20/56.

²⁶¹ Page 8 of Three’s response to Document 20/56.

²⁶² Page 21 of Three’s response to Document 19/124.

²⁶³ Pages 21-22 of Three’s response to Document 19/124.

*be prevented. This means that the only lasting effect of ComReg's proposal might well be to adversely affect the price that Three must pay relative to other bidders in the auction.*²⁶⁴

6.2.2 ComReg's assessment of Three's submission of a more general nature

6.18 ComReg assesses Three's submissions by reference to the number of each of the bullet point summaries above.

Three's submissions of a more general nature – legal basis for Proposed Spectrum Competition Caps

6.19 In relation to **point (i)** (regarding the legal basis for ComReg's proposed spectrum caps), ComReg recalls Three's similar claim in its response to Document 19/59R and which ComReg adequately addressed at paragraph 6.164 of Document 19/124. ComReg considers that the observations set out therein adequately address Three's current claim including, for example, that:

- a) the relevant issue is whether, as a matter of principle, taking into account existing, relevant spectrum holdings in the context of the Proposed Spectrum Competition Caps is without legal basis;
- b) in that regard, one of ComReg's primary objectives is the promotion of competition (section 12 of the 2002 Act) and in pursuit of that objective ComReg is obliged to, among other things, safeguard competition to the benefit of consumers and promote, where appropriate infrastructure based competition (Regulation 16(2)(c) of the Framework Regulations). Moreover, Regulation 9(11) of the Authorisation Regulations²⁶⁵ obliges ComReg to consider whether undertakings potentially obtaining additional spectrum rights (such as in the Proposed Award) would likely distort competition;
- c) clearly, it is not meaningful to assess the potential effects of an accumulation of spectrum rights without having any regard to the existing spectrum holdings of undertakings;

²⁶⁴ Page 2 of Three's response to Document 20/56.

²⁶⁵ Regulation 9(11) of the Authorisation Regulations provides:

"The Regulator shall ensure that radio frequencies are efficiently and effectively used having regard to section 12(2)(a) of the Act of 2002 and Regulations 16(1) and 17(1) of the Framework Regulations. The Regulator shall ensure that competition is not distorted by any transfer or accumulation of rights of use for radio frequencies. For this purpose, ComReg may take appropriate measures such as mandating the sale or lease of rights of use of radio frequencies." (emphasis added);

- d) given this, it is entirely appropriate that ComReg, among other things:
- i. examines whether any existing spectrum holdings are relevant to the rights proposed to be awarded in the context of potentially affecting downstream competition;
 - ii. considers the position of the undertaking with the highest level of existing, relevant spectrum holdings (i.e. Three); and
 - iii. considers the existing and potential level of asymmetry between it and other relevant undertakings and, in particular, other MNOs including the MNO with the lowest spectrum holdings, to assess potential distortions to competition;
- e) furthermore, if ComReg considers that any accumulation would likely distort competition, then it is also obliged under Regulation 9(11) to take appropriate measures to prevent same. In that regard, Article 5 of the RSPD Decision identifies, in the context of Member States' obligations to promote effective competition and avoid distortions of competition in the internal market for ECS, various measures that can be taken by Member States including, in particular, limiting the amount of spectrum for which rights of use are granted to any undertaking; and
- f) in light of the above, ComReg's Proposed Spectrum Competition Caps clearly has legal basis in principle.

Three's submissions of a more general nature – alleged discrimination

6.20 In relation to **point (ii)** (regarding alleged discrimination), ComReg recalls Three's similar claim in its response to Document 19/59R and refers to its assessment of such matters in Document 19/124, including paragraphs 6.164 and 6.165 in particular. For example, that:

- a) ComReg is proposing to apply the same sub-1GHz and overall caps on all potential bidders (e.g. Three and any other bidder could hold a maximum of 70 MHz of sub-1 GHz spectrum following the Proposed Award) and, therefore, ComReg does not agree that the Proposed Spectrum Competition Caps are asymmetric *per se*;
- b) of course, the Proposed Spectrum Competition Caps would affect every potential bidder differently because of their respective existing spectrum holdings (e.g. 800 MHz and 900 MHz holdings in respect of the Proposed Sub-1 GHz Cap); and
- c) Regulation 9(11) of the Authorisation Regulations obliges ComReg to

consider whether any accumulation of spectrum rights would distort competition - which, for obvious reasons, necessarily entails consideration of relevant existing spectrum holdings.

- 6.21 In that context, different effects are to be expected in spectrum competition caps which take into account existing spectrum holdings unless all incumbent operators have equivalent holdings. This is clearly not the case here (given, relevantly, Three's larger sub-1 GHz and supra-1 GHz holdings).
- 6.22 For the sake of completeness, ComReg also observes that the Proposed Spectrum Competition Caps would also affect other undertakings differently and again based solely on their respective existing relevant spectrum holdings. For example:
- a) in the context of the Proposed Sub-1 GHz Cap, both Vodafone and Eir would be more restricted in their respective ability to obtain 700 MHz Duplex rights of use than Imagine, DenseAir or any market new entrant (mobile and non-mobile);
 - b) in the context of the Proposed Overall Cap, Vodafone would be more restricted than Eir, both Vodafone and Eir would be more restricted than Imagine and DenseAir, and all existing operators (mobile and non-mobile) would be more restricted than any market new entrant (mobile and non-mobile); and
 - c) the above is also clearly illustrated in Figure 9 at page 176 of Document 19/124 (extracted below).

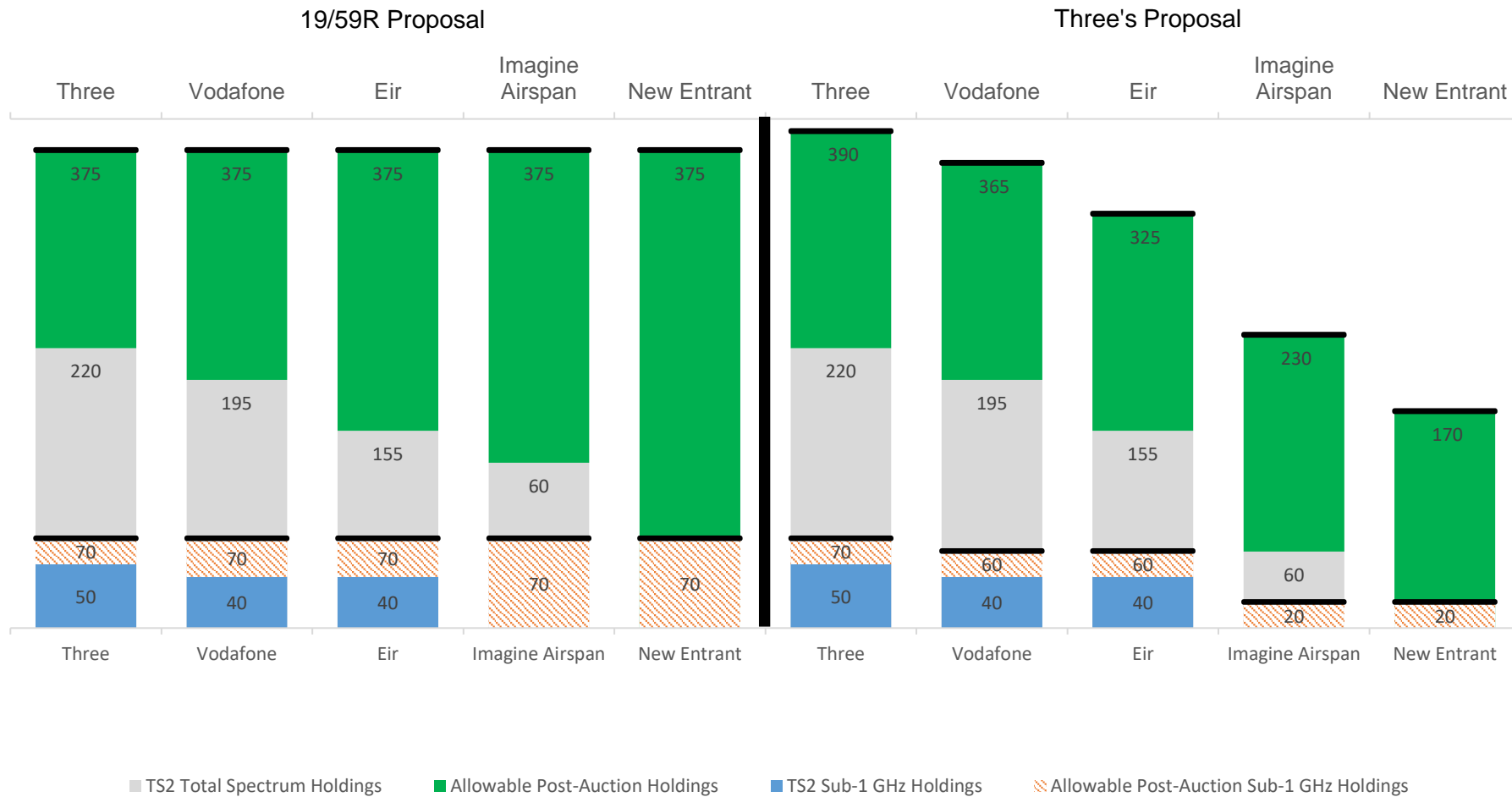


Figure 10. ComReg's Proposed Spectrum Competition Caps and Three's proposal to not take into account existing spectrum holdings (Figure 9 of Document 19/124 at page 176)

Three's submissions of a more general nature – alleged “material disadvantage” to Three

6.23 In relation to **point (iii)** (regarding the Proposed Spectrum Competition Caps placing Three at a “material disadvantage with respect to its ability to access spectrum through the auction” and being “unfair”), ComReg recalls that any restriction upon Three under the Proposed Spectrum Competition Caps, in absolute terms and in relative terms, is a function of the level of its relevant existing spectrum holdings – which, in Three’s case, are the largest holdings among the MNO and non-MNO existing operators. There is accordingly an objectively different starting point, and it is not “unfair” to take that into account. Furthermore, restrictions on the ability of an undertaking to acquire additional rights of use in a spectrum award, which are based solely on the relevant existing spectrum holdings of an undertaking, are entirely appropriate in principle in light of Regulation 9(11) of the Authorisation Regulations in particular. Finally, note also the observations above and elsewhere in this chapter that the Proposed Spectrum Competition Caps comply with the principles of non-discrimination and proportionality. Any alleged “disadvantage” to Three must be seen against the potential for distortions of competition affecting other operators, and competition, through asymmetric spectrum holdings and that it is necessary, appropriate, and proportionate for ComReg to take reasonable measures and exercise an evaluative judgment as to how to deal with these competing considerations.

Three's submissions of a more general nature – current spectrum asymmetry between MNOs

6.24 In relation to **point (iv)** (regarding ComReg’s views on the current spectrum asymmetry of spectrum holdings between MNOs), ComReg recalls Three’s similar claim in its response to Document 19/59R and refers to its assessment of such matters in Document 19/124, including:

- a) its assessment at paragraphs 6.166-6.167 of Document 19/124 and the material referred to therein;
- b) the Section entitled “*Potential distortions to competition*” in Section 6.5 of Document 19/124 and the material referred to therein;
- c) the section entitled “*ComReg’s proposals for the specific level of the overall cap*” in Section 6.5 of Document 19/124 and the material referred to therein; and
- d) relevant updated material set out later in this section.

6.25 Accordingly, it is clear that ComReg’s competition concerns relate to potential spectrum accumulations that could arise from the Proposed Award that would potentially distort competition, where the risk of such accumulations will, of

course, be affected by undertakings' respective existing spectrum holdings. Thus, if the starting point is not identical due to differences in existing spectrum holdings, it is trite to observe that the end-points may also differ between operators when considering a cap on spectrum accumulations in the award.

Three's submissions of a more general nature – proportionality

- 6.26 In relation to **point (v)** (regarding proportionality), ComReg recalls Three's similar claim in its response to Document 19/59R, refers to its assessment of same and other relevant material throughout Section 6.5 of Document 19/124²⁶⁶ and, further, observes that Three has not meaningfully addressed these considerations in its submissions since then. For the avoidance of doubt, ComReg further considers the proportionality of its Proposed Sub-1 GHz Cap, including in light of alternative proposals put forward by Three, later in this section. See also Chapter 7 where ComReg assesses and demonstrates the compliance of its Award Format with the principles of non-discrimination and proportionality.

Three's submissions of a more general nature – claimed need for Regulatory Impact Assessment

- 6.27 In relation to **point (vi)** (regarding a Regulatory Impact Assessment), ComReg recalls Three's similar claim in its response to Document 19/59R, refers to its assessment of same at paragraph 6.171 of Document 19/124 and considers that the observations set out therein already adequately address Three's current claim and ComReg does not propose to set them out again here. In addition, ComReg observes that compliance with its obligations under Regulation 9(11) does not entail the regulatory discretion typically involved in matters where a RIA is normally employed (e.g. whether or not to include certain spectrum bands in an award, to undertake a comparative or competitive selection procedure or to impose a regulatory obligation, such as potentially attaching a licence condition). ComReg further observes that even if a RIA on proposed spectrum caps were necessary in the present case (which it does not accept), it would not be obliged to consider and assess spectrum cap options which are not viable in terms of complying with its statutory obligations. ComReg refers to its analysis of Three's spectrum cap proposals in Document 19/124, and its assessment of Three's recent proposals later in this chapter, in this regard.

Three's submissions of a more general nature – not for ComReg to “pick winners”

- 6.28 In relation to **points (vii) and (viii)** (regarding “picking winners” etc), ComReg

²⁶⁶ Including, but not limited to, paragraphs 6.168, 6.200 – 6.208, 6.210, 6.213, 6.219 – 6.225, 6.239 – 6.250 and the material referred to therein.

outlines its response as follows.

6.29 First, ComReg agrees that it is not its role, in the context of the Proposed Spectrum Competition Caps or otherwise, to “pick winners” in a spectrum award.

6.30 Second, ComReg also recalls that, generally speaking, the purpose of competition caps is to ensure that the distribution of spectrum rights in an award is determined by competition among bidders, subject to preventing accumulations of spectrum rights on such a level that would likely distort competition (e.g. “extreme asymmetries”) in accordance with, *inter alia*, its obligations under Regulation 9(11) of the Authorisation Regulations.

6.31 Third, ComReg has, in the context of the proposed award of 700 MHz Duplex rights, identified a specific level of potential extreme asymmetry that, in its view, would likely distort competition.

6.32 Fourth, ComReg also observes, in the context of its Proposed Sub-1 GHz Cap and Overall Cap, that a wide range of outcomes would still be permitted, and which would ultimately be determined by competition between bidders in the Proposed Award. For example, in the context of the Proposed Sub-1 GHz Cap, ComReg recalls its observation at paragraph 6.196 of Document 19/124 that:

- *“If there is no interest for the 700 MHz lots other than from the MNOs, then all three MNOs would be faced with the prospect of ending the auction with five, six or seven sub-1 GHz lots; and*
- *If there is interest from at least one additional bidder, then Three is arguably in a more favourable position than Vodafone and Eir due to its greater existing holdings; in that case it would be guaranteed five sub-1 GHz lots at the end of the auction, while the other two would only be guaranteed four.”*

6.33 Accordingly, ComReg does not accept any suggestion by Three that, by way of the Proposed Spectrum Competition Caps, ComReg would be “picking winners” contrary to its statutory obligations. On the contrary, ComReg is applying its statutory objectives by imposing a non-discriminatory general cap intended to further the relevant statutory objectives in a proportionate manner, and in particular avoiding or minimising the potential for distortions of competition to occur through the impact that the accumulation of highly asymmetric spectrum holdings could have on competition. ComReg is not therefore “picking winners” but has made a complex evaluative judgment as to how best balance the need to avoid material asymmetry in spectrum accumulations distorting competition against permitting robust and effective bidding where at all possible.

Three's submissions of a more general nature – Proposed Spectrum Competition Caps would apply only during the Proposed Award

- 6.34 In relation to **point (ix)** (regarding the Proposed Spectrum Competition Caps applying only during the auction), ComReg outlines its response below.
- 6.35 First, Three's statement that "*ComReg has not specified any particular spectrum holding [that] should be prevented*" is not correct. ComReg's position in respect of the need for the Proposed Sub-1 GHz Cap is clearly set out in Document 19/124. See also Section 6.6 below in this regard.
- 6.36 Second, by way of the Proposed Spectrum Competition Caps, ComReg will prevent the Proposed Award being used as a mechanism by which undertakings would have the ability and incentive to bid strategically to obtain spectrum accumulations that would potentially distort downstream competition. This is the intended purpose and benefit of the Proposed Spectrum Competition Caps. The fact that the Proposed Spectrum Competition Caps would only apply during the Proposed Award²⁶⁷ does not, in ComReg's view, diminish the benefit of precluding spectrum accumulations arising from the award that would potentially distort competition. Indeed, in ComReg's view, this shows that ComReg has proportionality considerations well in mind. In addition, ComReg observes that applying spectrum competition caps only for the duration of an award is commonplace, as BEREC observed²⁶⁸:

"In most countries, there are no provision to limiting the amount of spectrum a licensee can retain during the entire duration of their licence, i.e. the spectrum caps are only employed during the award procedure and are not applied for the duration of the license (for instance BoR (18) 235 15 during spectrum trading)."

- 6.37 Third, ComReg rejects the suggestion that the Proposed Spectrum Competition Caps "*adversely affect*" the price that Three must pay relative to other bidders in the auction. See, in that regard, the discussion and demonstration (in this chapter and Chapter 7) of compliance of the Proposed Spectrum Competition Caps and the award format more generally with the principles of non-

²⁶⁷ As noted at paragraph 6.172 of Document 19/124:

*"ComReg notes that its Proposed Competition Caps would only apply for the duration of the proposed auction and would not apply to the market following the **assignment** of the radio spectrum. Operators would, subject to the licences and their conditions, be free to trade, lease and combine rights of use of spectrum following the auction to the extent that such rights of use of spectrum are designated as being tradable or leasable and in line with competition law and the legal framework for electronic communications in Ireland."*

²⁶⁸ BEREC, "*BEREC report on practices on spectrum authorization, award procedures and coverage obligations with a view to considering their suitability to 5G*", BoR (18) 235 ("**BEREC 2018 Report**"), pages 14 and 15.

discrimination and proportionality²⁶⁹.

6.38 Finally, Three's observation that there is "*no impediment to Three or any bidder obtaining spectrum that is greater than the cap immediately after the auction*" ignores the continued potential application of Regulation 9(11) of the Authorisation Regulations (which of course provides the principal legal bases for the imposition of spectrum caps in the present case). Any such assessment under Regulation 9(11) would be conducted at the relevant time and having regard to the facts and circumstances at that time, and any other relevant and material considerations.

6.39 In light of the above, ComReg is satisfied that the points raised by Three under point (ix) above are not persuasive and do not required further consideration.

6.3 Proposed Sub-1 GHz Cap - whether existing holdings in the 800 MHz and 900 MHz bands should be taken into account for the award of 700 MHz Duplex

6.3.1 Background - overview of ComReg's position in Document 19/124

6.40 ComReg refers to its consideration of this issue at paragraphs 6.180 – 6.183 of Document 19/124. In summary, ComReg:

- a) noted that all sub-1 GHz spectrum share propagation attributes that make the bands largely substitutable from a network design perspective;
- b) observed that the 700 MHz, 800 MHz and 900 MHz bands can all be used to deliver national coverage and support the future strong growth in demand for mobile broadband services for 4G and 5G;²⁷⁰ and

²⁶⁹ For example, at a paragraphs 6.185 and 6.186 of Document 19/124 which state:

[6.185] *In considering the potential competitive effects arising from an extreme asymmetry, ComReg considers whether there would be an increased likelihood that smaller MNOs (e.g. Eir) or potential entrants would be foreclosed from expanding capacity, deploying alternative technologies, or entering the market, and also whether such an operators costs would be increased to the extent that they would be unable to effectively compete on a comparable basis.*
 [6.186] *In that regard, ComReg would be primarily concerned with a situation where the two larger MNOs could bid up to a sub-1 GHz cap in order to make the smallest MNO (i.e. Eir) a more marginal player by denying it 700 MHz rights of use and distorting competition in downstream markets. This would have the largest impact on the smallest operator as it has less scope to mitigate the absence of 700 MHz rights of use because of its smaller existing spectrum holdings."*

See also the analysis subsequent to these paragraphs in relation to the likely competition effects of Three and Vodafone each winning 2 x 15 MHz and Eir winning none.

²⁷⁰ For example:

- 700 MHz, 800 MHz and 900 MHz are harmonised frequency bands with technological possibilities from their combined use (see: <https://ec.europa.eu/digital-single->

- c) observed that consideration of existing spectrum holdings in an award of 700 MHz rights has been employed in other jurisdictions (e.g. Netherlands, UK, and Austria).

6.41 ComReg also noted that Three's submission was in stark contrast to Three UK's submissions to Ofcom concerning the UK's proposed award of the 700 MHz and 3.6 GHz – 3.8 GHz spectrum bands and, in particular, that Ofcom should impose a sub-1 GHz cap taking into account existing spectrum holdings, similar to what is being proposed by ComReg.²⁷¹

6.42 In light of its consideration of the available material, ComReg stated that it remained of the view that existing spectrum holdings in the 800 MHz and 900 MHz bands should be counted towards the Proposed Sub-1 GHz Cap.

6.3.2 Views of interested parties (whether existing 800 MHz and 900 MHz holdings should count towards the sub-1 GHz cap)

6.43 In its response to Document 19/124, Vodafone submits:

- i. *"We support ComReg's proposal to have separate Competition Caps for the sub-1GHz band and an overall cap for spectrum to support mobile services. In addition, we support the inclusion of existing spectrum in the caps. This practice has been the norm in other countries and, as noted by ComReg in paragraph 6.181, supported by Three in auctions in other countries."*

[market/en/news/commission-sets-out-technical-conditions-allocate-more-radio-frequencies-mobile-internet](https://www.ofcom.gov.uk/consult/condocs/market/en/news/commission-sets-out-technical-conditions-allocate-more-radio-frequencies-mobile-internet/));

- as noted by the RSPG, the 700 MHz, 800 MHz and 900 MHz bands are already potentially available for 5G;
- in the context of 5G, it is widely accepted that 5G deployments will focus, in the short term, on enhanced mobile broadband (i.e. improvements in network performance, including by way of three-band carrier aggregation of rights in the 700 MHz, 800 MHz and 900 MHz bands)

²⁷¹ Among other things, Three UK submitted in its submission of 12 March 2019 at page 33 that:

"Ofcom should address the risk of further concentration of sub-1 GHz spectrum in the hands of Vodafone and O2 by the imposition of an 80 MHz (37%) sub-1 GHz cap, in addition to the overall cap."

The proposed cap would avoid extreme asymmetry in sub-1 GHz spectrum, by constraining Vodafone and O2 to acquire a maximum of 2x10 MHz of 700 MHz FDD and 5 MHz of 700 MHz SDL spectrum. This would preclude Vodafone and O2 from bidding strategically, and leave a minimum of 2x10MHz FDD and 1x10MHz of 700MHz SDL for Three and BT/EE to expand their low frequency holdings.

As we note in section 4.7, the risks of imposing a sub-1GHz cap are asymmetric – with significant upside for consumers in terms of ensuring continued effective competition in mobile services and limited if any loss in efficiency in terms of spectrum allocation." (emphasis added)

See: https://www.ofcom.org.uk/data/assets/pdf_file/0024/143493/three.pdf

6.44 In summary, Three submits:

- ii. the 700 MHz band is a pioneer band for 5G services. In the short term, spectrum at 800 MHz and 900 MHz is not a substitute for 5G roll out and DotEcon has stated that it will be substitutable in the long run only²⁷²;
- iii. as the current sub-1GHz licences expire in 2030, a full 10 years before the 700 MHz licences would expire there can be no guarantee that the 800 MHz or 900 MHz spectrum will be available to mobile or any particular MNO beyond the current expiry (and ComReg offers no certainty that spectrum acquired in this award will be taken into account in subsequent awards). This means the bands are not reliable substitutes in the longer term²⁷³;
- iv. *“the effect of the bias against Three will last for a full decade beyond the expiry of the current licences that caused it in the first place” and “The only way to avoid this under ComReg’s currently proposed auction rules would be to introduce another timeslice for the sub-1GHz spectrum covering the period from July 2030 to December 2040. Similar consideration might apply to the supra-1GHz spectrum”*²⁷⁴;
- v. It should be noted that as part of the Merger commitments, Virgin Media retains the option to acquire 2 × 5 MHz of Three’s 900 MHz spectrum and 2 × 10 MHz of its 1800 MHz spectrum (and 2 × 10 MHz of 2.1 GHz spectrum up to July 2022). Were this option to be exercised, then Three would have no more sub-1GHz spectrum than either Vodafone or Eir. ComReg has not explained how, if at all, these matters have been taken into account in its deliberation.²⁷⁵

6.3.3 Whether existing 800 MHz and 900 MHz holdings should count towards the sub-1 GHz cap – ComReg assessments of views of interested parties

6.45 ComReg assesses the views of interested parties by reference to the numbered bullet point summary above.

Whether existing 800 MHz and 900 MHz holdings should count towards the sub-1 GHz cap – other jurisdictions

6.46 In relation to **point (i)** raised by Vodafone, ComReg notes Vodafone’s agreement with the proposal to include all existing 800 MHz and 900 MHz holdings in the

²⁷² Page 20 of Three’s response to Document 19/124.

²⁷³ Ibid.

²⁷⁴ Ibid.

²⁷⁵ Page 10 of Three’s response to Document 20/56.

sub-1 GHz cap. In relation to Vodafone's view that the inclusion of existing spectrum in the spectrum caps "*has been the norm in other countries*", ComReg observes that:

- a) The Dutch Administration has imposed a competition cap that will prevent any bidder from acquiring more than 40% of mobile spectrum under 1 GHz²⁷⁶;
- b) The Spanish Administration, in July 2020, amended its 700 MHz band auction proposals to include a cap of 2 × 15 MHz available to each operator in the 700 MHz band and a combined limit of 2 × 35 MHz (i.e. 70 MHz) per operator in the 700 MHz, 800 MHz and 900 MHz bands²⁷⁷; and
- c) RTR, the Austrian regulator, included a 700 MHz cap where "*each bidder may acquire a maximum of four blocks (2 x 20 MHz) with the exception of A1 Telekom Austria AG, which is restricted to a maximum of two blocks (2 x 10 MHz)*"²⁷⁸.

Whether existing 800 MHz and 900 MHz holdings should count towards the sub-1 GHz cap – Three's claim that 800 MHz and 900 MHz is not a substitute for 5G services

- 6.47 In relation to **point (ii)** raised by Three (the 800 MHz and 900 MHz bands are not substitutable with the 700 MHz Duplex), ComReg does not consider this argument persuasive for the reasons outlined below.
- 6.48 First, it does not address the points identified in Document 19/124 regarding the harmonisation of the 800 MHz and 900 MHz bands for 5G.
- 6.49 Second, there have been developments since the publication of Document 19/124 in relation to some of these matters, and which further support the view that existing spectrum holdings in the 800 MHz and 900 MHz band should be taken into account, including the availability of carrier aggregation. In that regard, ComReg notes that three-band sub-1 GHz carrier aggregation is envisaged in 3GPP Release 15.
- 6.50 Third, Three's claim does not take into account the relevant findings from the Connectivity Reports and the LS Telcom report - which have informed ComReg's Proposed Sub-1 GHz Cap and other proposals (e.g. coverage and roll-out). For

²⁷⁶ <https://www.government.nl/binaries/government/documents/publications/2020/03/06/non-binding-translation-auction-regulation-and-explanatory-notes-2020/Non-binding+translation+auction+regulation+and+explanatory+notes+2020.pdf>

²⁷⁷ https://portal.mineco.gob.es/es-es/comunicacion/Paginas/200721_np_frecuencias.aspx

²⁷⁸ See:

https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/Multibandauktion_700-1500-2100MHz_2020/FRQ5G_2020_tender_document.en.html

example, in their report²⁷⁹, Oxera/Real Wireless found that:

- a) based on their interviews with Irish MNOs, the first priority would be to extend capacity and coverage for their core existing business model, mobile broadband services, with LTE Advanced and, later, 5G²⁸⁰;
- b) “[Of the Candidate Bands], **the 700 MHz band is likely to be of most interest in Ireland in terms of providing or improving coverage, given that its strong propagation qualities support more cost-effective approaches to the coverage of distributed and rural populations.**”²⁸¹ (emphasis added); and
- c) “During our discussions with Irish MNOs, we found that they would use the 700MHz band (possibly aggregated with other sub-1GHz bands) to enhance coverage.”²⁸²

6.51 Thus, in the near term MNOs are likely to use 700 MHz Duplex rights in conjunction with rights in other frequency bands, including in the 800 MHz and 900 MHz bands, to improve core, existing MBB services via LTE/LTE-Advanced in terms of more cost-effective approaches to the coverage of distributed and rural population, with additional “5G” services (e.g. IoT and massive IoT, low latency services, high reliability services etc), following, and benefiting from, the initial improvements to the MNOs’ core MBB infrastructure and services.

6.52 ComReg also observes that recent material provided by the Irish MNOs (in the context of ComReg’s Temporary ECS licensing schemes) would confirm these

²⁷⁹ Document 18/103c.

²⁸⁰ Ibid, page 15. See also:

*“From a longlist of possible use cases, **MBB will continue to be a core service and the primary beneficiary of extending mobile capacity and coverage.** In our view, operators will deploy infrastructure initially for MBB and then layer additional services onto that network in order to increase revenue.*

For the Internet of Things (IoT) use cases, Irish MNOs believe that these use cases would not justify additional network roll-out in their own right. However, when combined with MBB, these use cases improve the overall business case by increasing potential service revenue, differentiation from competitors, and customer loyalty.” (page 17)

“For MNOs across the world, there are two top-level objectives driving future investment.

1. To enhance the cost efficiency and user experience of existing services— such as MBB— by boosting data rates, device capacity, and coverage. This category also includes enhancing existing 2G-based M2M services in situations where they need additional data capability, or where the operator wishes to refarm spectrum from 2G.

2. To enable new services and revenue streams that centre on the IoT and may require far lower latency and/or higher levels of reliability than those that are delivered by LTE.” (page 18).

²⁸¹ Ibid., page 15.

²⁸² Ibid., page 29.

findings.^{283 284}

- 6.53 Furthermore, there is also very limited market penetration of 5G handsets presently (e.g. Apple only released its first 5G-enabled iPhone in October 2020 and Irish MNOs have only offered 5G services for less than a year²⁸⁵), which are also expensive. See also Table 2 above which highlights that, as of September 2020, there were circa 2800 4G devices for the 700 MHz Band compared to circa 100 5G devices.²⁸⁶







²⁸³ For example, in Three's submission of 2 September 2020 in support of a further temporary licensing scheme, it states:

*"3. How temporary rights have assisted with the provision of ECS in the state (16C, 16D, 16F)
The temporary spectrum licence has allowed Three to rapidly increase its network capacity in many of the areas that have experienced increased congestion arising from the changed demands brought about by Covid-19. When the Temporary Licences were first issued, we were able to immediately deliver extra capacity to an important but limited number of sites, and we have been able to continually expand the number of sites that use 700MHz and 2100MHz for 4G data service since." (emphasis added)*







We believe Gaggin in Co. Cork is an interesting example of the benefit to consumers of the temporary measures. The area from Gaggin to Old Chapel lies to the west of Bandon. It is not well served by fixed broadband service, and mobile services in the area were unable to support locals to work from home. Local residents had resorted to working from their cars in the church yard in Bandon to get connectivity. Three has a site in the area, however it is a small mast that is fully loaded and unable to take additional antennae or equipment. On receipt of the Temporary Licence it was decided to deploy an additional temporary mast in the area delivering 4G data through 700MHz, 800MHz, and 2100MHz, This site is now delivering data at up to 155Mb/s in the Gaggin area and throughput on the site has increased five-fold and is growing. More importantly, it is delivering a service that allows locals to work from home."

The above is a single localised example of the benefits that have come from use of the Temporary Licence, but there have been benefits throughout the country. When the Stay at Home requirements were first introduced and we experienced a surge in demand, there was a reduction in the average throughput received by individual end users and an increase in the number of cells that would be classified as congested. As we have been able to roll-out 4G on 700MHz and 2100MHz overall end-user throughput has recovered and in some places is now higher than the pre-March level. (emphasis added).

See also Eir's and Vodafone's respective submissions in support of a further temporary licensing scheme.

²⁸⁴ More recently, on 1 December 2020, as part of its submission to ComReg regarding the potential renewal of its Further Temporary ECS Licence, Three [



 ].

²⁸⁵ Using existing 3.6 GHz Band spectrum rights. See Tables 6 and 7 below in this chapter which highlights the correlation between 5G New Radio ("NR") sites and 3.6 GHz band sites for the MNOs.

²⁸⁶ Indeed, it may be some time before 4G handsets able to utilise the 700 MHz Band penetrate the market to the same extent as for other bands (e.g. 2.1 GHz and 2.6 GHz). See again Table 2 earlier in this document. In addition, [



 ]

6.54 In addition, ComReg observes that Three has not reconciled its views in the present matter with those of Three UK, the latter of which argued for a sub-1 GHz cap - which would take into account existing sub-1 GHz holdings (e.g. in the 800 MHz and 900 MHz bands) to “...avoid extreme asymmetry in sub-1 GHz spectrum”.

6.55 Finally, ComReg also notes and agrees with DotEcon’s view that²⁸⁷:

“Ignoring existing holdings is untenable, because the reasoning for the cap is based on avoiding excessively asymmetric outcomes that are likely to harm downstream competition. Clearly, all of the spectrum available to an operator is relevant to its ability to compete effectively, and it follows that the cap must take existing holdings into account. Where a network operator has a large spectrum disadvantage, this will tend to raise its incremental costs of deploying capacity, as it needs more network investment to compensate. It may face an unavoidable quality of service disadvantage, as availability of spectrum may limit the peak speeds it can offer. This may render that network operator less able to impose competitive constraints on those operators with greater amounts of spectrum.”

6.56 Accordingly, not only are the 800 MHz and 900 MHz bands substitutable with the 700 MHz Duplex in the long run, they are also substitutable in the short term.

Whether existing 800 MHz and 900 MHz holdings should count towards the sub-1 GHz cap – expiry of 800 MHz and 900 MHz licences in 2030

6.57 In relation to point (iii) raised by Three (expiry of the current sub-1 GHz licences in 2030), ComReg outlines its response as follows.

6.58 First, ComReg recalls Three’s previous request for clarification in its response to Document 19/59R (as summarised in bullet point (xi) of paragraph 6.139 of Document 19/124) and ComReg’s consideration of Three’s request at paragraph 6.177 of Document 19/124²⁸⁸. Further, ComReg observes that Three has not meaningfully addressed these considerations.

6.59 Second, while Three’s observation that “there can be no guarantee that the 800

²⁸⁷ Pages 50-51 of DotEcon’s report (Document 20/122a).

²⁸⁸ Including relevantly that:

- “current 800 MHz, 900 MHz and 1800 MHz rights expire in 2030, and would therefore coexist with new 700 MHz rights for approximately 10 years, before being reassigned. ComReg considers that distortions to competition could materialise during this lengthy period in the event of an excessive accumulation of sub-1 GHz rights as a result of the Proposed Award; and
- similarly, current 3.6 GHz band rights expire in 2032 and would coexist with new 2.1 GHz rights for 10 years and all other rights proposed to be award for 12 years. Again, ComReg considers that distortions to competition could materialise during these lengthy periods in the event of an excessive accumulation of spectrum rights as a result of the Proposed Award.”

MHz or 900 MHz spectrum will be available to mobile” is noted, ComReg is not aware of any material to suggest that there is any likelihood, let alone a sufficiently strong likelihood at this stage, that these globally important spectrum bands for mobile telecommunications services would no longer be allocated/available for mobile services in Ireland²⁸⁹. Clearly, however, ComReg would take any real possibility of this occurring into account at the relevant time, if appropriate to do so in the light of any other relevant and material statutory objectives and other policies.

6.60 Third, and in relation to Three’s observation that “[t]here can be no guarantee that the 800 MHz or 900 MHz spectrum will be available to...any particular MNO”, ComReg outlines its response below:

- a) first, all existing 800 MHz, 900 MHz and 1800 MHz rights of use are due to expire on 12 July 2030²⁹⁰;
- b) in its current Radio Spectrum Management Strategy Statement 2019 – 2021 (Document 18/118), ComReg stated, generally, that “*Where existing spectrum rights of use are due to expire in the near future (e.g. the next five years), ComReg endeavours to set out its proposals on the future use of such bands well in advance of expiry including, where appropriate, defining and carrying-out an assignment process for same.*” (paragraph 4.77);
- c) based on this stated general approach, ComReg observes that a similar process would likely be undertaken to address the future of those spectrum bands, including setting out its considerations, and proposals for consultation, on very similar matters to those being addressed in the present consultation process.²⁹¹ Further, this process would be informed by the relevant facts and circumstances at that time; and
- d) finally, ComReg notes that, by definition, there is never any guarantee that spectrum rights will be made available to “any particular MNO”. This is a

²⁸⁹ Indeed, ComReg recalls, among things, that:

- there is no such agenda item for WRC 23;
- In recent years, more sub-1 GHz bands are being allocated for mobile than not (i.e. 700 MHz and 800 MHz) and the potential for a review of further sub-1 GHz spectrum (e.g. 600 MHz band) being made available for award, from 2025 onwards.

²⁹⁰ See Wireless Telegraphy (Liberalised Use and Preparatory Licences in the 800 MHz, 900 MHz and 1800 MHz bands) Regulations, 2012 (S.I. No. 251 of 2012).

²⁹¹ Including, for example:

- which bands ought to be awarded (including any new spectrum bands which might become available for award in the intervening period, or existing bands which ought to and could reasonably be incorporated into any award);
- the appropriate award format; and
- whether spectrum caps should be applied and, if so, the nature and level of same, including whether existing rights of use (such as those currently proposed to be awarded) ought to be counted towards those caps.

core tenet of the Common Regulatory Framework.

6.61 In addition, ComReg notes and agrees with DotEcon's view that²⁹²:

“Beyond 2030, we expect that ComReg will not leave spectrum subject to expiring licences unallocated. A new award of 800 MHz, 900 MHz and 1800 MHz spectrum will be necessary, and competition caps will likely be set in accordance with similar underlying principles to those used in previous awards. Existing licensees would have incumbency advantages due to their existing use of the spectrum and complementary network assets, making it likely that they win spectrum back. Therefore, the termination of existing 800 MHz, 900 MHz and 1800 MHz licences is not a cliff edge facing the current MNOs.”

6.62 In relation to Three's claim that “ComReg offers no certainty that spectrum acquired in this award will be taken into account in subsequent awards”, ComReg reiterates its clarifications in Document 19/124 that any 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz holdings obtained under the Proposed Award may be taken into account for a competition cap/s for the award of sufficiently substitutable and/or complementary) spectrum bands in the future, noting again that these matters would be determined based on the particular facts and circumstances at the relevant time. That said, ComReg observes that the weight of the material set out in Document 19/124, and as further reflected upon and updated in this document, would certainly indicate that 700 MHz Duplex holdings obtained in the Proposed Award would count towards any spectrum competition cap for any future competitive award of 800 MHz and 900 MHz spectrum rights in or around 2030.

Whether existing 800 MHz and 900 MHz holdings should count towards the sub-1 GHz cap – Three's claim of “bias” beyond expiry of 800 MHz and 900 MHz licences

6.63 In relation to point (iv) raised by Three (regarding its claim of “bias” beyond the expiry of existing 800 MHz, 900 MHz and 1800 MHz rights of use and its alternative time-slice proposal), ComReg outlines its response below:

- a) ComReg does not accept that the Proposed Spectrum Competition Caps, which would affect all potential bidders differently based solely on their respective existing spectrum holdings at the time of the procedure, are “biased” against Three or would result in “bias” against Three in the usual sense of the word;
- b) as Three itself recognises, the Proposed Spectrum Competition Caps

²⁹² Pages 55-56 of DotEcon's report (Document 20/122a).

would only apply for the duration of the Proposed Award;

- c) accordingly, Three (and any other potential bidder) is entitled to seek to acquire new spectrum rights following the Proposed Award (whether by way of transfer, lease or in any subsequent award) subject to the relevant statutory procedures and ComReg's statutory obligations including, most notably, under Regulation 9(11) of the Authorisation Regulations, and general provisions of *ex post* competition laws;
- d) as noted above, the weight of the material before ComReg at this time would certainly indicate that 700 MHz Duplex holdings obtained in the Proposed Award would count towards any spectrum competition cap for any competitive award of 800 MHz and 900 MHz spectrum rights in or around 2030; and
- e) as discussed elsewhere in this chapter, the Proposed Sub-1 GHz Cap complies with the principles of non-discrimination and proportionality.

6.64 In light of the above, it is not necessary to examine Three's additional time-slice proposal any further.

Whether existing 800 MHz and 900 MHz holdings should count towards the sub-1 GHz cap – Merger commitments

6.65 In relation to **point (v)** raised by Three (regarding the Merger commitments ("Commitments")²⁹³, ComReg outlines its response as follows.

6.66 First, the Commitments are something which pre-date, and are separate to, the Proposed Award in the sense that they were remedies proposed voluntarily by the merging parties in 2014, in an effort to remedy the substantial lessening of competition concerns raised by the transaction.

6.67 Second, the Commitments envisage a series of standalone spectrum divestment measures that were intended to contribute towards making up for the loss of competition caused by the Merger by lowering entry barriers for a new entrant. These (and other) aspects of the Commitments remain fully in force today. Thus:

- a) in order to enable the Upfront MVNO (i.e. initially UPC Ireland and now Virgin Media)²⁹⁴ to develop into an MNO, Three must offer it the option to acquire, by way of transfer from Three, the rights of use to some or all of the Divestment Spectrum²⁹⁵ (at the election of Virgin Media) ("Spectrum

²⁹³ Available at: https://ec.europa.eu/competition/mergers/cases/additional_data/m6992_4894_3.pdf .

²⁹⁴ Or the "Second MVNO" (i.e. Carphone Warehouse) which is no longer trading.

²⁹⁵ Divestment Spectrum: means:

(a) 2 × 5 MHz of 900 MHz spectrum in Time Slice 2 (13 July 2015 to 12 July 2030);

Option”);

- b) the Spectrum Option may be exercised by Virgin Media for a period of ten years commencing from 1 January 2016 (“Spectrum Option Period”) subject to the following:
- i. the Spectrum Option may only be exercised by Virgin Media if there is a Capacity Agreement in place between it and Three, otherwise its right to exercise the Spectrum Option will lapse²⁹⁶; and
 - ii. the Spectrum Option may only be exercised by Virgin Media if it demonstrates to the Monitoring Trustee (at the time it first seeks to exercise the Spectrum Option) that it has a concrete business plan to use the Divestment Spectrum to become an MNO within a reasonable period of time following the first exercise of the Spectrum Option;
- c) Three shall offer (i) the rights of use to the 1800 MHz and 2100 MHz Divestment Spectrum at no minimum price but shall not be obliged to transfer this Divestment Spectrum at [redacted from Commitments]* and (ii) the rights of use to the 900 MHz Divestment Spectrum at [redacted from Commitments]*;
- d) if the transfer of the rights of use to the Divestment Spectrum is subject to ComReg’s approval then the Commitment (in paragraph 13) shall be conditional on that approval;
- e) if at any point following the transfer of the Divestment Spectrum until the expiry of the applicable rights of use under the relevant spectrum licences (i) Virgin Media is no longer independent of and unconnected to any mobile network operator active in Ireland or (ii) Virgin Media seeks to transfer the rights of use to the Divestment Spectrum to a third party, Three shall have the right, subject to applicable approvals under Irish and/or EU law, to re-acquire the rights of use to the Divestment Spectrum by way of transfer from Virgin Media at the same price as Virgin Media has paid to Three and, in such circumstances, Virgin Media shall be required to clear and return the Divestment Spectrum to Three within a period of 6 months from the date of Three exercising its rights to re-acquire the Divestment Spectrum. Provided that (i) above shall not prevent the Purchasing MVNO entering into network sharing, spectrum

(b) 2 × 10 MHz of 1800 MHz spectrum in Time Slice 2 (13 July 2015 to 12 July 2030); and

(c) 2 × 10 MHz of 2100 MHz spectrum for the remainder of the licence period until 24 July 2022.

²⁹⁶ Noting that the Capacity Agreement with Virgin Media has a maximum period of 10 years (Section C of Commitments) and was entered into around June 2014.

pooling or roaming agreements with mobile network operators in Ireland;
and

- f) when Three has reached or is about to reach a legally binding agreement with Virgin Media to transfer all or part of the Divestment Spectrum, the relevant Three entities to the Commitments shall provide the EC with a copy of the agreement and a reasoned statement in writing, enabling the EC to verify that the commitment to transfer the rights of use to some or all of the Divestment Spectrum has been fulfilled in a manner consistent with the Commitments.

6.68 Third, in principle, to the extent it could arise, there is an in-built mechanism under paragraph 53 of the Commitments, pursuant to which the EC may, in response to a reasoned request from H3GUKH or H3GIH showing good cause waive, modify or substitute, in exceptional circumstances, one or more of the undertakings in the Commitments. Paragraph 53 applies on its face for the entire duration of the Commitments, and so would be open to Three for the remaining period of operation of the Commitment. Whether and to what extent Three has entered into contractual or other arrangements in this connection and whether and to what extent any such arrangements would, or may, allow the modification of those arrangements in the event that the EC granted a waiver or modification of the Commitments is not known to ComReg, and would very likely depend also on the terms of any final EC decision in this regard (and any legal challenges thereto).

6.69 Fourth, ComReg also notes that EC's Merger Decision itself states, at paragraph 1005:

"...the Commission notes that the MNO commitment [i.e. the Spectrum Option] and this decision are without prejudice to ComReg's statutory powers, notably those in relation to effective use of spectrum."

6.70 Fifth, an undertaking's existing spectrum holdings under the Proposed Spectrum Competition Caps would only be assessed by ComReg at the time of the procedure (i.e. once it has received an Application from an undertaking to participate in the Proposed Award). See, in particular, paragraph 3.49 of the Draft Information Memorandum (Document 20/32) ("Draft IM") which states²⁹⁷:

²⁹⁷ Note:

- Table 18 of the Draft IM (page 78) identifies, on an indicative basis, that the deadline for the submission of a completed Application Form would be 8 weeks following the publication of the final Information Memorandum. At this juncture, ComReg envisages the publication of its response to consultation on the draft IM and the final Information Memorandum circa Q1/2021;
- based on the above indicative timeframes, there would be at least **5** months until the deadline for Applications to be submitted, and for the assessment of Applications received in light of,

“Applications are subject to Competition Caps (see Section 4.1.3)²⁹⁸. If an Application Form includes Lots that, if awarded, would exceed the relevant Competition Caps, ComReg may, at its discretion, contact the particular Applicant and seek to resolve the issue by having the Applicant amend its Initial Bid Form. If ComReg is unable to resolve the issue in this manner, ComReg shall reject the Application on the basis that it is invalid and shall notify the Applicant of its decision.”

- 6.71 In light of the wording of paragraph 3.49 and Section 4.1.3 of the Draft IM, ComReg considers that the proposed position and process is quite clear. In particular, if, at the time that any Application to participate in the Proposed Award is received from Three, some or all of the Divestment Spectrum is no longer associated with Three’s existing licences (e.g. said spectrum is instead held by Virgin Media under its own licence/s as a consequence of the Commitments), then said spectrum would not count towards Three’s existing spectrum holdings for the purposes of the Proposed Spectrum Competition Caps.²⁹⁹
- 6.72 Without prejudice to the above, to the extent that Three continues to hold rights of use to the Divestment Spectrum at the time of its Application, ComReg does not consider that it would be appropriate to exclude that spectrum from Three’s existing spectrum rights at the time of Applications on the basis of the mere possibility that Virgin Media might trigger the Divestment Commitment at some unspecified stage in the future. This view reflects, among other things:
- a) the relevant Three entities willingly offered up the Commitments to eliminate the concerns about a substantial lessening of competition caused by their Merger to obtain clearance for their commercial transaction. In so doing, they were aware that the Commitments would

among other things, an undertaking’s existing spectrum holdings under the Proposed Competition Caps.

²⁹⁸ The relevant portion of Section 4.1.3 of the Draft IM states:

“Competition Caps

4.13 All Bids in the Main Stage are subject to an Overall Competition Cap and a Sub1 GHz Competition Cap that will apply to spectrum holdings immediately following the Award Process and therefore limit the rights of use that Bidder’s may bid for/acquire in the Award Process. These Competition Caps are evaluated separately for each Time Slice, and include spectrum associated with existing licences held during the relevant time period(s). For the avoidance of doubt, these caps only apply for the duration of the Award Process. They do not affect the transfer of rights thereafter, for instance pursuant to spectrum leasing.

4.14 Sub-1 GHz Competition Cap: no Bidder may bid for/acquire spectrum rights of use in the Award Process that would result in it holding total spectrum rights of use for more than 70 MHz (2 x 35 MHz) of spectrum across the 700 MHz Duplex, 800 MHz and 900 MHz Bands at any time during either of the two Time Slices.

4.15 Overall Competition Cap: no Bidder may bid for/acquire spectrum rights of use in the Award Process that would result in it holding total spectrum rights of use for more than 375 MHz across the 700 MHz Duplex, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and 3.6 GHz Bands at any time during either of the two Time Slices.” (emphasis added)

²⁹⁹ ComReg also observes that Three, in its response to Document 20/32 (or elsewhere), did not comment on the above provisions of the Draft IM generally or in the context of the Commitments.

last for 10 years on a forward-looking basis and that that period might well intersect with one or more spectrum auctions in Ireland. Indeed, the EC Merger decision contains several references to the first MBSA auction in 2012³⁰⁰;

- b) the consequences of incorrectly excluding some or all of the Divestment Spectrum from Three's existing spectrum for the purposes of the Proposed Spectrum Competition Caps would be potentially serious and widespread. In particular, if, for example, ComReg incorrectly excluded the one block of 900 MHz of the Divestment Spectrum from Three's existing holdings, and thus Three was permitted to bid for and in fact won 2 x 15 MHz of 700 MHz Duplex under the Proposed Sub-1 GHz Cap (and Vodafone also won 2 x 15 MHz of 700 MHz Duplex), there would be damage to the overall competitive dynamic from an extreme asymmetric distribution of spectrum rights that could not be addressed until a future award process of relevant spectrum rights (e.g. an award of new 800 MHz and 900 MHz rights in and around 2030). In light of, *inter alia*, ComReg's obligation to promote and safeguard competition (including its obligations under Regulation 9(11) of the Authorisation Regulations), this justifies erring on the side of caution by including the Divestment Spectrum in Three's existing holdings where there would be any significant uncertainty;
- c) the potential for the relevant Three entities, under the Commitments, to raise the impact of the Proposed Award on the continuation and scope of the Commitments if and when: (i) the Proposed Award is concluded; and (ii) it is clear that Virgin is seeking to avail of the Spectrum Option (see Commitments, paragraphs 53 and 54 in particular (discussed above)); and
- d) the various matters/uncertainties discussed immediately below.

6.73 Without prejudice to the above, ComReg further notes that:

- a) Three has not provided any views or supporting material as to the current likelihood of the Spectrum Option being properly exercised by Virgin Media (and, if so, when it would be so exercised), other than to allude to the mere possibility for same;
- b) Even if Virgin Media were inclined to exercise the Spectrum Option at this juncture, its exercise is subject to stringent pre-conditions, including, in particular, satisfactorily demonstrating to the Monitoring Trustee appointed under the Commitments that it "*has a concrete business plan*

³⁰⁰ See, e.g., paragraphs 1001, 514.

to use the Divestment Spectrum to become an MNO within a reasonable period of time following the first exercise of the Spectrum Option”;

c) In that connection, ComReg:

i. recalls that the EC clearly anticipated that the acquirer of the Divestment Spectrum will have built “a sizeable subscriber base”³⁰¹ such that it would be “a credible and attractive network sharing and spectrum pooling partner for any of the three MNOs that are active in Ireland”; and

ii. observes that:

A. Virgin Media has a mobile subscriber base of circa 115,000³⁰² (2.2% of subscribers excl. M2M and MBB) whereas Three had circa 420,000 subscribers (8.6% of subscribers excl. M2M and MBB) prior to the Merger;

B. Virgin Media’s mobile subscriber base increased following [REDACTED];

C. [REDACTED].

iii. further observes that the above factors are supported by [REDACTED]

³⁰¹ At paragraph 1003 of its Decision. In that regard, it is noteworthy that the EC described Three’s existing subscriber base at the time (of c.500,000) in a number of places as being ‘limited’.

³⁰² ComReg published Quarterly Data, Q3 2020.

6.3.4 ComReg's final position on whether existing 800 MHz and 900 MHz holdings should count towards the sub-1 GHz cap

6.74 In light of the above, and based on the material before it, ComReg's final position is that it is appropriate to take into account all existing spectrum holdings in the 800 MHz and 900 MHz bands at the time of Applications for the purposes of a spectrum competition cap for the award of 700 MHz Duplex rights.

6.4 Proposed Sub-1 GHz Cap – background, views of interested parties

6.4.1 Background – earlier documents

6.75 By way of background, ComReg particularly refers to:

- the Connectivity Reports;
- LS Telecom Report;
- Section 7.7 of Document 19/59R and the material referenced in same;
- DotEcon's report accompanying Document 19/59R (Document 19/59a);
- Section 6.5 of Document 19/124 and the material referenced in same; and
- DotEcon's report accompanying Document 19/124 (Document 19/124a).

6.4.2 Background - downstream competition – potential uses

6.76 ComReg sets out below some factual and other material from Document 19/59R by way of background to the following discussion on ComReg's competition analysis (updated as appropriate).

6.77 The WBB ecosystem in Ireland includes both MNOs and Fixed Wireless Access ("FWA operators"). These are two potential categories of users of the spectrum rights of use in the Proposed Award.³⁰⁵

³⁰⁵ Another potential user would be entities operating a small-cell network for providing **wholesale capacity** to other operators (i.e. Dense Air). This may provide operators with an alternative source of capacity and reduce the need for holding spectrum licences directly themselves. DotEcon notes that although such users are a positive development it does not fundamentally change current conditions of competition in mobile retail markets.

- 6.78 In Document 19/59a, DotEcon stated that the acquisition of the available spectrum by MNOs and the impact on competition in mobile telecommunications services (especially MBB) is likely to be the most relevant factor when determining the need for measures to safeguard competition.³⁰⁶ In effect, any distortion of competition arising from the Proposed Award is most likely to arise in mobile telecommunications services and that should be the main consideration in determining appropriate spectrum competition caps.
- 6.79 In addition, DotEcon did not see any compelling evidence to suggest that other services (e.g. FWA) are as yet relevant for the assessment of downstream competition in mobile telecommunications services,³⁰⁷ and ComReg agrees with this observation. Moreover, any future fixed/mobile convergence would more likely lead to national MNOs offering FWA services in particular locations, rather than specialist (and often geographically-limited) FWA providers extending their offering into full mobile services.
- 6.80 In Document 19/59R, ComReg stated that it agreed that the impact on competition in mobile telecommunications services is the primary concern when determining the appropriate spectrum competition caps for the Proposed Award. ComReg also observed that a spectrum competition cap focussed upon downstream mobile telecommunications services would be unlikely to create any particular concerns in relation to the provision of FWA services. This reflected, *inter alia*, the relative spectrum holdings of FWA operators and MNOs, meaning that the Proposed Spectrum Competition Caps would be clearly be less restrictive upon Imagine and other FWA operators (noting that Imagine has 60 MHz of 3.6 GHz spectrum, whereas MNOs have between 185 and 285 MHz).
- 6.81 In light of the above, and noting the nature of the responses received since Document 19/124, the following section focuses upon downstream competition in mobile telecommunications services and mobile broadband (MBB) in particular.

6.4.3 Proposed Sub-1 GHz Cap - views of interested parties

- 6.82 As noted previously, Eir does not object to the Proposed Sub-1 GHz Cap and Vodafone supports same. In that regard, in its response to Document 19/124,

³⁰⁶ DotEcon Award Design Report (Document 19/59a), p39.

³⁰⁷ DotEcon Award Design Report (Document 19/59a), p41. For example:

- FWA services are distinct to mobile services, as they are used as an alternative to a fixed service in areas where it might be uneconomic to provide fixed services. Therefore, FWA is less likely to compete with mobile broadband services in those areas and general mobile broadband services are not likely to be an effective substitute to FWA.
- Any limited substitution is in one direction such that mobile broadband may be substitutable in certain areas, however, FWA services are not a good alternative to mobile broadband services by virtue of only being available at a fixed location.

The provision of FWA services in a smaller geographic area is unlikely to impose any material competitive constraint on national mobile services.

Vodafone submits:

“Given Ireland’s low population density it is likely that any service for mobile units will use frequencies below 1GHz. To support competition these sub-1GHz frequencies should be distributed among operators. We agree with the value 70MHz (2x35) proposed for sub-1GHz spectrum, for the reasons given in Document 19/59.”

Three

6.83 In summary, Three submits that:

- i. many other European countries (e.g. Denmark, Germany, Switzerland and the UK) have completed or proposed 700 MHz awards in which a single bidder could acquire 2 x 40 MHz or more of sub-1 GHz spectrum³⁰⁸;
- ii. based on its analysis in the Annex to its response to Document 19/124 that ComReg’s proposal “builds-in” (relevantly for the purposes of the present discussion)³⁰⁹:
 - *the possibility for Three to win no sub-1GHz spectrum in this award;*
 - *the possibility for Eir to win less spectrum than both Vodafone and Three, thereby increasing the asymmetry in sub-1GHz spectrum holdings from that which exists today.*
- iii. ComReg has not identified any objectively justifiable basis for the inclusion of the caps (i.e. has not defined the extreme spectrum asymmetry it is trying to prevent nor identified why the Proposed Spectrum Competition Caps are necessary to prevent extreme spectrum asymmetry)³¹⁰;
- iv. ComReg has not carried out an assessment of the effects of its proposals on competition (including that it has not clearly identified the nature of the harm, competition or otherwise, it is proposing to address (e.g. extreme spectrum asymmetry), the significance of this harm (and how the significance is manifested in a market / on end users), or the likelihood of this harm occurring (is it likely or just theoretical)). Three also claims that ComReg has neither evidenced nor provided objective reasoning behind the implementation of the spectrum caps³¹¹;
- v. Therefore, it is very difficult to understand how the spectrum caps / other

³⁰⁸ Page 10 of Three’s response to Document 20/56.

³⁰⁹ Page 19 of Three’s response to Document 19/124. Again, Three’s various claims regarding pricing are addressed in Chapter 7.

³¹⁰ Page 8 of Three’s to Document 20/56.

³¹¹ Ibid.

restrictions are proportionate or lawful in compliance with Regulation 11 of the Authorisation Regulations, Regulation 17(1)(b) of the Framework Regulations or otherwise or address any perceived competition concern in the Irish market. Three strongly refutes that there is such a concern in respect of Three³¹².

6.4.4 Proposed Sub-1 GHz cap – ComReg’s assessment of Three’s points (i) – (v) regarding Proposed Sub-1 GHz cap

Proposed Sub-1 GHz Cap – point (i) - Three’s claim regarding the position of certain other countries in relation to a sub-1 GHz cap level of 80 MHz

6.84 In relation to **point (i)** raised by Three (regarding the position of other countries with respect to allowing bidders to acquire 2 × 40 MHz (i.e. a sub-1 GHz cap of 80 MHz) or more of sub-1 GHz spectrum), ComReg observes that there are material differences between the Proposed Award and the Danish, Swiss and UK awards of 700 MHz Duplex spectrum rights; including that each of these other awards included the award of additional 700 MHz supplementary downlink spectrum (SDL) rights, meaning that there was more available sub-1 GHz spectrum available in those awards³¹³. In addition, and as noted above, the Spanish administration, in July 2020, amended its 700 MHz band auction proposals to include a cap of 2 × 15 MHz available to each operator in the 700 MHz band and a combined limit of 2 × 35 MHz (i.e. 70 MHz) per operator in the sub-1 GHz bands (i.e. 700 MHz, 800 MHz and 900 MHz). Moreover, the relevant issue is whether ComReg has applied the relevant and material statutory objectives and other considerations that are appropriate and proportionate for the Proposed Award in an Irish context, and not whether it has done something identical to other countries taking decisions appropriate for their own national circumstances and context.

³¹² Ibid.

³¹³ See, for example:

- <http://www.dotecon.com/news/danish-700-mhz-900-mhz-and-2-3-ghz-auction-ended/> ;
- <https://www.commsupdate.com/articles/2019/02/08/switzerland-completes-5g-auction/>
- <https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2020/plans-for-spectrum-auction> ; and
- Three UK’s submission to Ofcom of 12 March 2019 in which relevantly states:

“The proposed cap would avoid extreme asymmetry in sub-1 GHz spectrum, by constraining Vodafone and O2 to acquire a maximum of 2x10 MHz of 700 MHz FDD and 5 MHz of 700 MHz SDL spectrum. This would preclude Vodafone and O2 from bidding strategically, and leave a minimum of 2x10MHz FDD and 1x10MHz of 700MHz SDL for Three and BT/EE to expand their low frequency holdings.” (emphasis added)

Proposed Sub-1 GHz Cap – point (ii) - Three’s claim that ComReg’s proposal “builds in” the possibility for Three to win no 700 MHz Duplex spectrum and for Eir to win less spectrum than Vodafone and Three

- 6.85 In relation to **point (ii)** raised by Three (where it claims that ComReg’s proposal “builds in” the possibility for Three to win no sub-1 GHz spectrum in this award, and the possibility for Eir to win less spectrum than both Vodafone and Three), ComReg outlines its response as follows.
- 6.86 First, ComReg refers to, and agrees with, the detailed consideration by DotEcon of the matters raised by Three/NERA as set out in Document 20/122a, and further considered in Chapter 7 and Annex 7 of this document and does not propose to reiterate these matters here.
- 6.87 Second, in relation to the point regarding the possibility of Three not winning any sub-1 GHz spectrum in this award more generally, ComReg recalls Three’s similar claim in its response to Document 19/59R, which ComReg addressed at paragraphs 6.164 - 6.197 of Document 19/124³¹⁴, and considers that the observations set out therein (and as relevantly updated in this document) already adequately address Three’s current claim. For example, ComReg recalls its observation at paragraph 6.196 of Document 19/124 that:

- *“If there is no interest for the 700 MHz lots other than from the MNOs, then all three MNOs would be faced with the prospect of ending the auction with five, six or seven sub-1 GHz lots; and*
- *If there is interest from at least one additional bidder, then Three is arguably in a more favourable position than Vodafone and Eir due to its greater existing holdings; in that case it would be guaranteed five sub-1 GHz lots at the end of the auction, while the other two would only be*

³¹⁴ Specifically:

*“[6.196] In relation to **point (xiv)(a)** raised by Three (i.e. not winning any 700 MHz spectrum), ComReg observes that its arguments are premised on the notion of excluding other sub-1 GHz spectrum holdings which, for the reasons outlined above, is not persuasive. Therefore, when viewed in the context of total sub-1 GHz holdings, ComReg considers the following points from DotEcon’s assessment of Three’s claim particularly convincing:*

- *If there is no interest for the 700 MHz lots other than from the MNOs, then all three MNOs would be faced with the prospect of ending the auction with five, six or seven sub-1 GHz lots; and*
- *If there is interest from at least one additional bidder, then Three is arguably in a more favourable position than Vodafone and Eir due to its greater existing holdings; in that case it would be guaranteed five sub-1 GHz lots at the end of the auction, while the other two would only be guaranteed four.*

[6.197] In any event, ComReg considers such a situation as unlikely to occur as it would require Eir and Vodafone to have a marginal valuation for a third lot that would be greater than Three’s valuation of just one lot (noting that such a situation would not result in Three becoming a marginal player given its existing spectrum holdings).”

guaranteed four.”

6.88 Third, in relation to the possibility that Eir may win less 700 MHz Duplex spectrum than Vodafone and Three under the Proposed Sub-1 GHz Cap, ComReg acknowledges that this could be an outcome (e.g. Three winning 2 × 10 MHz, Vodafone winning 2 × 15 MHz and Eir winning 2 × 5 MHz). However, and on the basis of the material before it, ComReg has no reason to believe that such an outcome would likely distort competition (in contrast to a situation where Vodafone and Three each won 2 × 15 MHz and Eir none). Indeed, ComReg has expressly catered for the possibility of an existing MNO winning less than 2 × 10 MHz of 700 MHz Duplex (i.e. 2 × 5 MHz) in its coverage proposals. Finally, ComReg notes Eir’s submissions that:

- *“[it] has considered the arguments and has no objections to the proposed 70MHz sub 1GHz cap”³¹⁵; and*
- *“Irrespective of the merits of Three’s case there is no justification whatsoever for prohibiting two bidders from winning all of the available 700 MHz spectrum (subject to the already proposed sub-1 GHz cap”³¹⁶*

Proposed Sub-1 GHz Cap – point (iii) – objective justification for the Proposed Spectrum Competition Caps

6.89 In relation to **point (iii)**, (Three’s general claim that ComReg has not conducted a competition assessment), ComReg recalls that it addressed this general point at paragraph 6.172 of Document 19/124³¹⁷.

³¹⁵ Page 11 of Eir’s response to Document 19/124.

³¹⁶ Page 13 of Eir’s response to Document 20/56.

³¹⁷ Paragraph 6.172 of Document 19/124 states:

“In relation to Eir’s claim that ComReg has not conducted a proper assessment of competition in the mobile market, ComReg outlines its response below:

- *first, the Proposed Competition Caps are to prevent extreme asymmetric outcomes (i.e. excessive accumulations) that would likely distort downstream competition;*
- *in particular, they are not designed to micromanage the spectrum holdings of operators or establish a particular market structure, and as such the proposed range for the overall cap is designed to allow reasonable flexibility for the market to establish the distribution of spectrum;*
- *further, ComReg refers to its competition (and by implication, consumer) considerations in Document 19/59R and as updated and refined in this document; and*
- *ComReg notes that its Proposed Competition Caps would only apply for the duration of the proposed auction and would not apply to the market following the assignment of the radio spectrum. Operators would, subject to the licences and their conditions, be free to trade, lease and combine rights of use of spectrum following the auction to the extent that such rights of use of spectrum are designated as being tradable or leasable and in line with competition law and the legal framework for electronic communications in Ireland.*

Proposed Sub-1 GHz Cap – points (iii) – (v) - Three's various queries and claims regarding ComReg's competition analysis

- 6.90 In relation to **points (iii) – (v)** raised by Three (i.e. the various queries regarding the extreme spectrum asymmetry that ComReg is trying to prevent, the nature of harm it is proposing to address, and the significance and likelihood of same, evidentiary basis etc), ComReg observes that these matters are readily apparent from the discussion at paragraphs 6.185 – 6.195 of Document 19/124 and the material informing same.
- 6.91 Nevertheless, and for the sake of completeness, ComReg outlines and updates (in terms of newly available information etc) its competition analysis informing the Proposed Sub-1 GHz Cap below, including by reference to the DotEcon Report (Document 20/122a) in the following section.

6.5 ComReg's updated competition analysis informing the Sub-1 GHz Cap

6.5.1 Context of ComReg's competition analysis informing the Sub-1 GHz Cap - downstream competition in mobile telecommunications services

- 6.92 As noted in Section 6.5.2 above, ComReg considers that the acquisition of the spectrum being made available in the award by MNOs, and the potential impacts on competition in downstream mobile telecommunications services (especially MBB), is likely to be the most relevant factor when determining the need for measures to safeguard competition and that should be the main consideration in determining appropriate spectrum competition caps.
- 6.93 ComReg would provide the following observations by way of additional context to the following competition analysis.
- 6.94 First, on a general level, the focus is the **retail** dimension to downstream competition for mobile telecommunications services.³¹⁸ That is, where MNOs (via their own mobile network) and MVNOs³¹⁹ (via their host MNO's mobile network) sell voice and data services to end consumers.

³¹⁸ Whilst the various wholesale dimensions to downstream competition mobile telecommunications services are recognised (e.g., the supply by MNOs of access to their network, and the ability to make calls, to MVNOs by which to enable MVNOs to provide retail mobile telecommunications services: see, in particular, the section 6.1 of the EC's Merger Decision), it does not appear necessary to focus upon same in the present case because, *inter alia*, Eir does not host any MVNOs and is therefore not active in this dimension.

³¹⁹ MVNOs are service providers that purchase access and call origination at the wholesale level from MNOs in order to offer their own retail mobile services to subscribers at retail level.

6.95 In that regard, ComReg notes from the EC's Merger Decision that³²⁰:

- a) the notifying parties identified a market for mobile telecommunications services to end customers as being one of the relevant product markets affected by the Merger;
- b) this product market identified by the notifying parties also corresponded to the product markets defined in previous EC decisions;³²¹
- c) In previous decisions, the EC did not further divide this market by type of customer (business or private customers), by type of service (post-paid or pre-paid), or by type of network technology (2G/GSM or 3G/UMTS). The EC also noted that it had not previously found there to be a separate market for data-only services;
- d) according to the Notifying Party, the EC should also define one overall retail mobile telecommunications services market in this case;
- e) the EC agreed and defined the relevant product market as the retail mobile telecommunications services market; and
- f) The geographic scope of the retail mobile telecommunications services market was national in scope (*in casu* Ireland).

6.96 In the present case, ComReg considers it appropriate to frame its competition analysis by reference to the broad retail mobile telecommunications services sector identified by the EC in its Merger Decision because, among other things:

- a) the EC has continued to adopt this particular retail market definition in subsequent mobile mergers³²²;
- b) the relevant factors identified by the EC in the Merger Decision for not further dividing the overall retail market remain valid today. For example:³²³

³²⁰ Pages 36-37 of the EC Merger Decision.

³²¹ See, for example, Commission Decision of 12 December 2012 in Case No COMP/M.6497 – *Hutchison 3G Austria / Orange Austria*, paragraph 58; Commission Decision of 1 March 2010 in Case No COMP/M.5650 – *T-Mobile / Orange UK*, paragraphs 21, 24; Commission Decision of 27 November 2007 in Case No COMP/M.4947 – *Vodafone / Tele2 Italy / Tele2 Spain*, paragraph 14.

³²² See, for example, Case No. M.7018 – *Telefónica, Deutschland/ E-Plus*; Case No. M.7612 - *Hutchison 3G UK/Telefonica UK*; Case No. M.7637 - *Liberty Global / BASE Belgium*; Case No. M.7758 - *Hutchison 3g Italy / WIND / JV*; Case No. M.8792 - *T-Mobile NL/Tele2 NL*; Case No. M.8864 - *Vodafone / Certain Liberty Global Assets*; Case No. M.9041 - *Hutchison / WIND TRE*.

³²³ See paragraphs 137 – 161 of the EC Merger Decision.

- i. voice (voice and data), MBB (data only)³²⁴ and machine-to-machine³²⁵ (“M2M”)³²⁶ services continue to be offered through the same infrastructure and technology as other mobile telecommunications services, and MNOs could easily switch from offering MBB (data only) to offering other mobile telecommunications services, and vice versa;
 - ii. an MNO offering only post-paid services could easily offer pre-paid services and *vice versa*, and all MNOs in Ireland continue to offer both types of services; and
 - iii. the services provided to business customers are essentially the same as those provided to private customers, and MNOs serving one group of customers could easily switch to offering services to the other group;
- c) as discussed in Section 6.4.3 above, MNOs are likely to use 700 MHz Duplex rights to improve their core existing MBB services. As these services are clearly important across the various segments (e.g. pre-paid and post-paid customers, both private and business customers etc) and

³²⁴ Whereas a consumer with a mobile phone will purchase both voice and data services, consumers with tablets and laptops typically purchase only data services, in order to access the internet. These data services are received on a SIM-card, which, in the case of laptops, may be inserted in a USB-modem, also known as a dongle. In the case of tablets, the SIM-card is directly installed in the tablet. Irish MNOs often refer to these data-only services as mobile broadband and when used in this sense mobile broadband is a subcategory of data services, namely those data services purchased by users of laptops and tablets. See paragraph 144 of EC Merger Decision.

To avoid confusion with MBB services as the term is used generally throughout this document, this data-only segment is referred to as “**MBB (data-only)**”.

³²⁵ Machine to Machine (M2M) refers to technologies that involve data communication between devices or systems in which, at least in principle, human intervention does not occur. These technologies may encompass either wireless or wired communications, or both. M2M communication is already widely deployed in Ireland and its usage is set to grow rapidly, driven in no small part by the expansion of next generation telecommunications technology and a decline in the cost of the embedded wireless modules and sensors that enable M2M services. This continued improvement in the infrastructural environment around M2M has led to a rapid growth of applications and services that meet users’ business and lifestyle needs. M2M technologies transfer data on the condition of physical assets and devices to a central location (which is distantly located the devices) for effective monitoring and control. M2M has a multitude of uses, with current deployments in the healthcare, energy, home automation and transportation sectors. Specific examples of M2M applications include smart metering, vehicle and consignment tracking and alarm monitoring systems of various kinds, ATM machines signalling the need for cash replacement, smart grid monitoring of real time electricity demand, smart home applications such as switching on and off lights, heating and other appliances.

Different networking technologies can be used to connect M2M devices, depending on the amount of mobility needed, quality required, data rate, the degree of dispersion of devices over an area, and so on.

ComReg Document 20/15 at pages 66-67.

³²⁶ In more recent merger decisions the EC has begun to exclude M2M services from the relevant retail market. Therefore, for completeness, ComReg provides data below both including and excluding M2M data.

as a proportion of total retail mobile revenues (as discussed below), the results of the following competition analysis are not, in any event, particularly sensitive to the exact market definition used, such as whether a particular segment, or part of a segment (e.g. M2M) is included or excluded.

- d) Reference is also made to Section 6.6.2 below, which further updates and considers the structure of competition in retail mobile communications services in Ireland, including developments since the EC Merger Decision, and is further supportive of, and consistent with, the basic approach outlined here.

6.97 Accordingly, the **competition analysis has as its primary focus downstream competition for retail mobile telecommunications services (as defined by the EC in the Merger Decision)**.³²⁷ More particularly, for the reasons set out in Section 6.4 above (i.e. whether 800 MHz and 900 MHz should be counted), the focus is upon retail mobile telecommunications services, and MBB services in particular, provided by LTE/LTE-Advanced rather than 5G at the moment. This also reflects that 5G deployments are currently and would likely remain focussed upon the 3.6 GHz Band in Ireland for some time³²⁸ (which also appears to be case in Europe and more broadly).

6.98 Second, it is important to appreciate that the focus in terms of the source of a potential distortion of competition is a narrow and specific one. The main issue is whether the auction could lead to outcomes whereby one or more bidders end up with spectrum holdings on such a scale in the relevant bands that, bearing in mind their current relevant spectrum holdings, have the potential to adversely affect competition on in downstream retail mobile services in Ireland. The particular focus is therefore on an excessive concentration of these essential spectrum inputs following the auction, and how that could affect downstream competition.

6.99 Third, the competition analysis is also forward-looking, up until 2030. This reflects the fact that existing 800 MHz, 900 MHz and 1800 MHz spectrum rights will expire then and, consequently, any potential extreme asymmetry in sub-1 GHz holdings contributed by existing holdings in those bands would fall away (leaving only sub-1 GHz asymmetry in the 700 MHz Duplex at that point). Further, in any future competitive award for new rights of use in these bands, Eir would be in a

³²⁷ ComReg also observes that the geographical dimension for retail mobile telecommunications services continues to be national in scope for the same reasons identified by the EC in the Merger Decision. In particular, that licences which enable the provision of mobile services are national in scope (including those proposed to be granted on foot of the award) and MNOs sell, market and price their services on a national level (paragraph 164 of EC's Merger Decision).

³²⁸ See Tables 6 and 7 below in this chapter which highlights the correlation between 5G NR sites and 3.6 GHz Band sites for the MNOs.

position to obtain new 800 MHz and 900 MHz spectrum rights by which to seek to reduce any advantage held by Vodafone and Three in 700 MHz Duplex holdings. In that regard, ComReg reiterates that it would expect 700 MHz Duplex holdings won in this award to be taken into account in any competition cap/s for the award of spectrum rights in the 800 MHz and 900 MHz bands (e.g. in a sub-1 GHz cap similar to that currently proposed).

6.5.2 Background information relevant to the competition analysis

6.100 In this section, ComReg sets out some background information on downstream competition in mobile telecommunications services:

- Structure of Irish mobile telecommunications services sector particularly as respects the retail level;
- Information relating to the Merger; and
- The recent increased importance of Eir as a competitive force in the Irish mobile telecommunications services sector.

Background – structure of Irish mobile telecommunications services sector³²⁹

Size, service providers, shares by subscribers and revenues, and concentration

6.101 There are approximately 6.9 million subscribers of retail mobile telecommunication services in Ireland, and 5.2 million if the MBB (data-only) and machine-to-machine (“M2M”) segments are excluded.

6.102 The main categories of retail mobile telecommunications services are: voice (including voice and data over a smartphone), MBB (data-only), M2M and messaging.

6.103 In terms of the relative contribution of these services to total retail mobile revenues as of Q3 2020³³⁰:

- Total mobile retail revenues in Ireland was €398 002 (000’s) comprised of:
 - Mobile voice (including voice and data): €299 766 (000’s) (approximately 75% of total retail mobile revenues);

³²⁹ For the avoidance of doubt, where the term “market” or “retail market” is used in this section, it refers to retail mobile telecommunications services.

³³⁰ ComReg Quarterly Key Data Portal.

- MBB (data-only): €83 063 (000's) (approximately 21% of total mobile retail revenues); and
- Messaging: €15 173 (000's) (approximately 4% of total mobile revenues).

6.104 There are three MNOs (Vodafone, Eir and Three) active in providing these services on a nationwide basis, accounting for over circa 88% of all subscribers (excl. MBB (data-only) and M2M)). The remaining circa 12% are carried by four MVNOs: (LycaMobile, Tesco Mobile, Postfone and Virgin Mobile)³³¹.

6.105 The market shares of each operator are set out below in Table 4 below.

Table 4. Retail market shares by subscribers (incl. and excl. M2M and MBB (data-only)) and revenue (incl. M2M and MBB (data-only))³³²

Operator	Q3 2020 (excl. M2M and MBB (data- only))	Q3 2020 (incl. M2M and MBB (data-only))	Q3 2020 (revenue)
Vodafone	35.5%	38.1%	43.0%
Eir	21.9%	17.0%	17.2%
Three	30.3%	35.7%	32.3%
Tesco Mobile	8.3%	6.2%	4.7%
Virgin Mobile	2.2%	[>]	[>]
Lycamobile	[>]	[>]	[>]
Postfone	[>]	[>]	[>]

6.106 The overall market concentration level (by reference to the number and size of firms) can also provide useful information about the competitive situation. Broadly speaking, a sector is more concentrated where a small number of firms account for a large combined share of customers/revenues.

6.107 The most commonly used measure of concentration is the Herfindahl-Hirschman Index ("HHI"), which is defined as the sum of the squares of the shares of

³³¹ As noted previously, in its more recent merger decisions, the EC has begun to exclude M2M services from the relevant retail market. ComReg also notes that the inclusion of both M2M subscriptions (which accounted for 20.9% of all mobile subscriptions in Q3 2020) and MBB (data only) subscriptions may understate the role of MVNOs in downstream retail competition for retail mobile telecommunications services. ComReg has, therefore, presented market shares by subscribers both excluding and including MBB and M2M and, when discussing these smaller operators, highlights subscriber shares excluding M2M and MBB (data-only). ComReg also provides market shares based on revenue which is a useful complement to shares based on subscribers and can give a more accurate picture of the relevant strength of players on the market.

³³² ComReg Quarterly Key Data, Q3 2020. Available on the ComReg Portal.

revenues/customers etc of all firms participating in the sector³³³. ComReg has previously considered that a market with a HHI greater than 2,500 is highly concentrated³³⁴ and also notes that the Competition and Consumer Protection Commission considers that a market with a HHI greater than 2,000 may be regarded as highly concentrated.³³⁵

6.108 Based on the retail subscriber share estimates in Table 4 above, the HHI for Irish retail mobile telecommunications services is over 3,000 when including M2M and MBB (data only), and over 2,700 when excluding M2M and MBB (data only), which indicates a very high level of concentration. This is consistent with the EC's findings in the Merger discussed further below³³⁶.

MNO spectrum holdings and sites

MNO spectrum holdings

- 6.109 MNOs use rights of use in licensed spectrum bands to deliver mobile services. MNOs typically use low frequency spectrum (i.e. sub-1 GHz spectrum such as 800 MHz and 900 MHz) to provide wide area and good in-building coverage due to the propagation characteristics of these frequency bands. Higher frequency bands (e.g. 1800 MHz, 2.1 GHz) are typically used for providing capacity in higher density areas, which reflects the relatively poorer propagation characteristics of, but greater amount of available spectrum within, these bands.
- 6.110 Existing spectrum holdings, and how they might change as a result of the Proposed Award, are at the core of this competition analysis and, in particular, whether any potential accumulation of excessive rights of use in the Proposed Award by one or more MNOs could create potential competition concerns for downstream retail mobile telecommunications services.

³³³ The HHI takes into account the relative size distribution of the firms in a market. It approaches zero when a market is occupied by a large number of firms of relatively equal size and reaches its maximum of 10,000 points when a market is controlled by a single firm. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases. Market concentrations based on HHIs are classified as follows: (a) unconcentrated Markets: HHI below 1,500; (b) Moderately Concentrated Markets: HHI between 1,500 and 2,500; and (c) Highly Concentrated Markets: HHI above 2,500.

³³⁴ Paragraph 3.32 of Market Review Wholesale High Quality Access at a Fixed Location Response to 2018 Further Consultation and Decision – Document 20/06.

³³⁵ Paragraph 3.10 of CCPC's Guidelines for Merger Analysis, 31 October 2014.

³³⁶ The EC calculated the post-merger HHI by subscribers (incl. MBB (data-only) and M2M)) and by revenues to be 3,486 and 3,704, respectively. ComReg observes that the declines in HHI since the Merger are largely the result of Tesco acquiring sole control of Tesco Mobile in 2017 (Case M/17/037 – Tesco Ireland / Tesco Mobile) and, to a far lesser degree, the result of a change in the distribution subscribers between MNOs and MVNOs (noting marginal falls in the shares of Vodafone and Three).

6.111 MNOs have large amounts of existing holdings and which are relevant to this competition analysis. Table 5 below sets out the current relevant spectrum holdings of all three MNOs.

Table 5. Current MNO spectrum holdings (unpaired)

Band	Expiry date of rights in band	Three	Vodafone	Meteor (Eir)
800 MHz	2030	20 MHz	20 MHz	20 MHz
900 MHz	2030	30 MHz	20 MHz	20 MHz
Total sub-1 GHz		50 MHz	40 MHz	40 MHz
1800 MHz	2030	70 MHz	50 MHz	30 MHz
3.6 GHz ³³⁷	2032	100 MHz	105 MHz	85 MHz
2.1 GHz FDD	2022 (Vodafone and Three) 2027 (Eir)	60 MHz	30 MHz	30 MHz
Total supra-1 GHz		230 MHz	185 MHz	145 MHz
Total		280 MHz	225 MHz	185 MHz

6.112 As can be seen above, Three has the largest sub-1 GHz and overall spectrum holdings. While Eir has the same quantum of sub-1 GHz holdings as Vodafone, it has smaller overall holdings than the other two MNOs and considerably less 1800 MHz spectrum than Three.

MNO site numbers

6.113 A mobile network is composed of a number of mobile sites linked to a core network by backhaul connections. Each mobile site covers a certain limited area and has a maximum capacity. The capacity of a mobile site depends on the number of antennas on the site and the range of frequencies that the MNO has the right to use. MNOs construct and manage (or lease) passive infrastructure, i.e., towers/sites for mobile and other wireless networks, installing and using Radio Access Network (“RAN”) active equipment to transmit data.

6.114 Table 6 and 7 below set out the current number of sites for all three MNOs in

³³⁷ Note that these figures are the maximum assigned to the operator in any given licensed 3.6 GHz Band Region. In terms of non-MNO 3.6 GHz band holdings:

- Imagine holds 60 MHz under its 3.6 GHz Band Liberalised Use Licence in the non-city Regions; and
- DenseAir holds 25 MHz in the non-city Regions and 60 MHz in the 5 city Regions.

each spectrum band and in use for each technology.³³⁸

Table 6. Number of sites using each technology for each MNO³³⁹

Technology	No. Sites by MNO		
	Eir	Three	Vodafone
GSM	1713	1694	2150
UMTS	2021	2381	2319
LTE	1283	1979	1843
NR (3.6 GHz)	205	155	48
Overall Total	2055	2397	2340

Table 7. Number of sites in each band, for each MNO³⁴⁰

Band	No. Sites by MNO		
	Eir	Three	Vodafone
800 MHz	1060	1865	1555
900 MHz	1932	2164	2032
1800 MHz	643	1534	1019
2.1 GHz	1414	1743	1441
3.6 GHz	205	155	52
Overall Total	2055	2397	2340

6.115 From the above, ComReg observes that, compared to Three and Vodafone, Eir

³³⁸ Source: ComReg's Siteviewer database, as of 3 December 2020.

³³⁹ Source: Siteviewer data as of December 2020. The data here represents the number of sites for:

- **Three:** as of 9 September 2020 for the 3.6 GHz band and 11 August 2020 for all other bands;
- **Eir:** 7 August 2020 for Eir for 3.6 GHz band and 27 May 2020 for all other bands, and
- **Vodafone:** 27 November 2020 for 3.6 GHz band and 9 November for all other bands.

The data is provided annually by the MNOs as part of the renewal of their licences. As the 3.6 GHz band was licensed separately to the 800 MHz, 900 MHz, 1800 MHz bands, this accounts for the different data dates above.

³⁴⁰ Ibid.,

has³⁴¹:

- a) significantly fewer overall sites;
- b) considerably fewer LTE sites; and
- c) considerably fewer 800 MHz and 1800 MHz sites.

Background - Three/O2 Merger

6.116 In a number of its submissions, Three makes reference to the EC's May 2014 Decision³⁴² to clear the acquisition of Telefónica Ireland Limited ("O2") by Hutchison 3G UK Holdings Limited ("Merger"). Those references appear to be primarily intended to call into question the need for the Proposed Sub-1 GHz Cap. For example, in its response to Document 20/56, Three notes that "[a]s ComReg is aware, this merger (including spectrum holdings) was examined by the EC (M.6992) who found that it was not harmful for competition". As discussed further below, this characterisation is not correct. The EC did identify serious competition concerns raised by the Merger and insisted on a series of remedies as pre-conditions for its eventual clearance. ComReg notes that the Merger significantly altered the market structure in Ireland, and it is therefore appropriate to provide further context around the EC Decision in that regard. As will be seen, this information is relevant to ComReg's consideration around the appropriate sub-1 GHz cap.

6.117 ComReg notes that, prior to the Merger, there were four MNOs in Ireland, Vodafone, Telefonica O2, Meteor (Eir) and Three (being the smallest). Following the Merger, the merged entity (now called Three Ireland (Hutchison) Limited, trading as Three) became the second biggest operator behind the largest, Vodafone, with Eir in third place.

6.118 In its decision, the EC made the following relevant observations:

- a) *"The Irish retail mobile telecommunications services market is an oligopolistic market characterised by a high degree of concentration and high barriers to entry."*³⁴³
- b) The proposed Merger would reduce the number of MNOs in Ireland from four to three. It would lead to a market structure with two large MNOs with a similar strong position, Vodafone and the merged entity. Eircom would

³⁴¹ Noting that Three and Vodafone provided their respective data more recently than Eir and thus the site numbers for Eir will have increased. [REDACTED]

[REDACTED] <].

³⁴² Case No COMP/M.6992 - Hutchison 3G UK / Telefonica Ireland.

³⁴³ At paragraph 177.

be “a distant third player” (with 19% of subscribers).³⁴⁴

- c) “The merger would significantly increase the already high level of concentration in the market with a post-merger HHI of 3,486, representing an increase of more than 620 points.”³⁴⁵
- d) “In a concentrated market, such as the Irish retail mobile telecommunications services market, all MNOs contribute to competition to a certain degree and are therefore arguably important.”³⁴⁶
- e) The EC concluded that Three was an important competitive force, constraining all other MNOs on the retail mobile telecommunications services market.³⁴⁷ The Merger would therefore remove an important competitive force from the retail mobile telecommunications services market.
- f) The EC also observed that MVNOs then currently active on the Irish market had a fairly weak market position, that it is difficult for MVNOs to obtain a sufficiently high market share and affect the behaviour of other MNOs, and further MVNO entry, even if it were to occur, would not in itself be sufficient to negate the adverse effects of eliminating one of the four MNOs from the market³⁴⁸;
- g) Accordingly, the EC concluded that the proposed Merger “**would result in a significant impediment to effective competition on the retail mobile telecommunications market in Ireland**”.³⁴⁹

The Commitments (remedies) offered by Three

6.119 When a merger raises competition concerns because it could significantly impede effective competition, the parties may seek to modify the merger in order to resolve those competition concerns and thereby obtain clearance for the merger.

6.120 However, as noted by the EC, the commitments have to eliminate the competition concerns entirely and have to be comprehensive and effective in all respects. Furthermore, the commitments must be capable of being implemented effectively within a short period of time as the conditions of competition on the market will

³⁴⁴ At paragraphs 178 and 221.

³⁴⁵ At paragraphs 222 and 232.

³⁴⁶ At paragraph 283.

³⁴⁷ At paragraph 321.

³⁴⁸ At paragraphs 273-275.

³⁴⁹ At paragraphs 178 and 186.

not be maintained until the commitments have been fulfilled.³⁵⁰

6.121 The EC also noted that the overall result of any commitments accepted in this case must be that the likely negative effects of the elimination of Three as an important competitive force is removed. Their overall effect must therefore be to allow **existing or new competitors to replace the constraint that Three has been exerting on the market.**³⁵¹

6.122 The **Final Commitments** offered by Three and accepted by the EC can broadly be described as follows:

- a) an Upfront MVNO Commitment;
- b) a Second MVNO Commitment;
- c) a commitment to give the Upfront MVNO the option to acquire the customer base of O2's youth sub-brand "48"; and
- d) a commitment to divest spectrum to either the Upfront MVNO or the Second MVNO within 10 years of 1 January 2016, subject to the MVNO demonstrating to the Monitoring Trustee that it has a concrete business plan to use the Divestment Spectrum to become an MNO within a reasonable period of time following the exercise of the spectrum option.

6.123 In concluding that the Final Commitments removed the identified competition concerns, the EC made, among other things, the following observations:

- a) *"...the final MVNO entry commitment is suitable and sufficient to enable the MVNOs to replace the important competitive constraint that Three currently exerts on the Irish retail mobile telecommunications services market. Together, the MVNOs will commit to purchasing a minimum of [...] % of the merged entity's network capacity. Calculations from the Notifying Party demonstrate that **this will allow those MVNOs together to achieve an approximately 8% subscriber share on the Irish retail mobile telecommunications services market.** This comes very close to the 10% subscriber share that Three currently has on the market.....Given the incentives for the MVNO entrants to increase their subscriber base with attractive offers, the Commission considers that the two MVNOs will **be able to sufficiently replicate the competition that Three has brought to the Irish market.**" (emphasis added)³⁵²*
- b) *"Hence, the two MVNO entrants will have the possibility of acquiring in total up to 30% of the merged entity's network capacity. Based on the*

³⁵⁰ See, for example, paragraph 893 of the Decision.

³⁵¹ See, for example, paragraph 916 of the Decision.

³⁵² At paragraph 985.

*Notifying Party's calculations, this will be sufficient to serve approximately **15% of subscribers in Ireland, which is 1.5 times larger than the current subscriber share of Three.***³⁵³ (emphasis added)

- c) *“Furthermore, the Upfront MVNO will have the **option to acquire the customer base of the “48” brand** (a sub-brand of O2), which currently comprises approximately [50,000–75,000]* customers representing a market share of over [0–5]*%. Such a customer transfer **will enable an Upfront MVNO to enhance viability of its operations and to achieve scale quicker.***³⁵⁴ (emphasis added)
- d) *“The Commission concludes that the structure of the Final Commitments is such, that there is sufficient **certainty** that the Final Commitments can be **implemented effectively.***³⁵⁵ (emphasis added)
- e) *“The MNO commitment bolsters the effectiveness of the final MVNO entry commitment.”³⁵⁶ “By the time that the MVNO decides to use the spectrum option, which may be at any point within ten years for both the Upfront MVNO and the Second MVNO, that MVNO will have had all the means **to build a sizeable subscriber base and commercial operations in Ireland.***³⁵⁷ (emphasis added)

Developments since the Merger decision

6.124 In terms of relevant developments since the Merger Decision, ComReg notes the following:

- a) the Upfront MVNO – Dixons Carphone (ID Mobile) – launched its services in August 2015 but exited in April 2018;
- b) the Second MVNO – Virgin Media – launched in October 2015. As at 30 September 2020, almost five years after launching, it has 115,210³⁵⁸ subscribers (representing 2.2% of subscribers excl. M2M and MBB (data only)) compared to the circa 475 000 customers of Three at the time of the Merger (then representing approximately 8.8% of subscribers excl. M2M and MBB (data only));
- c) the Merger commitment option to acquire the customer base of the “48” brand was never exercised by the Upfront MVNO. The merged entity

³⁵³ At paragraph 987.

³⁵⁴ At paragraph 989.

³⁵⁵ At paragraph 991.

³⁵⁶ At paragraphs 1002 and 2006.

³⁵⁷ At paragraph 1003.

³⁵⁸ Liberty Global Q3 2020 Report: <https://www.libertyglobal.com/wp-content/uploads/2020/11/LG-Q3-2020-Press-Release.pdf>

continues to operate this brand;

- d) as discussed in Section 6.3 of this chapter, there are no sufficient grounds to suggest that Virgin Media will exercise the Spectrum Option;
- e) as discussed above, the sector continues to be highly concentrated, with Eir remaining a distant third behind the nearest MNO (Three) and its shares of sales/subscribers have also remained largely unchanged since the Merger. Its retail market shares declined slightly in the period following the Merger but prior to the launch of GoMo from 18.1% to 17.0% as a share of revenues and from 20.2% to 19.6% share of subscribers (excl. MBB (data-only) and M2M)³⁵⁹. As will be discussed below, Eir's market share increased following the launching of GoMo in October 2019; and
- f) Tesco has grown its subscriber shares (excl. MBB (data-only) and M2M)) by approximately 3.4% since the time of the Merger from 4.9%³⁶⁰ to 8.3%, with a subscriber base of circa 431,000 as of Q3 2020. However, most of this growth occurred prior to Tesco Ireland Holdings Limited acquiring sole control of Tesco Mobile from Three in July 2017³⁶¹, as in Q2 2017 Tesco had a 7.7% subscriber share (excl. MBB (data-only) and M2M)). Since then, it has experienced more moderate growth with its share rising by just 0.6% over the past three years. It is also now clearly experiencing more intense competition from MNOs in the form of GoMo and "48", which will impact on its ability to acquire new and/or retain existing subscribers.

6.125 In light of the above, it is at least uncertain whether the Final Commitments package was successful in terms of eliminating the competition concerns identified by the EC by replacing the important competitive constraint that Three had exerted on the market pre-Merger. It is appropriate for ComReg to bear this in mind when considering appropriate spectrum caps for the Proposed Award.

Background – recent increased importance of Eir as a competitive force in downstream retail mobile telecommunications services

6.126 At the time of the Merger (2014), the EC considered that Three was a "maverick firm" and posed a greater competitive force than Eircom. The EC further noted that Eircom:

- a) seems to be keen on improving its network quality and brand

³⁵⁹ From 18.4% to 15.6% share of subscribers (incl. MBB (data-only) and M2M).

³⁶⁰ As of Q2 2014.

³⁶¹ DETERMINATION OF MERGER NOTIFICATION M/17/037 – TESCO IRELAND/ TESCO MOBILE

perception³⁶²; and

- b) was likely to become more effective in the coming years as Eircom gained nationwide network coverage as a result of the Mosaic agreement.

6.127 Since the Merger, Eir has rebranded, is under new ownership³⁶³, and has significantly improved its 4G population coverage. It also acquired 3.6 GHz Band spectrum rights in 2017 and is deploying a 5G network using these rights of use.

6.128 In addition, in October 2019, Eir introduced its GoMo³⁶⁴ sub-brand which offers “unlimited”³⁶⁵ mobile plans with low prices³⁶⁶ and which has had an appreciable impact on competition in the sector. For example: ³⁶⁷

- a) as of October 2020, after 12 months in operation GoMo, reportedly has 250,000³⁶⁸ subscribers (approximately 4.8% of subscribers excl. M2M and MBB (data only));

- b) Eir’s shares (by subscriber excl. M2M and MBB (data-only)) has increased from 19.1% in Q3 2019 to 21.9% in Q3 2020³⁶⁹, reversing previous declines.

6.129 ComReg analysis of net porting data³⁷⁰ highlights the competitive effects of the launch of GoMo on rival providers as shown in Figure 11 below. While GoMo appears to compete most closely with [X ██████████ X], it is noteworthy that, prior to the launch of GoMo, [X ██████████ ██████████ ██████████ ██████████ ██████████ X] ³⁷¹.

³⁶² M.6992 – Three/O2 Decision paragraph 59.

³⁶³ In December 2017, Iliad and NJJ agreed to acquire a 31.6% minority interest in Eir with a call option enabling it to take over control in 2024 .

³⁶⁴ GoMo press release, via website 15/10/2019. <https://gomo.ie/last-updates/>

³⁶⁵ The fair usage threshold in relation to data usage for the SIM Only Service was 80GB.

³⁶⁶ GoMo launched with a limited time price of €9.99 per month. This introductory offer was replaced by the current price, €12.99, as of January 2020.

³⁶⁷ In that regard, note ComReg’s evidence on porting

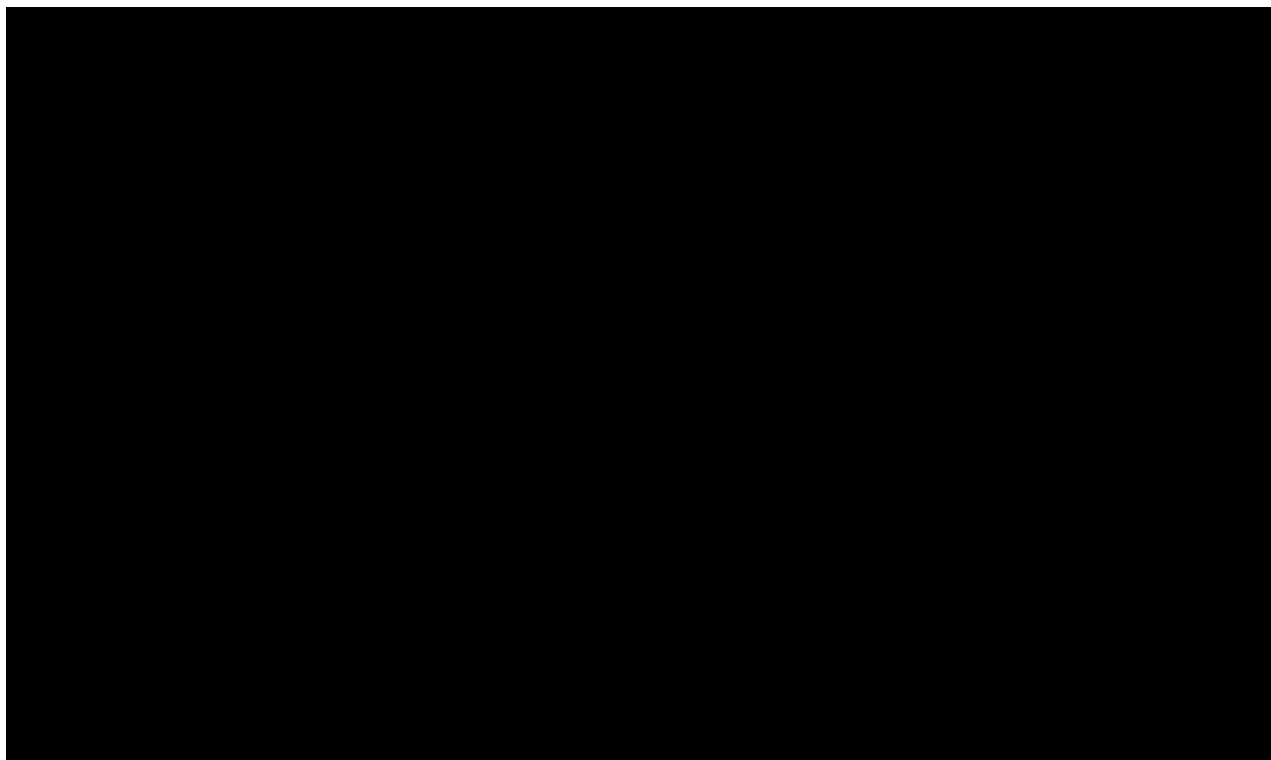
³⁶⁸ <https://www.rte.ie/news/business/2020/1012/1171093-mobile-brand-gomo-reaches-250-000-customer-mark/>

³⁶⁹ For completeness, ComReg notes Eir’s subscriber share excl. M2M and MBB has increased from 19.1% in Q3 2019 to 21.8% in Q2 2020.

³⁷⁰ This is the sum of porting to and from a given operator-operator pair for a given quarter.

³⁷¹ ComReg does not request data on the porting of numbers to sub-brands separate to that of their parent.

Figure 11. Porting from other operators to Eir on a quarterly basis, Q1 2019 – Q2 2020 [X]



6.130 In addition, while factors other than the offerings of rival providers can influence a provider's decisions on its own offerings (including not least COVID-19 and its effect on telecommunication services), ComReg observes that in the months following the launch of GoMo, rival providers began offering lower prices, higher data allowances or (more often than not) both. For example, Virgin Mobile offered an unlimited plan for €15 per month in March (increasing its data cap from 40 GB to 80 GB), Three re-launched its "48" brand in April for €9.99 per month for 20GB and €14.99 for 40GB, and Vodafone offered its first unlimited data plan in May.

6.5.3 Structure of competition analysis informing the Proposed Sub-1 GHz Cap

6.131 ComReg's competition analysis is structured as follows:

- which spectrum accumulation outcomes from the Proposed Award that might give rise to potential competition concerns for downstream competition for retail mobile telecommunications services is ComReg seeking to prevent (e.g. extreme asymmetries);
- the potential severity of the effect on competition if these spectrum accumulation outcomes were to occur. In particular:
 - Advantages to MNOs winning 700 MHz Duplex spectrum; and

- Disadvantages to an MNO not winning any 700 MHz Duplex and the ability to find alternative means to compete;
- the likelihood of these spectrum accumulation outcomes arising from bidders' behaviour in the Proposed Award under a cap level of 80 MHz (i.e. ability and incentive to bid strategically); and
- the likely impact on downstream competition for mobile telecommunications services from these spectrum accumulation outcomes.

6.132 Before doing so, ComReg recognises the uncertainty that is inherent and inevitable in conducting any such forward-looking analysis. There are unavoidable uncertainties, for example, in relation to assessing the potential severity of an extreme spectrum asymmetry on competition or the likelihood of an extreme asymmetry in sub-1 GHz spectrum arising as an outcome of the auction. Such uncertainties mean that the competition analysis involves expert evaluative judgment. In that light, ComReg has carried out its analysis and exercised its judgment taking account of all relevant facts, the submissions received from stakeholders and the views of its expert advisors (and DotEcon, Frontier Economics, LS Telcom and Oxera/Real Wireless in particular in the present case).

6.5.4 Competition analysis – which spectrum accumulation outcomes (“extreme asymmetries”) is ComReg seeking to prevent by way of the Proposed Sub-1 GHz Cap

6.133 By way of background, ComReg recalls the following from paragraphs 6.185-6.187 of Document 19/124:

“6.185 In considering the potential competitive effects arising from an extreme asymmetry, ComReg considers whether there would be an increased likelihood that smaller MNOs (e.g. Eir) or potential entrants would be foreclosed from expanding capacity, deploying alternative technologies, or entering the market, and also whether such an operators costs would be increased to the extent that they would be unable to effectively compete on a comparable basis.

6.186 In that regard, ComReg would be primarily concerned with a situation where the two larger MNOs could bid up to a sub-1 GHz cap in order to make the smallest MNO (i.e. Eir) a more marginal player by denying it 700 MHz rights of use and distorting competition in downstream markets. This would have the largest impact on the smallest operator as it has less scope to mitigate the absence of 700 MHz rights of use because of its smaller existing spectrum holdings. (emphasis

added)

6.134 In light of this background, ComReg outlines its analysis of the potential spectrum accumulation outcomes below.

6.135 First, ComReg recognises that existing asymmetry in sub-1 GHz holdings between the three MNOs is limited to a single block of 900 MHz spectrum (10 MHz unpaired) advantage in favour of Three over Vodafone and Eir (or 25% current asymmetry).

6.136 Second, and as ComReg has previously identified, there are very few realistic options for a sub-1 GHz cap level when one takes into account existing spectrum holdings, the number of existing MNOs and the limited availability of 700 MHz Duplex spectrum (60 MHz unpaired). As noted by DotEcon in Document 20/122a³⁷²:

- a) *Setting the sub-1 GHz at any lower level (than 70 MHz) would entail precluding competition for 700 MHz spectrum entirely if only the existing MNOs bid. A cap at 60 MHz would leave one block unsold (as Vodafone and Eir could acquire at most two blocks, and Three a single block). Leaving a block fallow would be clearly contrary to ComReg's objective to ensure efficient use of spectrum. Therefore, 70 MHz (seven blocks) is also a lower bound for the level of the sub-1 GHz cap; and*
- b) *any cap at a higher level (80 MHz or more³⁷³) would allow asymmetry to increase to four times its current level, potentially leaving one MNOs with double the sub-1 GHz spectrum of another. Fine judgement is not needed to see that this would risk lessening downstream competition because of the scale of the asymmetry. Therefore, 70 MHz (seven blocks) is the upper bound for a reasonable level of the cap.*

6.137 As ComReg has previously identified that a cap level of lower than 70 MHz (i.e. 60 MHz) would not be appropriate for this award³⁷⁴, including for the reasons identified by DotEcon above, this cap level is not considered any further.

6.138 In this section, the following cap levels are considered in terms of the potential level of asymmetry in sub-1 GHz holdings that might arise:

- a) ComReg's Proposed Sub-1 GHz Cap of 70 MHz (or approximately 37% of total sub-1 GHz holdings);
- b) a cap level of 80 MHz (or approximately 42% of total sub-1 GHz holdings);

³⁷² Pages 49-50 DotEcon Report (ComReg Document 20/122a).

³⁷³ Note that cap levels only need to be considered at some multiple of 10 MHz, as all 700 MHz Duplex rights are being offered in blocks of this size (i.e. 2 x 5 MHz).

³⁷⁴ Page 52 DotEcon Report (ComReg Document 20/122a).

and

- c) no sub-1 GHz cap at all (which, based on its largest holdings of 800 MHz and 900 MHz spectrum, could result in Three holding approximately 58% of total sub-1 GHz holdings (or Vodafone/Eir holding approximately 53% of total sub-1 GHz holdings).

6.139 The following table illustrates existing sub-1 GHz holdings and the maximum potential level of sub-1 GHz holding asymmetry between Three and Eir under the 3 cap levels identified above³⁷⁵. It also assumes no bidders for 700 MHz Duplex besides the three incumbent MNOs.

Table 8. Current sub-1 GHz asymmetry and highest potential level of asymmetry vis-à-vis Three and Eir (total of 60 MHz of 700 MHz Duplex available)

Scenario	Three	Vodafone	Eir	Sub-1 GHz Asymmetry	Sub-1 GHz Asymmetry
				Three vs Eir (MHz)	Three vs Eir (%)
Current Sub-1 GHz holdings	50 MHz	40 MHz	40 MHz	10 MHz	25%
Sub-1 GHz cap of 70 MHz	70 MHz	70 MHz	50 MHz	20 MHz	40%
Sub-1 GHz cap of 80 MHz	80 MHz	70 MHz	40 MHz	40 MHz	100%
No Sub-1 GHz cap	110 MHz	40 MHz	40 MHz	70 MHz	275%

³⁷⁵ ComReg recognises that the level of maximum asymmetry between Three and Eir could equally apply to Vodafone – given the same current sub-1 GHz holdings of Vodafone and Eir. Similarly, ComReg recognises that the maximum level of asymmetry could be shown the other way i.e. where Three obtains no 700 MHz Duplex rights. However, given the relative market position of Eir compared to Vodafone and Three (e.g. in terms of lower subscriber numbers, market shares, spectrum holdings and network sites) as outlined previously, the more likely potential for competition concerns arising from an extreme asymmetry would be from the marginalisation of the weakest MNO and the competition analysis is therefore presented in this context.

6.140 As can be seen above:

- a) the Proposed Sub-1 GHz Cap of 70 MHz would allow for a significant increase in the level of current asymmetry between Three and Eir from 25% to 40% (i.e. a 60% increase in the level of current asymmetry);
- b) a cap of 80 MHz could result in Three holding double the sub-1 GHz spectrum holdings of Eir, which would increase the level of current sub-1 GHz asymmetry from 25% to 100% (i.e. a 400% increase in the level of current asymmetry); and
- c) not applying any sub-1 GHz cap could result in Three holding close to three times the sub-1 GHz holdings of Eir, which would increase the level of current asymmetry from 25% to 275% (i.e. an 1100% increase in the level of current asymmetry).

6.141 Given the potentially overwhelming asymmetry involved in a situation where no sub-1 GHz cap was applied (and also noting that no interested party has suggested that ComReg adopt such an approach), this cap level is not considered any further. Of course, to the extent that potential competition concerns could arise under a cap level of 80 MHz, then it can be safely assumed that competition concerns would also arise in a situation of not applying a sub-1 GHz cap at all.

6.142 Accordingly, in the following section ComReg considers the likely impact upon Eir if it did not win any 700 MHz Duplex spectrum (and Vodafone and Three each winning 30 MHz) under a potential sub-1 GHz cap level of 80 MHz.

6.5.5 Potential severity of the effect on competition if spectrum accumulation outcomes were to occur

6.143 This section considers the potential severity of the effect on competition under a cap level of 80 MHz by, firstly, identifying the advantages that would accrue to Vodafone and Three each with 30 MHz of 700 MHz Duplex spectrum rights, and then considering the impacts upon Eir, including its ability to find an alternative means to effectively compete with Vodafone and Three, such as by using alternative spectrum rights and/or adding additional sites.

Advantages to MNOs with 700 MHz spectrum

Background - importance of 700 MHz Duplex spectrum to mobile telecommunications services generally and in Ireland

6.144 ComReg notes that 700 MHz Duplex spectrum is of particular importance for the provision of retail mobile telecommunications services generally. See, in particular, the Connectivity Reports and the LS Telecom Report. For example, in

section 4.4.3.2 of its report, LS Telcom finds, among other things, that spectrum in the 700 MHz band is particularly important for providing rural coverage and on major terrestrial routes because it balances a number of attractive features:

- a) for a given power, it provides wider area coverage and better in-building penetration than higher frequency spectrum; and
- b) compared to higher frequency spectrum, its propagation is less affected by obstacles such as walls, trees, and weather-related obstacles (such as rain and fog).

6.145 See also the 700 MHz EU Decision (Decision 2017/889) which states³⁷⁶:

“Rapidly growing wireless broadband traffic and the increasing economic, industrial and social importance of the digital economy make enhanced wireless network capacity a necessity. Spectrum in the 700 MHz frequency band provides both additional capacity and universal coverage, in particular for the economically challenging rural, mountainous and insular areas as well as other remote areas, predetermined in accordance with areas that are a national priority, including along major terrestrial transport paths, and for indoor use and for wide-range machine-type communications. In that context, coherent and coordinated measures for high-quality terrestrial wireless coverage across the Union, building on best national practices for operators’ licence obligations, should aim to meet the RSPB objective that all citizens throughout the Union should have access both indoors and outdoors, to the fastest broadband speeds of not less than 30 Mbps by 2020, and should aim to achieve an ambitious vision for a gigabit society in the Union. Such measures will promote innovative digital services and ensure long-term socioeconomic benefits.”

6.146 In addition, ComReg notes that 700 MHz Duplex spectrum is also of particular importance for cost-effective, widespread mobile connectivity in Ireland given its highly distributed and rural population. For example, at pages 12-13 of its report (Document 18/103c), Oxera states:

“According to a variety of measures, Ireland has one of the most widely distributed and rural populations in Europe. For example, Ireland’s population density of 69.3 people per km² is considerably lower than the EU28 average of 117.5 people per km² (Eurostat, 2016).

³⁷⁶ Recital 9 of Decision (EU) 2017/899 of the European Parliament and of the Council of 17 May 2017 on the use of the 470-790 MHz frequency band (“**700 MHz EU Decision**”).

See also recital 7, which states: *“The assignment of the 700 MHz frequency band should be structured in a way that facilitates competition and should be carried out in a manner that does not undermine existing competition.”*

According to Eurostat, 72% of the Irish population live in NUTS 3 areas that are defined as predominantly rural areas. By contrast, across the EU as a whole only 22% of the population live in areas that are defined as rural regions. The Census of 2016 shows that:

- Ireland's low population density of 70 people per km² falls to 27 people per km² in the rural areas;*
- 37% of the population lives in rural areas;*
- 3% of the population lives in 28% of the total land area (this is based on an analysis of the small areas);*
- 70% of the population lives in 3% of the total land area (this is based on an analysis of the small areas); and*
- 76% of the total landmass is forestry or farmland.*

The above illustrates the challenges Ireland's demographic characteristics pose to the deployment of infrastructure for both fixed and mobile networks. Given such demographic features, there are certain parts of the country that are difficult to reach, and, if left to commercial incentives alone, the most sparsely populated regions in Ireland may not benefit from the availability of future mobile connectivity services."

Specifically, the costs of achieving widespread mobile connectivity are particularly high in Ireland, owing to its highly distributed and rural populations. For example, Ireland's population density of 69.3 people per km² is considerably lower than the EU28 average of 117.5 people per km². In addition, information from the Census of 2016 shows that:

- Ireland's low population density of 70 people per km² falls to 27 people per km² in the rural areas;*
- 37% of the population lives in rural areas;*
- 3% of the population lives in 28% of the total land area;*
- 70% of the population lives in 3% of the total land area; and*
- 76% of the total landmass is forestry or farmland."*

6.147 In addition, and as identified by Frontier Economics at page 8 of Document 18/103b, Ireland has one of the highest densities of roads per capita in Europe:

"Ireland's road network is extensive with 5,306 km of primary and secondary roads. There is a further 91,000 km network of regional and local roads. Ireland's extensive road network presents challenges to mobile operators.

The road density in Ireland, measured at 21 km per 1000 inhabitants, is twice the EU average. Outside of urban areas, mobile operators provide coverage in areas where their customers are located. Therefore, while they may build dedicated capacity to support connectivity on the most used roads, the sheer volume of roads (compared to users) in Ireland means that this is only economically viable on the busier and larger road networks".

Benefits to MNOs with 700 MHz Duplex spectrum rights

6.148 There are considerable advantages to an MNO with 2 × 10 MHz of spectrum rights in each of the 700 MHz Duplex, 800 MHz and 900 MHz bands, compared to one with only 2 × 10 MHz of spectrum rights in each of the 800 MHz and 900 MHz bands.

6.149 First, 700 MHz Duplex rights will allow an MNO to avail of three-band carrier aggregation³⁷⁷ (i.e. of its rights in the 700 MHz Duplex, 800 MHz, and 900 MHz bands), being a key technology that will reduce the cost of high-speed connectivity (i.e. 30 Mbit/s). In particular, this would allow an MNO to upgrade existing sites to provide a 30 Mbit/s service at substantially lower costs relative to building new sites to provide the same level of service.³⁷⁸

6.150 Second, an MNO able to carrier-aggregate 2 × 10 MHz in each of the 700, 800 and 900 MHz bands would enjoy a 65% coverage gain (for speeds of 30 Mbit/s), compared to an MNO only able to carrier aggregate 2 × 10 MHz in each of the 800 and 900 MHz bands. For example, in section 4.4.3.2 of its report, and based on its interpretation of the figures in the Oxera Report, LS Telcom found:

- a) an operator using carrier aggregation with 10 MHz in each of the 700, 800 MHz and 900 MHz bands would be able to achieve 30 Mbit/s of capacity at ranges of around 4.5 km from a cell-site;
- b) an operator using carrier aggregation with 10 MHz in each of the 800 and 900 MHz bands would be able to achieve 30 Mbit/s of capacity at ranges of up to around 3.5 km from a cell-site; and
- c) in effect, used in conjunction with the existing sub-1 GHz bands, 700 MHz Duplex spectrum provides a 65% coverage gain for speeds of 30 Mbit/s. Further, the ability to carrier aggregate the 700 MHz band with other licenced spectrum bands is an important factor in encouraging the

³⁷⁷ Carrier aggregation increases the peak data rates users can experience. It does this by assigning multiple blocks of frequency (i.e. carriers) to a single user. There are several types of aggregation. Inter-band carrier aggregation involves multiple carriers from different bands (e.g. 800 MHz and 1800 MHz). Intra-band carrier aggregation involves different carriers within a single frequency band (e.g. two 5 MHz carriers in 1800 MHz).

In that regard, Oxera noted in its report that:

“During our discussions with Irish MNOs, we found that they would use the 700MHz band (possibly aggregated with other sub-1GHz bands) to enhance coverage. Therefore, we assume in our model that Irish MNOs will deploy three-band Carrier Aggregation after the 700MHz band is assigned. In the future, if Carrier Aggregation can help improve coverage (and if MNOs have the incentive to do so), it is reasonable to expect that MNOs will deploy this feature to enhance coverage. We note that coverage expansion could be achieved through other means, such as new site deployment. It is up to each MNO to carry out the cost benefit analysis and decide on a strategy” (page 29).

³⁷⁸ See, in particular, the Oxera Report and the LS Telcom Report.

widespread rollout of 30 Mbit/s services as it reduces network costs.

6.151 Third, whereas the Oxera and LS Telcom reports considered the benefits to an MNO holding 2 × 10 MHz of 700 MHz Duplex, the potential spectrum accumulation outcome of Three and Vodafone winning 2 × 15 MHz each would mean that the potential benefits identified above to these MNOs would be greater because:

- a) Three would hold 2 × 40 MHz of sub-1 GHz spectrum (i.e. 15 MHz of 700 MHz, 10 MHz of 800 MHz and 15 MHz of 900 MHz);
- b) Vodafone would hold 2 × 35 MHz of sub-1 GHz spectrum (i.e. 15 MHz of 700 MHz, 10 MHz of 800 MHz and 10 MHz of 900 MHz); and
- c) whereas Eir would continue to only hold 2 × 20 MHz (i.e. 2 × 10 MHz in each of the 800 MHz and 900 MHz bands) and also noting that no alternative sub-1 GHz spectrum bands likely to become available over the next decade (e.g. 600 MHz).

6.152 Fourth, ComReg recalls that the findings from the Oxera Report have informed ComReg's proposed coverage and rollout conditions for 700 MHz Duplex spectrum rights won in this award. In particular, and as discussed further in Chapter 8, an existing MNO which wins at least 2 × 10 MHz of 700 MHz Duplex spectrum would be obliged to meet:

- coverage levels as set out in Table 9 below; and
- coverage at specific locations across the State as identified in Table 13 in Chapter 8.

Table 9. Obligations on an existing MNO winning at least 2 × 10 MHz in the 700 MHz Duplex

Outdoor Coverage Service (Single User Throughput Cell Edge)	Coverage dimension	Coverage level to be met in:		
		3 Years	5 Years	7 years
30 Mbit/s ³⁷⁹	Population	85%	92%	95%
30 Mbit/s	Motorways	75%	85%	90%
30 Mbit/s	Primary Roads	60%	75%	80%
3 Mbit/s	Population	99%	99%	99%
3 Mbit/s	Geographic area	90%	91%	92%

6.153 In addition, ComReg is proposing that an existing MNO which wins less than 2 × 10 MHz of 700 MHz Duplex spectrum (i.e. 2 × 5 MHz) would be required to meet the above obligations, except that the minimum single user throughput cell edge level would be reduced to 20 Mbit/s (instead of 30 Mbit/s).

6.154 Accordingly, the above table represents the minimum outdoor coverage levels that would be provided by Vodafone and Three should they each win 2 × 15 MHz of 700 MHz Duplex under a cap level of 80 MHz (with a minimum single user throughput cell edge level of 30 Mbit/s).³⁸⁰

6.155 Table 10 below highlights the difference in coverage levels across the population coverage (30 Mbit/s and 3 Mbit/s) between:

- Current MNO coverage levels for these coverage dimensions; and
- ComReg's proposed coverage obligations for an MNO winning at least 2 × 10 MHz of 700 MHz Duplex (after 7 years) (i.e. Vodafone and Three if


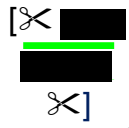

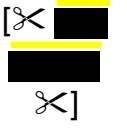


³⁷⁹ As noted in the Oxera Report:

"In relation to the specific application data rates: 3Mbit/s represents a minimum mobile data rate, 30Mbit/s represents the target data rate for 2020 (as set out in Article 6 the EU Radio Spectrum Policy Programme (RSPP) Decision), and 50Mbit/s represents a higher data rate."

³⁸⁰ In particular, Vodafone and Three could choose to provide coverage levels over the coverage obligations, including because of the benefits from each having 2 × 15 MHz of 700 MHz Duplex that would be possible under a cap level of 80 MHz (compared to the 2 × 10 MHz holdings assumed by Oxera and LS Telcom for the purposes of their reports).

they each won 2 × 15 MHz).

Table 10. ComReg estimate of current population coverage levels of each MNO relative to the proposed population coverage obligations for 700 MHz Duplex spectrum³⁸¹

Outdoor Coverage Service (Single User Throughput Cell Edge)	Coverage Dimension	Eir's current coverage	Three's current coverage	Vodafone's current coverage	700 MHz Duplex coverage obligation ³⁸² target per year		
					3	5	7
30 Mbit/s	Population				85%	92%	95%
3 Mbit/s	Population				99%	99%	99%

Source: ComReg estimate, based on ComReg's modelling of the coverage of MNOs in its Outdoor Coverage Map. Data from Release 5 May 2020.

Effect on Eir where it wins no 700 MHz Duplex spectrum under cap level of 80 MHz

6.156 In this section, ComReg considers the extent to which Eir might be able to find an alternative means to maintain its competitive position in terms of providing a comparable MBB service to the same coverage levels as would be required from Vodafone and Three holding 700 MHz Duplex rights under ComReg's proposed coverage obligations.

6.157 For the reasons outlined below, ComReg considers that an extreme asymmetry in sub-1 GHz spectrum holdings would cause Eir significant technical and financial disadvantages relative to Vodafone and Three.

6.158 First, as no alternative sub-1 GHz spectrum bands for MBB are likely to become available until around 2030 at the earliest (e.g. potentially 600 MHz), Eir may

³⁸¹ As estimated with the revised RSRP levels in Chapter 8.

³⁸² 30 Mbit/s SUTP.


³⁸³ Eir has publicly stated that its 4G (i.e. LTE) mobile network "reaches 99% of the population" (see: <https://www.eir.ie/pressroom/23-July-2020-eirs-4G-mobile-network-reaches-99-of-the-population/>), however, ComReg notes that this is likely to be at a lower throughput level than the proposed obligations.



seek to use mid-band frequencies instead of 700 MHz Duplex by which to provide a comparable nationwide MBB service. For example, by carrier aggregating its 800 MHz Band and 900 MHz Band spectrum rights with its existing 1800 MHz spectrum rights (or other available mid-band spectrum holdings). However, ComReg observes that this would not provide the 65% coverage gains that LS Telcom considers would be obtained by MNOs carrier aggregating existing 800 MHz Band and 900 MHz Band rights with 700 MHz Duplex spectrum (based on Oxera's findings). This is because the capacity gains from aggregating 1800 MHz spectrum would still be limited by its poorer propagation characteristics compared to 700 MHz Duplex³⁸⁴. That is, the additional capacity benefits of 1800 MHz spectrum would cease before a consumer reached the greater cell-edge radius provided by its 800 MHz Band and 900 MHz Band spectrum rights.

6.159 Accordingly, Eir may seek to deploy additional sites to provide a coverage and quality of service level comparable to Vodafone and Three (i.e. site densification).

6.160 Second, adding more sites would cause Eir to incur both substantially higher capital expenditure ("CAPEX") costs and significantly higher ongoing operational expenditure ("OPEX") costs, compared to an MNO with 700 MHz Duplex rights (which would be adding 700 MHz Duplex spectrum rights to an existing site (by way of a site upgrade/refresh³⁸⁵ instead of adding new sites). See, in particular, Tables A2.5 and A2.6 from the Oxera Report which highlights:

- a) **CAPEX costs:** €268.5K for a new site³⁸⁶, compared to €11K for a site upgrade and €19K for a site refresh; and
- b) **OPEX costs:** new site (€15K), active radio equipment (15% of CAPEX), and backhaul (25% of CAPEX).

6.161 In that regard, and in terms of **current MBB population coverage (at 30 Mbit/s)**, ComReg observes from Table 10 above that []


]. This reflects³⁸⁷:

- a) [] and 

³⁸⁴ That said, carrier aggregating with mid-band spectrum would provide additional capacity closer to the cell-site within the propagation range of the particular mid-band spectrum used.

³⁸⁵ 'Site refresh' refers to the replacement cost for the radio equipment at the end of the radio equipment's lifetime.

³⁸⁶ Comprised of site (€250K), active radio equipment (€10.5K) and backhaul (€8K): page 18.

³⁸⁷ ComReg notes that there are a number of different ways in achieving the extension of coverage however the approach taken by other operators can be indicative in how Eir may wish to achieve comparable coverage.

b) [REDACTED]
[REDACTED] ×]

6.162 Therefore, compared to Vodafone's and Three's site numbers, Eir may require between approximately [× [REDACTED] ×] additional 800 MHz sites and [× [REDACTED] ×] 1800 MHz sites³⁸⁸ to match Vodafone's and Three's **current** population coverage levels at 30 Mbit/s.

6.163 In terms of the potential numbers of additional sites Eir may need to deploy if it considered it necessary to keep abreast with the MBB coverage and quality service levels of Vodafone and Three under the coverage obligations, ComReg recognises that this would be a highly sensitive strategic decision for Eir which would reflect, among other things, the costs of adding additional sites and the benefits from same in terms of maintaining its competitive position. Understandably, Eir has not provided this material to-date. Accordingly, ComReg is carrying out its analysis and exercising its evaluative judgment on these matters taking account of all relevant facts, the submissions received from stakeholders, and the views of its expert advisors (and DotEcon, LS Telcom and Oxera/Real Wireless in particular in the present case).

6.164 Bearing in mind the forward-looking nature of this exercise and the above material uncertainties, ComReg would make the following observations based on currently available information.

6.165 First, the difficulty for Eir in bridging any gap between its MBB coverage levels and that of Vodafone and Three is exacerbated because Eir has [× [REDACTED] ×]
[REDACTED]
[REDACTED] ×].

6.166 Second, Eir's recent improvements in its 4G MBB coverage highlights the significant network deployments required to improve coverage without additional spectrum³⁸⁹. Between June 2019 and May 2020, Eir improved its population coverage by circa [× [REDACTED] ×], but this required a significant increase in the deployment of sites³⁹⁰ from [× [REDACTED] ×] to [× [REDACTED] ×] in 800 MHz (+[× [REDACTED] ×]) and [× [REDACTED] ×] to [× [REDACTED] ×] (+[× [REDACTED] ×]) in 1800 MHz³⁹¹.

6.167 Third, Oxera's analysis highlights the increasing additional costs of improving MBB coverage at 30 Mbit/s beyond 90% population (and exponential beyond

³⁸⁸ Noting that sites at 1800 MHz are generally deployed to increase the capacity available in areas rather than coverage and are therefore less relevant to delivering coverage where other better suited bands are available.

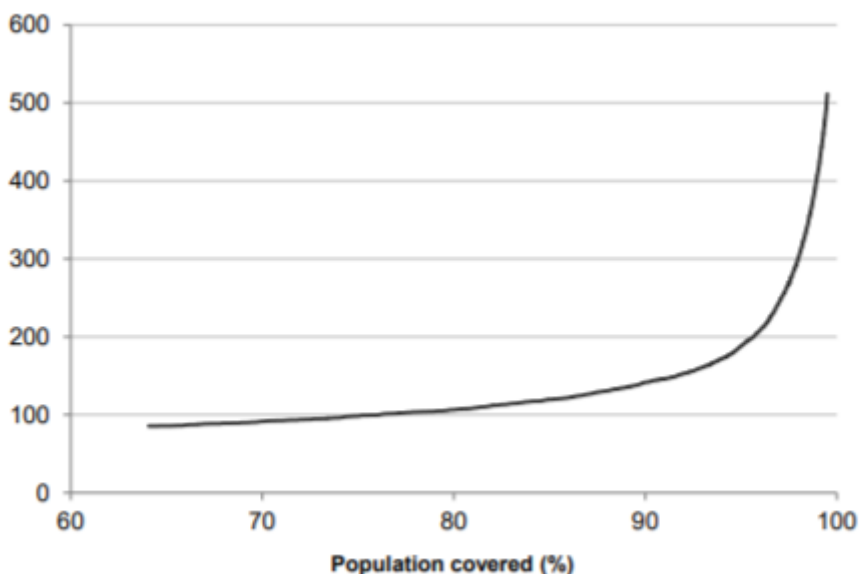
³⁸⁹ ComReg notes this analysis does not include the Temporary licence spectrum.

³⁹⁰ Noting that the addition of the sites may not be all targeting coverage.

³⁹¹ These site figures are those collected by ComReg as part of its modelling of the coverage of MNOs in its Outdoor Coverage Map and date from May 2020. For the avoidance of doubt these are not those presented in Tables 6 and 7 above.

95% population) for an MNO with 700 MHz Duplex spectrum rights and the 65% coverage gain identified by LS Telcom. See, for example, Figure 5.14 from the Oxera Report, which is extracted below.

Figure 12. Oxera/Real Wireless estimated costs of targeting 30 Mbit/s population coverage, starting in mid-2020 (€m, 2017 monies)



6.168 Given this, further improvements in 4G MBB coverage by Eir and to the quality of service levels that would likely be provided by Vodafone and Three (i.e. 30 Mbit/s) absent any 700 MHz Duplex spectrum rights would likely require even greater deployment of macrosites and even greater costs. As noted by Oxera:

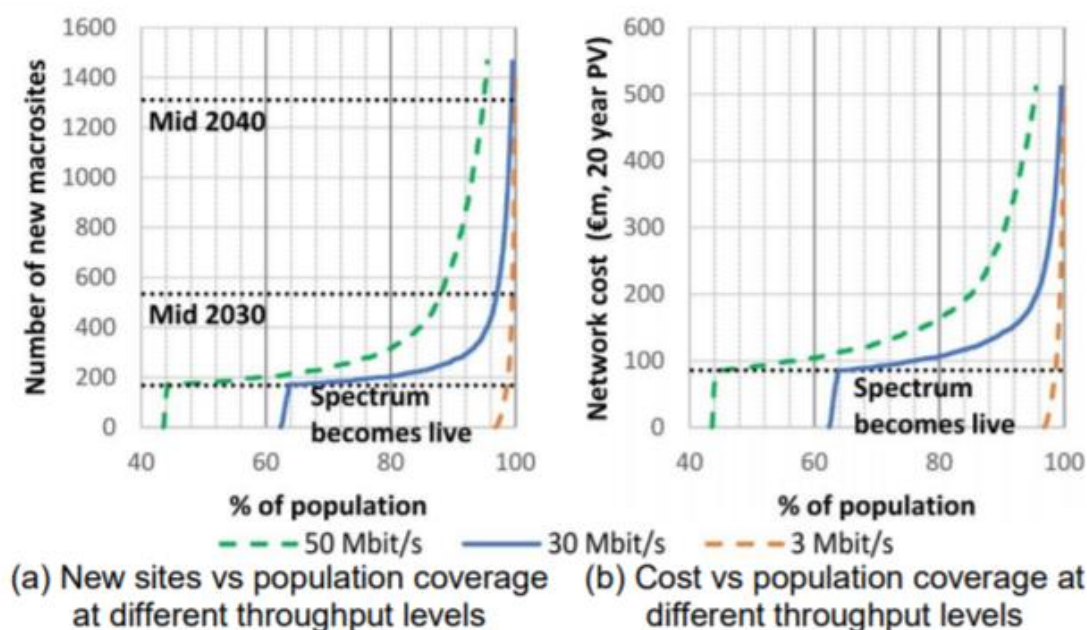
“Both the 700MHz band and Carrier Aggregation reduces the cost of providing coverage (as site upgrades cost less than building new sites). Therefore, the incremental cost of providing coverage is reduced in the immediate years following mid-2020 [following the release of 700 MHz]”³⁹².

6.169 Oxera states that this reduction in incremental costs is represented by the ‘kink’ in many of the charts in Section 5 of the Oxera Report³⁹³. See, for example, Figures 5.7(a) and (b) from the Oxera Report in relation to the network costs required to achieve 30 Mbit/s MBB population coverage extracted below.

³⁹² Page 35 of the Oxera Report. Text in brackets inserted by ComReg for clarity.

³⁹³ Page 35 of the Oxera Report “Therefore, the incremental cost of providing coverage is reduced in the immediate years following mid-2020 (mid-2020 appears as a ‘kink’ in many of the charts in section 5). However, as we will see in section 5.2, the incremental cost of coverage rises again when coverage reaches very high levels”.

Figure 13. Oxera/Real Wireless estimated network costs of targeting 30 Mbit/s population coverage for Scenario 5.7, (€m, 2017 monies)



6.170 ComReg also observes the following points from Three UK in its submission to Ofcom³⁹⁴:

“As Ofcom says, having more spectrum allows an MNO to serve customers with a given quality of service at lower cost (i.e. without needing extra sites). The issue is cost and quality of service: adding one new site means spending hundreds of thousands of pounds on infrastructure. As Ofcom has found, MNOs with smaller spectrum holdings tend to have higher marginal costs of adding capacity because they need many more sites to do so. In general, spectrum holdings determine an MNO’s ability to serve users with a minimum quality of service.

The same is true of low frequency spectrum. Sub-1GHz spectrum also allows an MNO to provide good quality coverage and capacity to a greater area at lower cost. Frequency determines an MNO’s ability to serve users with a minimum quality of service. MNOs with smaller holdings of low frequency spectrum face higher marginal costs of adding capacity in the coverage layer (because they need extra sites to do so),

³⁹⁴ Three UK’s response to Ofcom’s consultation on the Award of the 700 MHz and 3.6 -3.8 GHz spectrum bands of 9 December 2019 (page 14).

See: https://www.ofcom.org.uk/data/assets/pdf_file/0039/189795/three.pdf

whereas an MNO with a large sub-1GHz portfolio can deploy it on existing sites with lower equipment costs.

As Ofcom has noted, customers in harder-to-serve areas (deep indoors, or not close enough to an existing higher frequency site) can only be served economically by using low frequency spectrum (absent alternatives such as WiFi)."

6.171 Fourth, and in addition to the higher CAPEX and OPEX costs identified above for new site deployment, ComReg notes that Eir would incur further costs if it sought a faster network roll-out than would normally be the case. This would be so if it considered it necessary to do so to keep pace with the coverage improvements of the other two MNOs - which would be conducting considerably faster site upgrades/refreshes (by adding 700 MHz Duplex spectrum to an existing site instead of adding new sites). As Oxera states³⁹⁵:

"Faster network roll-out is more challenging to achieve. In general, we expect that faster network roll-out would be more costly for an MNO to achieve. This is because we expect that the unit costs would rise if an MNO had to deploy additional sites/upgrades more rapidly. For example, the network roll-out may require more engineering staff, vehicles, and equipment.

This requirement would result in the MNO incurring higher costs (than for a slower network roll-out). The network costing model does not fully capture these extra costs of faster roll-out; therefore, the model provides a lower bound estimate of the network costs where the speed of roll-out is significantly faster than the base case (2.5% CAGR).

We also expect that faster network rollouts may be less feasible for an MNO to achieve. For example, even if the MNO was able to invest in more engineering staff, vehicles, and equipment, the process of doing so would take time and may not be commercially viable. Therefore, network rollouts that require speeds significantly greater than the base case (2.5% CAGR) should be viewed with caution.

For context, a network roll-out with 2.5% CAGR in 2020 corresponds to a new site every week, or a carrier-upgrade every two days."

6.172 Fifth, and in relation to whether site densification would ultimately be a realistic and cost-effective alternative means by which Eir could maintain its competitive position, ComReg recalls the following points raised by Three UK to Ofcom:

a) *"Adding sites while theoretically possible will not be a commercially*

³⁹⁵ Page 35 of the Oxera Report.

*feasible substitute for additional 700 MHz*³⁹⁶

- b) *“The alternatives to low frequency spectrum such as site densification or other technological solutions proposed by Ofcom are either not commercially practicable or will only have a marginal impact.”*³⁹⁷
- c) *“Ofcom suggests that an alternative to deploying 700MHz spectrum is to build more mobile sites. Although building new sites can be used to increase an MNO’s capacity in hard-to-reach areas, it is not a viable substitute to deploying further low frequency spectrum. It is neither feasible nor economical to match the level of capacity in hard-to-reach areas that sub-1GHz spectrum can provide through network densification.”*³⁹⁸

6.173 Sixth, and given the better in-building penetration of 700 MHz Duplex spectrum compared to alternative mid-band spectrum, Eir would also face significant deficiencies in terms of providing equivalent coverage in harder-to-serve areas, such as indoors³⁹⁹. In that regard, ComReg recalls that⁴⁰⁰:

- a) the use of modern building materials, windows, block materials and roofing can have a significant detrimental effect on the propagation of radio waves into buildings constructed using these materials⁴⁰¹;
- b) this challenge seems likely to be further exacerbated as building and insulating materials used become even more energy efficient (e.g. important schemes such as the “Better Energy Homes”); and
- c) whilst most Irish consumers indicate satisfaction with their current mobile service, consumers most use their mobile devices in the home for voice and data, and indoor connectivity was highlighted as a key issue impacting mobile consumers. Further, rural consumers also tend to have

³⁹⁶ Three UK’s response to Ofcom’s consultation on the Award of the 700 MHz and 3.6 -3.8 GHz spectrum bands of 12 March 2019 (page 37).

³⁹⁷ Ibid.,

³⁹⁸ Three UK’s response to Ofcom’s consultation on the Award of the 700 MHz and 3.6 -3.8 GHz spectrum bands of 9 December 2019 (page 17).

³⁹⁹ While consumers may be able to access MBB services indoors via a WIFI network in some cases (e.g. in the home), there would remain a significant number of indoor spaces where WIFI may not be widely or freely available. For example, shopping centres, supermarkets etc.

⁴⁰⁰ See ComReg Document 18/103b at pages 6-9 (and the references to (i) ComReg’s Mobile Consumer Experience Survey – ComReg Document 17/100a slide 42 and 45 and (ii) The Effect of building material on indoor mobile performance – ComReg Document 18/17).

⁴⁰¹ See also ComReg Document 18/73 “The Effect of Building Materials on Indoor Mobile Performance”. Among other things, the report finds that the use of some modern building materials, in particular, those containing metals such as foil-backed thermal insulation or windows with aluminium or metallic frames can have a significant detrimental effect on the propagation of radio waves as they penetrate a building. The losses suffered by radio waves penetrating these materials is in the order of 20 up to 60 dB – that is a reduction in signal strength of 100 up to 1,000,000 times depending on the particular case.

a higher propensity to experience service issues than those who live in urban or suburban areas.

6.174 ComReg also observes the following points from Three UK's submission to Ofcom regarding both the importance of deep indoor coverage to consumers and the benefits of 700 MHz spectrum in this regard:⁴⁰²

“Contrary to what Ofcom claims, network quality in harder to serve areas is an important factor considered by customers and poor network quality is a competitive disadvantage.

...

700MHz will provide this capacity in harder to reach areas and allow for load balancing between the 800/1400MHz layer and the 700MHz layer helping to relieve congestion and provide a better experience for customers in harder to reach areas.

We serve large parts of the UK primarily based on our 800MHz layer as shown in Figure 7 – the grey areas (where covered). It is commercially feasible to serve the green areas with our high frequency spectrum in addition to low frequency spectrum. It is in all the grey areas (where covered) that additional 700MHz will be useful in load rebalancing and relieving congestion in Three's 800MHz layer as traffic demand grows. This is because 700MHz will have great coverage potential and its inbuilding penetration will be comparable to 800MHz (4G). Outside urban areas it will offer wide-area 4G/5G mobile coverage.”

6.175 In light of the above, it is likely that Eir would face significant technical and financial disadvantages relative to Vodafone and Three in the event that it did not win any 700 MHz Duplex spectrum under a cap level of 80 MHz including:

- a) higher incremental costs (both CAPEX and OPEX) of providing wide area coverage and at the quality of service levels comparable to Vodafone and Three, because it would need to construct significantly more sites to do so (in contrast to the other two MNOs which could deploy 700 MHz Duplex spectrum on their existing sites). Whilst Eir could seek to use alternative mid-band spectrum (e.g. 1800 MHz), this would not provide the substantial coverage gains that would be available to Vodafone and Three from deploying⁴⁰³ 700 MHz Duplex spectrum with their existing 800 MHz Band and 900 MHz Band spectrum rights;

⁴⁰² Page 40 of Three UK's submission to Ofcom of March 2019.

⁴⁰³ Noting that deploying it separately provides notable benefits and this is enhanced further where three band carrier aggregation is used.

- b) significant difficulties in keeping pace with the coverage expansion of Vodafone and Three given the considerably longer timeframes involved in deploying new sites (e.g. site negotiation, planning, construction, arranging power and backhaul etc) compared to adding 700 MHz Duplex spectrum at existing sites for Vodafone and Three. Alternatively, if Eir chose to implement a faster network roll-out than would normally be the case so as to keep pace with Vodafone and Three, then it would face further costs in doing so; and
- c) significant deficiencies compared to Vodafone and Three in terms of providing coverage in harder-to-serve areas (such as indoors) because of the poorer in-building penetration of alternative mid-band spectrum (e.g. 1800 MHz) compared to 700 MHz Duplex spectrum.

6.5.6 Likelihood of the extreme asymmetric outcome under a cap of 80 MHz occurring (i.e. ability and incentive to bid strategically)

6.176 Radio spectrum is a scarce resource and is also an essential input to the provision of mobile telecommunications services for an MNO (in contrast to an MVNO which relies up on the network of its host MNO to provide its services).

6.177 This is particularly so for low frequency spectrum, such as 700 MHz Duplex spectrum, because of the lower amounts of available frequencies in such bands. For example, there is 60 MHz unpaired available for assignment in the 700 MHz Duplex compared to 120 MHz unpaired in the 2.1 GHz Band also proposed to be awarded.

6.178 Furthermore, and as outlined above, an MNO acquiring 700 MHz Duplex spectrum would be able to provide wide-area coverage at a considerable cost advantage compared to seeking to provide the same level of coverage and quality of service but using higher frequency spectrum (e.g. 1800 MHz) because of the poorer propagation characteristics of the latter and therefore the need to build additional sites and corresponding higher CAPEX and OPEX costs. In that regard, the “intrinsic value” of 700 MHz Duplex spectrum to the MNOs is likely to be significant given the additional profits that the MNOs would earn from using these rights of use to provide improvements to their core MBB services, and in terms of avoiding the higher CAPEX and OPEX costs of not holding such spectrum.

6.179 At the same time, because of the scarce nature of 700 MHz Duplex spectrum and the significant financial and technical effects for a rival operator without such spectrum, there is the potential for MNOs to bid for 700 MHz Duplex spectrum with the purpose of foreclosing that capacity to rivals and adversely affecting a rival’s ability to provide an equivalent and competitive service offering or raising its costs if it sought to do so. In this case, a bidder/s would not be bidding on the

intrinsic value of the spectrum from using it themselves, but rather on the additional profits it would earn from reducing the competitive constraint that the rival provides (such as from customers migrating away from the rival to the bidder because of the reduced quality of service outside of urban/suburban areas of the rival, or being able to increase its own prices if the rival was forced to increase its prices because of its higher incremental costs of not holding the particular spectrum rights) (i.e. “Strategic Bidding”). As Three observes⁴⁰⁴:

“Bidders may be tempted to adopt conquering bid strategies. Spectrum suitable for mobile use is a scarce resource: when one bidder acquires a spectrum lot, it is denying another bidder from using that spectrum. This ability to block rivals can give rise to ulterior motives for acquiring spectrum, based on expectations that a rival MNO’s ability to offer equivalent services at similar cost will be diminished.”

6.180 In the present case, and in light of the previous discussion, the following factors indicate a real potential for Three and Vodafone to bid strategically for 700 MHz Duplex spectrum under a cap level of 80 MHz for the purposes of denying that capacity to Eir and the likely effects that this would have upon Eir:

- a) 700 MHz Duplex rights are important for the cost-effective enhancement of the MNOs’ core existing business model (i.e. MBB services with LTE/LTE-Advanced and, later, 5G) and particularly so in Ireland given its demographics;
- b) no alternative sub-1 GHz spectrum rights are likely to become available until around 2030, meaning that negative effects upon Eir are likely to endure for a long period. In that regard, ComReg notes the following points raised by Three UK to Ofcom *“The 700MHz award is the last opportunity for MNOs to buy low frequency spectrum. Any competition issues that arise due to concentration of sub 1GHz spectrum will persist indefinitely.”*⁴⁰⁵ This is also relevant in terms of the time period over which Three and Vodafone could benefit from adopting such bidding strategically under a cap level of 80 MHz;
- c) the *“Irish retail mobile telecommunications services market is an oligopolistic market characterised by a high degree of concentration and high barriers to entry.”*⁴⁰⁶;
- d) the higher level of concentration following the Merger through the loss of one standalone MNO, coupled with significant uncertainty as to whether

⁴⁰⁴ Page 13 of Three’s response to Document 19/124.

⁴⁰⁵ Three UK’s response to Ofcom’s consultation on the Award of the 700 MHz and 3.6 -3.8 GHz spectrum bands of 9 December 2019 (page 2).

⁴⁰⁶ At paragraph 177 of EC’s merger decision.

the Final Commitments package has turned out in practice to have been successful in addressing the EC's competition concerns regarding the Merger;

- e) the considerably weaker position of Eir compared to Vodafone and Three (e.g. in terms of lower subscriber numbers, share of revenues, existing spectrum holdings and network sites);
- f) higher incremental costs (both CAPEX and OPEX) of providing wide area coverage and at the quality of service levels comparable to Vodafone and Three, because it would need to construct significantly more sites to do so (in contrast to the other two MNOs which could deploy 700 MHz Duplex spectrum on their existing sites). Whilst Eir could seek to use alternative mid-band spectrum (e.g. 1800 MHz), this would not provide the substantial coverage gains that would be available to Vodafone and Three from deploying or indeed carrier-aggregating 700 MHz Duplex spectrum along with their existing 800 MHz Band and 900 MHz Band spectrum rights;
- g) significant difficulties in keeping pace with the coverage expansion of Vodafone and Three given the considerably longer timeframes involved in deploying new sites (e.g. site negotiation, planning, construction, arranging power and backhaul etc) compared to adding 700 MHz Duplex spectrum at existing sites for Vodafone and Three. Alternatively, if Eir chose to implement a faster network roll-out than would normally be the case so as to keep pace with Vodafone and Three, then it would face further costs in doing so;
- h) that these higher costs would also be carried by Eir over a considerably smaller customer and revenue base than Vodafone and Three;
- i) significant deficiencies compared to Vodafone and Three in terms of providing coverage in harder-to-serve areas (such as indoors) because of the poorer in-building penetration of alternative mid-band spectrum (e.g. 1800 MHz) compared to 700 MHz Duplex spectrum; and
- j) the impact that such higher incremental costs and poorer coverage in harder-to-serve areas (both rural and urban indoors) may have on Eir's ability to provide an effective competitive constraint going forward, including upon its recent aggressive approach to its mobile offerings following the launch of GoMo (noting also the impact this has had on competition, including taking customers away from each of Three and Vodafone) and Eir's ability to compete across all of its current customer segments (see Section 6.5.7 below).

6.181 In addition, ComReg notes and agrees with the following point from DotEcon:⁴⁰⁷

“When bidding for three blocks, Three might expect some anti-competitive gains arising from gaining some potential downstream market power, as the current three-player market would fragment, with a higher-quality/lower-cost duopoly and a differentiated weaker player limited by its much smaller holding of spectrum. If Three was allowed to bid for three blocks of 700 MHz, then its valuation may contain some anticipation of gaining excess profits through weaker downstream competition. Allocating spectrum to Three on the basis of a valuation inflated by anti-competitive rents would not be efficient.”

6.182 Accordingly, and based on the material before it, ComReg considers that there would be a real likelihood of an extreme asymmetric outcome arising under a sub-1 GHz cap level of 80 MHz.

6.5.7 Impact on downstream retail competition for mobile telecommunications services from the spectrum accumulation outcomes concerned

Background and context

6.183 In this section, and informed by the preceding analysis, ComReg outlines its analysis of the likely impacts on downstream retail competition for mobile telecommunications services from the extreme asymmetric outcome considered likely to arise under a sub-1 GHz cap of 80 MHz.

6.184 ComReg reiterates that the likely impacts upon downstream retail competition for mobile telecommunications services will depend primarily on what Eir would likely do if faced with not winning any 700 MHz Duplex spectrum under a cap of 80 MHz. As Eir has not provided this material, ComReg has carried out its analysis and exercised its evaluative judgment taking account of all relevant facts, the submissions received from stakeholders and the views of its expert advisors (and DotEcon, LS Telcom and Oxera/Real Wireless in particular in the present case).

6.185 In light of the preceding sections of this competition analysis, ComReg considers the likely impact on downstream retail competition for mobile telecommunications services that could arise from a sub-1 GHz cap of 80 MHz under the following two scenarios:

1. If Eir did not seek to maintain its competitive position on MBB coverage and quality of service compared to Vodafone and Three

⁴⁰⁷ Page 51 of DotEcon report (Document 20/122a).

Europe⁴¹¹.

6.191 Second, ComReg recalls Frontier's forecast that demand for mobile data in Ireland will grow at an average of 32% per year up to 2022⁴¹² and, further notes that the volume of mobile data traffic until September 2020 has exceeded the entire data traffic in 2019.⁴¹³ In addition, mobile voice services now account for 84% of total voice traffic in Ireland and users are consuming an average 10.1 GBs of mobile data a month, an increase of 40% compared to this time last year, and 153% compared to just three years ago⁴¹⁴.

6.192 The above increase in mobile data traffic is also reflected in terms of consumers' average mobile phone usage per day. For example, a consumer may spend on average of 30 minutes per day on making/receiving traditional mobile call compared to 130 minutes per day on activities requiring MBB (e.g. emailing, social media, internet-based applications for voice calls, streaming TV apps and video-on-demand, streaming music and browsing general websites)⁴¹⁵.

6.193 Third, ComReg also notes Frontier's observation that⁴¹⁶:

“Connectivity to support most mass market applications requires connectivity that typically:

- can download and upload most applications (a HD resolution video can be transmitted with bandwidth of 3-7 Mbps);*
- can support asymmetric download and upload, as we use connectivity to “consume” content more than we do to send content; and provides a low bandwidth “always-on connectivity” to support background data requirements for applications.”*

6.194 In addition, while file downloading and web browsing (some of the most common smartphone uses) do not have a hard-minimum speed requirement, the quality of experience increases with speed:

- web pages are getting larger and more content-rich, so data speeds need to increase commensurately to provide a good consumer experience. The size of the average web page has roughly trebled from around 700

⁴¹¹ According to Eurostat, 72% of the Irish population live in NUTS 3 areas that are defined as predominantly rural areas (Oxera Report page 13).

⁴¹² In 2018 ComReg commissioned Frontier Economics to publish a new mobile data traffic forecast to enable better network planning by operators and assist stakeholders to keep pace with consumer demand for services (Document 18/35). ComReg notes that the growth in mobile data (and LTE fixed wireless broadband) since 2018 have in fact exceeded the “base” scenario forecast of Frontier for Q1 and Q2 of 2020.

⁴¹³ Mobile data traffic was 539,697,814 GB in 2019 and 569,947,589 GB in Q1, Q2 and Q3 2020.

⁴¹⁴ Source: [ComReg Quarterly Key Data](#) as of Q3 2020.

⁴¹⁵ Slide 51 of Document 19/101.

⁴¹⁶ Page 6 of Frontier Report.

Kb in 2010 to over 2100 Kb in 2015. To load a web page of this size in around 3 seconds, which is what customers consider to be a good experience, a data speed of around 8-10 Mbit/s is necessary; and

- file downloads are increasingly common. Speeds determine how quickly large files will download and how many files can be downloaded per second.⁴¹⁷

6.195 Fourth, Irish mobile consumers place significant importance on quality of service and coverage in terms of choosing and remaining with a service provider. See, for example, ComReg's Mobile Consumer Experience Survey, 2019 (Document 19/101) and ComReg's Market Review Fixed Voice Call Termination and Mobile Voice Call Termination (Document 19/47) which found that:

- 27% of consumers reported that their selected network had a 'Good reputation';⁴¹⁸
- 15% of respondents chose their network because they heard that there is good coverage/signal quality in their area;
- 55% of respondents who switched provider, but kept their handset experienced an improvement in network coverage; and
- the main reason for switching from an operator, as reported by 30% of consumers, is network coverage/reliability⁴¹⁹.

6.196 Consequently, it is apparent that the quality of service for a given coverage level already of significance to consumers (rather than mere coverage itself) and this will increase over time given the growth in mobile data consumption. In that regard, ComReg also observes the following point raised by Three UK to Ofcom⁴²⁰:

"Previous discussions about the importance of low frequency spectrum have simply focused on MNOs' abilities to connect customers to their networks in hard to reach areas. ... What is more important (and increasingly so) for consumers is the quality of service that they can receive in these areas."

6.197 Given the above, if Eir did not provide a sufficiently comparable and competitive nationwide MBB service to Three and Vodafone (e.g. at the coverage levels and

⁴¹⁷ Three UK's submission to Ofcom dated 12 March 2019, page 36.

⁴¹⁸ Document 19/101 'Mobile Consumer Experience Survey 2019' Slide 38.

⁴¹⁹ Market Review Fixed Voice Call Termination and Mobile Voice Call Termination – Document 19/47, Para 4.95.

⁴²⁰ Three UK's response to Ofcom of 9 December 2019 (page 13).

to the same quality of service (e.g. 30 Mbit/s)) - noting again that this is the MNOs' core existing business model - then this would likely have serious effects on its ability to win and retain customers across a considerable proportion of Irish subscribers. That is, those that require or otherwise value high levels of coverage and quality of service and across various important coverage dimensions, such as by population, motorways and primary roads. In that regard, ComReg also observes Three UK's point to Ofcom that "*Contrary to Ofcom's assessment, the availability of good quality data services indoors and in rural areas is critical to consumers*"⁴²¹

6.198 In addition, given the better in-building penetration of 700 MHz Duplex spectrum, Eir would also be at a disadvantage in providing an equivalent quality of service for MBB services in both rural and urban areas (e.g. indoors). In that regard, ComReg also observes the following points raised by Three UK to Ofcom⁴²²:

"Consumers consider a service to be 'reliable' if it meets their demand wherever they use it, including both deep indoors and in rural areas. A definition of reliability must, therefore, require that consumers are able to receive the good quality 4G service they are accustomed to, wherever they need it..... Therefore, consumers' preferences for reliability of service wherever they consume mobile services and the types of services they demand, provide strong evidence that consumers do demand good quality 4G services indoors and in rural areas. These are services that can only be delivered with sufficient holdings of low frequency spectrum."

6.199 Accordingly, under this scenario there would be the potential for Eir to be limited to being an effective competitor for retail mobile telecommunications services in urban areas, in which case and as DotEcon observes: "*the current three-player market would fragment, with a higher-quality/lower-cost duopoly and a differentiated weaker player limited by its much smaller holding of spectrum.*"⁴²³. In that regard, ComReg also observes the following point from Three UK to Ofcom⁴²⁴:

"The persistent asymmetry in MNOs' low-frequency spectrum holdings will significantly weaken competition for significant customer segments. This is true for both the retail and wholesale markets in the UK because coverage and capacity in hard-to-reach areas are key drivers of competition and consumer choice."

⁴²¹ Three UK's response to Ofcom's consultation on the Award of the 700 MHz and 3.6 - 3.8 GHz spectrum bands of 9 December 2019 (page 15).

⁴²² Three UK's December response to Ofcom's consultation on the Award of the 700 MHz and 3.6 - 3.8 GHz spectrum bands (page 16).

⁴²³ Page 51 of the DotEcon Report (ComReg Document 20/122a).

⁴²⁴ Three UK's response to Ofcom's consultation on the Award of the 700 MHz and 3.6 - 3.8 GHz spectrum bands of 9 December 2019 (page 11).

6.200 Accordingly, the above factors indicate that a scenario in which Eir did not seek to maintain its competitive position with Vodafone and Three in terms of MBB coverage and related quality of service levels across important coverage dimensions (e.g. population, motorways, primary roads) would likely distort downstream retail competition for mobile telecommunications services.

Scenario 2: If Eir sought to maintain its competitive position

6.201 In light of the likely harm to Eir's ability to continue to provide an effective constraint upon its larger rivals for its core MBB service identified above, it is more likely that Eir would attempt to maintain its competitive position by adding some level of additional sites.

6.202 Rather than reiterate much of the previous analysis (such as in Sections 6.5.4 and 6.5.5 above), this section highlights some of the more important points regarding this potential scenario.

6.203 First, ComReg does not have meaningful visibility on the extent to which Eir would install additional macro sites beyond, for example, [REDACTED].

6.204 Second, given the likely prohibitive costs⁴²⁵ and time involved in seeking to provide a fully comparable MBB service (in terms of coverage and corresponding quality of service for same) with Vodafone and Three, Eir may instead choose to partially remediate by weighing up the costs and benefits of installing additional sites and coverage as the sector develops post-award. If so, and depending on the nature of Eir's choices in this regard, then there remains the potential for Eir to face a significant and enduring disadvantage in quality of service and coverage.⁴²⁶

6.205 Third, and as highlighted earlier, if Eir chose to deploy new sites then it would face:

- a) higher incremental costs (both CAPEX and OPEX) because of the additional sites it would need to deploy if it chose to match the high MBB coverage and quality of service levels of Vodafone and Three (in contrast to the lower costs for the latter two MNOs which could deploy 700 MHz Duplex spectrum on their existing sites and also benefit from the

⁴²⁵ Noting the earlier points [REDACTED] and Oxera's analysis of the increasing additional costs of improving coverage beyond 90%.

⁴²⁶ In that regard, ComReg again notes the point raised by Three UK in its submission to Ofcom of 9 December 2019 that "The 700MHz award is the last opportunity for MNOs to buy low frequency spectrum. Any competition issues that arise due to concentration of sub 1GHz spectrum will persist indefinitely."

coverage gains by carrier-aggregating this spectrum with their existing 800 MHz and 900 MHz spectrum);

- b) significant difficulties in keeping pace with the coverage expansion of Vodafone and Three given the considerably longer timeframes involved in deploying new sites (e.g. site negotiation, planning, construction, arranging backhaul etc) compared to adding 700 MHz Duplex spectrum at existing sites for Vodafone and Three. Alternatively, if Eir chose to a faster network roll-out than would normally be the case, then it would face further costs in doing so as outlined previously; and
- c) significant deficiencies compared to Vodafone and Three in terms of providing coverage in harder to serve areas (such as indoors) because of the poorer in-building penetration of alternative mid-band spectrum (e.g. 1800 MHz) compared to 700 MHz Duplex spectrum.

6.206 Fourth, these higher CAPEX and OPEX costs would also be carried by Eir over a considerably smaller customer and revenue base (see Table 4 above).

6.207 Fifth, these higher incremental costs and relatively poorer coverage in harder to serve areas would likely diminish Eir's ability to provide an effective competitive constraint going forward, including upon its recent aggressive approach to its mobile offerings following the launch of GoMo⁴²⁷ (noting also the impact this has had on competition, including taking customers away from each of Three and Vodafone). An increased cost base may reduce Eir's ability to compete as vigorously on price and, furthermore, customers may be less inclined to switch to Eir's MBB offerings if it had a lower quality of service and/or coverage levels than its rivals. Eir may have a reduced incentive to compete as vigorously on price in light of lower anticipated number of customers switching in response to a price decrease⁴²⁸.

6.208 Sixth, in the event that the competitive force exerted by Eir is significantly diminished, there is the potential for other operators to compete less vigorously as a result. In oligopolistic markets (including for Irish retail mobile telecommunications services as found by the EC), firms are strategically interdependent⁴²⁹ (i.e., the profit-maximising price of a firm is a best response to

⁴²⁷ If for example many GoMo users also valued quality of service and coverage as well as price. ComReg notes that at the time of its launch GoMo advertised it would offer "over 97% 4G coverage".

⁴²⁸ For a MNO, the decision to reduce prices to attract customers entails a trade-off between the margin on new subscribers attracted by the new lower price and the loss of margin on existing customers that avail of the new lower price (i.e., cannibalised sales)

⁴²⁹ The EC's Guidelines on Horizontal mergers "An oligopolistic market refers to a market structure with a limited number of sizeable firms. Because the behaviour of one firm has an appreciable impact on the overall market conditions, and thus indirectly on the situation of each of the other firms, oligopolistic firms are interdependent."

the price of its rivals)⁴³⁰ and, therefore, the terms of Eir's offerings likely influence the decisions made by Vodafone and Three, in particular, in relation to the terms of their own offerings. Research undertaken by WIK Consulting on behalf of the EC highlights the potential for unstable competition in three operator mobile markets (e.g., fluctuating levels of competition over time) such as Ireland⁴³¹, with competition in many cases being dependent on smaller players.⁴³² Such research, in ComReg's view, demonstrates the heightened sensitivity of the overall level of competition in three operator markets to the ability of all three operators to effectively compete.

6.209 Furthermore, ComReg does not consider that the presence of existing MVNOs, or entry by new MVNOs, would sufficiently compensate for any significant reduction in Eir's ability to provide an effective competitive constraint. For example:

- a) There are important differences between MVNO's and MNOs; an MVNO cannot invest and compete in terms of the quality of its network, thus limiting the competitive strategies available to it. In particular, an MVNO may have no influence on its host MNO's coverage and related quality of service levels. Similarly, an MVNO attempting to compete vigorously may be limited by its ability to secure sufficiently attractive terms from MNOs as such additional competition could impact its host MNO's product offerings.

- b) [REDACTED]

⁴³⁰ For the avoidance of doubt, this is a general point on competition in mobile markets and is distinct does not refer to tacit coordination. As noted by the General Court in *Airtours* such strategic interdependence is only one among several factors necessary to facilitate tacit coordination.

⁴³¹ For example, on page iii, WIK noted the following:

“Indeed, analysis conducted for this study of both fixed and mobile cases in the absence of regulation or where the take-up of regulated access was minimal) suggests that markets with two firms with symmetric and stable market shares (a structure which may be conducive to tacit collusion), are often associated with denial of access, higher prices and slower upgrades, while wholesale conduct and outcomes in three player markets may be more varied depending on whether specific players (often smaller providers) play a disruptive or follower role. Conversely, markets with four or more widespread infrastructure providers show greater tendencies to be associated with commercially provided wholesale access and more positive outcomes concerning quality and/or price.”

⁴³² WIK (2018) for the EC “Review of the SMP Guidelines” <https://op.europa.eu/en/publication-detail/-/publication/6eebf7b9-4833-11e8-be1d-01aa75ed71a1/language-en>

⁴³³ [REDACTED]

as “a distant third player”.

6.5.8 Proposed Sub-1 GHz Cap – ComReg’s competition analysis - conclusion

6.212 For the reasons set out above, ComReg considers that a Sub-1 GHz cap of 80 MHz would likely result in an extreme asymmetry in Sub-1 GHz holdings which would likely distort downstream competition in mobile telecommunications services within the meaning of Regulation 9(11) of the Authorisation Regulations.

6.213 In the next section, ComReg consider various alternative cap proposals presented by Three.

6.5.9 Proposed Sub-1 GHz Cap: Three’s alternative proposals

Summary of Three’s proposals and supporting material

6.214 In summary, Three put forward two alternative/additional Sub-1 GHz cap proposals, being:

- i. An additional joint cap of 2 × 25 MHz of 700 MHz Duplex across any two bidders, and which would “*have the effect of removing scenarios where both Vodafone and Eir each win 2x15 MHz in the winner and price determination*” (which Three subsequently called “**Option 5(a)**”); and
- ii. to use spectrum caps that only count spectrum that is available in the award itself and would, in Three’s view, apply equally to all bidders (either 2 × 10 MHz or 2 × 15 MHz of 700 MHz Duplex) (Three’s so-called “**Option 6**”).

6.215 Three also proposed a joint cap of 2 × 25 MHz in the 700 MHz Duplex on any two winners for the purposes of price determination only. As this proposal would not expressly restrict the ability of Vodafone and Eir to win 2 × 15 MHz each under the Proposed Sub-1 GHz Cap, it is not considered in the context of the Spectrum Competition Caps but instead in Chapter 7.

Option 5(a) – Three’s supporting material

6.216 In relation to Option 5(a), Three:

- a) proposes two supporting rule modifications⁴³⁵;

⁴³⁵ Specifically:

- Amending the closing rule for the clock rounds so bidding would continue if only two bidders remained competing for three 700 MHz lots each. Three also clarified that “*Under the current*

b) makes various submissions in support of its proposal (hereafter referred to as “**Three’s supporting material**”), including:

- i. it may be justified as a precautionary measure, “*designed to head off the potential for competition concerns*” and, in particular, it would “*diminish the likelihood of an auction outcome in which there were only two winning bidders*” (i.e. it would ensure at least three winners). Three also states that “*We suppose that ComReg may view this as an upside, given that it has separately argued that “a cap above 70 MHz risks there being only two winners for 700 MHz spectrum in this award” (ComReg Document 19/124a paragraph 74)*”;
- ii. “*The introduction of these two rules would preserve the structure of ComReg’s current proposal, and continues to meet ComReg’s desire to protect against an increased asymmetry in sub-1GHz spectrum where Eir is not a winning bidder in the same way as the current proposal does. Crucially however it mitigates the harm to Three that is an undesired collateral outcome if the modifications are not made*”;
- iii. In response to ComReg’s query (in Document 20/56) as to “*Whether a joint cap would place a restriction on bidders that goes beyond what ComReg has deemed necessary to safeguard competition*”, Three submits that “*We note that ComReg’s own proposal goes beyond what it has deemed necessary to safeguard competition, with flawed discriminatory effect.*”
- iv. In response to ComReg’s query (in Document 20/56) as to “*Whether [the joint cap] would prevent an outcome where both Vodafone and Eir obtain 70 MHz of spectrum, whereas Three only has 50 MHz.*”, Three submits:

“This would require that Three does not bid for any 700MHz spectrum, note that Three would then have zero after 2030. Again it only has effect if there is no other bidder which is

rules, the clock price at 700 MHz is increased if aggregate demand exceeds supply. Under the revised rules, the clock price at 700 MHz would also be increased if aggregate demand equals supply AND there were no more than two clock round bids that included 700 MHz lots.”; and

- *Optionally, a requirement that bidders bidding for packages containing three 700 MHz lots also submit a supplementary bid for otherwise identical packages with two 700 MHz lots, with a price difference no greater than the final clock price for 700 MHz. This option is presented by Three as “option 5(c)”.*

Three also submits, in relation to these proposed changes, that: “*We do not believe these modest changes materially add to the complexity of an already complex format. Indeed, because this rule precludes a potentially extreme allocation outcome that could be used to drive prices, it may actually reduce strategic complexity for bidders. If ComReg wishes to address concerns regarding complexity, it should switch to an SMRA-type format.*”

precisely when ComReg's proposal is most discriminatory. (We note that ComReg's Proposed Spectrum Competition Caps prevent an outcome where the following is obtained: Eir 80MHz, Voda 60MHz, Three 50MHz or Voda 80MHz, Eir 60MHz, Three 50MHz (up to 2030), with no coherent analysis or explanation provided as to why). We do not see why it should be a plausible or viable concern. The effect of the cap is to eliminate one rather asymmetric outcome. In our view, this would level the playing field between operators, as the discount available to Eir and Vodafone for their 1st lot has the effect of making them more competitive for a 2nd lot if, as is plausible, they place a higher value of the 2nd lot than the 1st lot. We also note that the cap would still allow any one of Eir, Three or Vodafone to obtain 70 MHz."

- v. In response to ComReg's query (in Document 20/56) as to "Whether [the joint cap] would amount to an effective reservation of some 700 MHz Duplex spectrum for Three in the event that only the existing MNOs competed for 700 MHz Duplex spectrum.", Three submits:

"The effect of ComReg's existing cap is to create an effective reservation of some 700 MHz spectrum for Eir and for Vodafone in a situation where only the three MNOs compete for this band. Our proposal removes the flawed discrimination against Three by providing us with an equivalent concession."

- vi. In response to ComReg's query as to "Whether it would preclude outcomes where Three has less sub-1 GHz spectrum than Eir and Vodafone.", Three submits:

"It doesn't preclude a 3-2-1 outcome, so either Vodafone or Eir could emerge with more spectrum than Three, but not both. This is factually correct, assuming only the three MNOs bid. We do not see why this should be a concern. To be clear, Three could still end up with the (joint) lowest amount of sub-1 GHz spectrum, and either Eir or Vodafone could have the largest amount."

- vii. it is "required to eliminate the discrimination against Three if ComReg decides to proceed with a CCA with its preferred sub-1 GHz cap. The rule ensures that in a 3 MNO scenario, at least one 700 MHz reserve price bid must be present in the alternative bid set that determines Three's price, as is already the case for Eir and Vodafone.";
- viii. [In a three-player scenario] it would place Three on a more level

playing field with Eir and Vodafone with respect to pricing, as Three would also de facto be guaranteed to pay reserve price for its first lot in the event that there are only three bidders for 700MHz;

- ix. Importantly, while these rules may result in Three securing a better price outcome in a three bidder contest, with a discount on the first lot equivalent but not exceeding that afforded to Eir and Vodafone, they will not change the prices that Eir and Vodafone pay.

Option 5(a) - views of interested parties on Three's proposals

Eir

6.217 In its response to Document 20/56 regarding Option 5(a), Eir submits:

"35. Three's concern is about the potential for asymmetric pricing of 700MHz spectrum, not the potential for two bidders to win all of the available spectrum. Irrespective of the merits of Three's case there is no justification whatsoever for prohibiting two bidders from winning all of the available 700MHz spectrum (subject to the already proposed sub-1GHz cap). Such an additional 700MHz spectrum cap could clearly lead to an inefficient outcome, and there is no justification for this. This option would therefore, at the very least, be disproportionate and should be rejected by ComReg."

6.218 In its response to Document 20/78 in relation to "Option 6" (as proposed by Three in its response to Document 20/56), Eir submits:

"3. Three has proposed a further option, option 6, to apply spectrum caps that only count the spectrum in the award. eir does not agree that this is a reasonable proposal. Three states that "ComReg has missed the most obvious and straightforward modification". [h]owever this is simply not the case as ComReg's proposed spectrum caps have resulted from a detailed consultation process which considered all potential options."

6.219 In its response to Document 20/56, Vodafone submits:

- x. *We agree that the current spectrum caps are a reasonable measure to prevent damage to competition.*
- xi. *Any asymmetric price outcome in this planned award would arise because of the different starting points of the bidders.*
- xii. *Outcome with asymmetric prices have been a feature of previous auctions in Ireland and internationally.*
- xiii. *We note the spectrum caps from MBSA1. In that auction, Three were*

effectively guaranteed a block of 900MHz at reserve price: a much lower cost than the cost to other operators. This outcome arose because Three had started with less spectrum. Now that positions are reversed, and Three are starting with more spectrum, they cannot reasonably complain that a possible outcome of the planned award could be that they will pay more.

- xiv. *“Each of the Options 5a to 5c appear to be an evident attempt by Three to distort the auction rules in their favour, seeking to guarantee their continued spectrum advantage. The only argument that Three have raised against the current Draft IM is a possible asymmetric price outcome. Running auctions using spectrum caps that apply to all parties but asymmetrically effect operators with larger holdings of spectrum has been a feature of previous auctions in Ireland and in other countries. Redesigning the auction to allow Three to maintain a spectrum advantage at low cost would clearly be discriminatory.”*
- xv. *“The following comments apply to Options 5(a) to 5(c):*
- The current MNOs Vodafone, eir and Three operate in a competitive market. ComReg have committed to assign this spectrum in an open transparent and non-discriminatory process.*
 - These options 5(a) to 5(c) appear to be aimed specifically at preventing an outcome where Three have less spectrum than the other MNOs.*
 - Just as it would be entirely inappropriate for Comreg to and introduce specific rules to guarantee a number of blocks of 700Mhz spectrum to Vodafone only it is against the nondiscriminatory principles of section 12 of the Act of 2002 to introduce rules that preserve Three’s spectrum advantage.*
 - These rules appear to have no purpose other than to reduce the price that Three would pay and so do not align with ComReg’s objective in the auction. In fact they discriminate against other bidders.”*
- xvi. *“Vodafone agrees with the ComReg observations [on Option 5(a) as detailed in paragraph 2.56 of Document 20/56]”*

ComReg’s assessment of Option 5(a)

6.220 First, ComReg notes that Option 5a is put forward by Three in the context of ComReg’s proposed CCA format (and opportunity cost pricing) and, further, where the Proposed Sub-1 GHz Cap and Proposed Overall Cap would also

apply.

6.221 ComReg observes that Three's rationale for the proposed additional sub-cap can be distilled to the following essential points:

- a) it would avoid a situation where there were only 2 winners of 700 MHz Duplex spectrum and, in particular, would *"have the effect of removing scenarios where both Vodafone and Eir each win 2x15 MHz in the winner and price determination"*; and
- b) it would avoid the concerns raised by Three regarding pricing as a result of not being able to express an opportunity cost for third lot of 700 MHz Duplex.⁴³⁶

6.222 The relevant question is whether the potential spectrum accumulation outcome which Three is seeking to prevent via Option 5(a) would be justified in terms of distortions to competition, and also whether this additional restriction would be proportionate, non-discriminatory etc.

6.223 ComReg considers this issue by examining Three's supporting material (but not those relating to pricing which are considered in Chapter 7) as summarised in paragraph 6.216 above, including by reference to the views of other interested parties.

Option 5(a) – Three's supporting material point (i) – Option 5(a) may be justified as a precautionary measure etc

6.224 In relation to **point (i) of Three's supporting material**, ComReg outlines its response as follows.

6.225 First, ComReg observes that Three cites the introductory paragraph of the section of DotEcon's report in relation to competition caps, which is merely a high level summary of ComReg's position in Document 19/59R.

6.226 Second, ComReg would, instead, highlight paragraphs 7.247 and 7.248 of Document 19/59R (and the latter in particular)⁴³⁷.

⁴³⁶ For example:

"The effect of ComReg's existing cap is to create an effective reservation of some 700 MHz spectrum for Eir and for Vodafone in a situation where only the three MNOs compete for this band. Our proposal removes the flawed discrimination against Three by providing us with an equivalent concession." (emphasis added) (page 20 of Three's response to Document 20/56).

⁴³⁷ Which stated:

"ComReg notes that 700 MHz Duplex rights of use would allow an MNO to use Carrier Aggregation across the three sub-1 GHz bands, thereby reducing the costs of deploying high-speed connectivity across wide areas. In circumstances where one MNO did not obtain any

6.227 Third, ComReg refers to its subsequent detailed analysis and assessment of the likely effects upon Eir and to downstream competition that could arise if Three and Vodafone each obtained 2 × 15 MHz of 700 MHz Duplex spectrum (i.e. Eir not obtaining any) under a cap level of above 70 MHz in Document 19/124 and as updated in this document, and the underlying material in support of same.

6.228 Fourth, ComReg observes that Three has not put forward meaningful competition arguments as to why each of Vodafone and Eir winning 2 × 15 MHz should be precluded on the basis of a likely distortion to downstream competition.

6.229 Fifth, ComReg observes that a potential outcome of Three not obtaining any 700 MHz Duplex spectrum and Vodafone and Eir each obtaining 2 × 15 MHz (which is the outcome sought to be avoided by Option 5(a)) would be materially different to that of Eir not obtaining any 700 MHz, based on the above-mentioned analysis. For example:

a) Three would still have 2 × 25 MHz of sub-1 GHz spectrum and there would be a substantial difference in the level of asymmetry in sub-1 GHz holdings between Three and Eir in the two scenarios. In particular:

- i. **sub-1 GHz cap level of 80 MHz:** (Three and Vodafone each win 2 × 15 MHz): Three (2 × 40 MHz), Vodafone (2 × 35 MHz) and Eir (2 × 20 MHz) (i.e. a 2 × 20 MHz (or 100%) asymmetry between Three and Eir in favour of Three);
- ii. **Option 5(a):** (Vodafone and Eir winning 2 × 15 MHz): Vodafone and Eir (2 × 35 MHz each) and Three (2 × 25 MHz) (i.e. 2 × 10 MHz (or 40%) asymmetry between Vodafone/Eir and Three in favour of Vodafone/Eir);

b) Three has considerably higher existing sites than Eir including, in particular, overall sites, LTE sites, and 800 MHz and 1800 MHz sites (see Tables 6 and 7 above);

c) [REDACTED]

700 MHz rights, it would need to carrier aggregate with 1800 MHz (or alternative) spectrum rights which would not be as cost effective and may already be required to meeting existing demands. In such circumstances, ComReg would be concerned if that MNO could not effectively and/or cost efficiently replicate the advantages that would accrue to the other MNOs which did have access to 700 MHz Duplex spectrum rights, given said disadvantages would affect its ability compete effectively in the relevant market/s.

Whilst such concerns would apply to any MNO which did not obtain 700 MHz Duplex rights, they are likely to be more acute in the case of Eir which, among other things, has a smaller customer base (and therefore lower mobile revenues with which to seek to ameliorate the above disadvantages) and lower amounts of spectrum holdings overall (including 1800 MHz). (emphasis added)

holdings and so such outcomes would not distort competition;

- (iv) It would be disproportionate to impose these additional restrictions upon the ability of other undertakings to acquire 700 MHz Duplex rights for the purposes of addressing Three's pricing concerns, not least because that Three itself has proposed an arguably less onerous measure to address its stated pricing concerns (i.e. a sub-cap on price determination only ("Option 5b")); and
- (v) ComReg notes Eir's and Vodafone's objections to Three's proposal, including that it lacks appropriate justification and would be disproportionate⁴³⁹.

Option 5(a) – Three's supporting material – points (iii) and (v) – Proposed Sub-1 GHz Cap is disproportionate and discriminatory

6.232 In relation to **point (iii) of Three's supporting material**, and for the reasons set out in Document 19/124 and in this document, ComReg does not believe that its Proposed Spectrum Competition Caps are discriminatory or disproportionate.

Option 5(a) – Three's supporting material - point (iv) – other sub-1 GHz outcomes that would be precluded under the Proposed Sub-1 GHz Cap

6.233 In relation to **point (iv) of Three's supporting material** (in relation to other potential sub-1 GHz outcomes that would be precluded under the Proposed Sub-1 GHz Cap), ComReg does not consider this to be particularly problematic in the circumstances for the following reasons.

6.234 First, and as discussed in section 6.3.3 above, when one takes into account sub-1 GHz holdings, there are very limited feasible options available in terms of the level of any sub-1 GHz cap.

6.235 Second, while ComReg recognises that there are a range of possible outcomes that would also be excluded by adopting a sub-1 GHz cap of 70 MHz, ComReg does not believe this factor to be sufficient, in the context of its objectives and duties in relation to competition (including to safeguard competition), to justify permitting its spectrum award to become a mechanism by which the largest two MNOs would be able to bid strategically to obtain sub-1 GHz spectrum

⁴³⁹ For example, Eir submits in its response to Document 20/56:

"35. Three's concern is about the potential for asymmetric pricing of 700MHz spectrum, not the potential for two bidders to win all of the available spectrum. Irrespective of the merits of Three's case there is no justification whatsoever for prohibiting two bidders from winning all of the available 700MHz spectrum (subject to the already proposed sub-1GHz cap). Such an additional 700MHz spectrum cap could clearly lead to an inefficient outcome, and there is no justification for this. This option would therefore, at the very least, be disproportionate and should be rejected by ComReg."

accumulations that would likely distort downstream competition.

6.236 Third, ComReg notes and agrees with DotEcon's view (at page 55 of Document 20/122a) that:

“Finally, Three has raised a specific point about which outcomes are included and excluded under the proposed cap. In response to ComReg’s observation that Three’s joint cap would rule out the outcome in which Three wins nothing and Vodafone and Eir split the 700 MHz equally between them, leading to a 7/7/5 outcome, Three questions why an 8/6/5 outcome, in which Three wins nothing and Vodafone and Eir have a four to two split of the six 700 MHz lots is ruled out. The difference between these cases is clear: in the 8/6/5 case there is an asymmetry of three blocks, whereas if Vodafone and Eir win three 700 MHz lots each the asymmetry is only two blocks. If we were to set a cap at 80 MHz to allow the 8/6/5 outcome, this would also permit an 8/7/4 outcome with an asymmetry of four blocks.”

6.237 Fourth, and as Three will be aware, ComReg has considered, and further considers in this document, alternative spectrum cap proposals as to their appropriateness to address the competition concerns identified.

6.238 Finally, and noting the potential outcomes cited by Three, ComReg also observes that Vodafone supports the Proposed Sub-1 GHz Cap, Eir does not object to the Proposed Sub-1 GHz Cap, and both do not support Option 5(a).

Three’s pricing concerns in the context of its proposed additional sub-cap

6.239 ComReg notes Three’s pricing concerns, and the pricing benefits that would accrue to Three as a result of its proposed sub-cap.⁴⁴⁰

6.240 ComReg addresses Three’s pricing concerns in Chapter 7. For example, in the context of ComReg’s obligations in relation to selection criteria and spectrum fees.

6.241 Without prejudice to that assessment, ComReg does not believe the claimed potential pricing effects upon Three from the combination of the Proposed Spectrum Competition Caps and CCA format are sufficient to justify the imposition of the additional restrictions upon Vodafone’s, Eir’s, Imagine’s, Airspan’s and any potential entrant/s’ ability to acquire additional sub-1 GHz

⁴⁴⁰ For example:

- “Three would also de facto be guaranteed to pay reserve price for its first lot in the event that there are only three bidders for 700MHz”; and
- “Importantly, while these rules may result in Three securing a better price outcome in a three bidder contest, with a discount on the first lot equivalent but not exceeding that afforded to Eir and Vodafone, they will not change the prices that Eir and Vodafone pay.”

spectrum rights (and combinations of same) that would arise under Option 5(a). This is because such respective accumulations are not considered, under the Proposed Sub-1 GHz Cap, likely to distort competition in the context of Regulation 9(11) of the Authorisation Regulations and, further, Three has not set out convincing competition arguments to the contrary.

6.242 Accordingly, and in light of the above, ComReg does not believe it necessary to consider Option 5(a) any further.

ComReg's assessment of Three's 700 MHz Duplex only cap (either 2 x 10 MHz or 2 x 15 MHz of 700 MHz Duplex)

6.243 ComReg recalls that it considered Three's alternative spectrum proposal in Document 19/124⁴⁴¹, including Three's view that "*the most appropriate cap is 2 x 10 MHz per operator*", and refers to its assessment in same.

6.244 ComReg also observes that Three does not appear to have meaningfully addressed these considerations in its submissions subsequent to the publication of Document 19/124.

6.245 In addition, ComReg notes that a cap of 2 x 15 MHz of 700 MHz Duplex would not address the situation of Three and Vodafone each obtaining 2 x 15 MHz and in relation to which ComReg remains concerned.

6.246 Therefore, for the reasons set out in Document 19/124 and as updated and/or refined in this document (such as in relation to whether existing 800 MHz and 900 MHz spectrum rights should be taken into account), ComReg does not consider Three's alternative 700 MHz Duplex spectrum cap proposal (whether of 2 x 10 MHz or 2 x 15 MHz) to be a valid or plausible option.

6.5.10 Proposed Sub-1 GHz Cap - updated consideration of Proposed Sub-1 GHz Cap against various regulatory obligations and principles

6.247 First, ComReg refers to its previous considerations on these matters as set out in Document 19/124. See, in particular, paragraphs 6.209 – 6.214 and paragraphs 6.217 – 6.218.

6.248 Second, ComReg also refers to its relevant considerations as updated in this chapter (such as its assessment of Three's various claims, including those of a more general nature, in relation to legal basis and non-discrimination).

6.249 Given this extensive preceding material, ComReg observes that an update is only reasonably required regarding the proportionality of the Proposed Sub-1

⁴⁴¹ See paragraphs 6.200 – 6.208 of Document 19/124.

GHz Cap, noting also Three's claim that ComReg has not carried out the analysis required to demonstrate that the cap proposed is a proportionate remedy given the claimed discriminatory impact.

6.250 In that regard and having considered the views of Three and other interested parties, including Three's alternative proposals, ComReg considers that its Proposed Sub-1 GHz Cap would be proportionate for the following reasons.

6.251 First, ComReg has extensively considered whether existing 800 MHz and 900 MHz spectrum rights ought to be taken into account in the award of 700 MHz Duplex rights. For the reasons set out in previous documents, including as and as further reflected upon and updated in this document, ComReg's final position is that it is appropriate to take into account all existing spectrum holdings in the 800 MHz and 900 MHz bands at the time of Applications for the purposes of a spectrum competition cap for the award of 700 MHz Duplex rights.

6.252 Second, and in light of this assessment, ComReg has considered, firstly, whether it would be appropriate to impose a sub-1 GHz cap of less than 70 MHz (i.e. 60 MHz). However, for the reasons set out in Document 19/59R and as further discussed in this chapter, ComReg does not believe it appropriate to do so.

6.253 Third, ComReg has given detailed consideration to whether it would be appropriate to impose a sub-1 GHz cap of greater than 70 MHz. In that regard, and on the basis of ComReg's evaluative judgement having regard to the available information before it including the views of its expert advisors, ComReg considers that a sub-1 GHz cap of 80 MHz would likely result in an extreme asymmetry in sub-1 GHz holdings which would likely distort downstream competition in mobile telecommunications services within the meaning of Regulation 9(11) of the Authorisation Regulations. Given this, ComReg further considers that it would not be appropriate to not apply a sub-1 GHz cap at all, given the overwhelming asymmetry in sub-1 GHz holdings that could arise in such a scenario⁴⁴² and the likely distortions to downstream competition from same.

6.254 Fourth, and in light of the foregoing, the Proposed Sub-1 GHz Cap, which would take proper account of relevant existing holdings in the 800 MHz and 900 MHz bands, and would limit all bidders to accumulating a maximum of 70 MHz of sub-1 GHz holdings, is suitable and effective to prevent the potential spectrum accumulation outcome which ComReg considers could give rise to a distortion of competition (under a sub-1 GHz cap level of 80 MHz or greater), noting ComReg's obligations under, *inter alia*, Regulation 9(11) of the Authorisation Regulations to prevent such accumulations, and the various measures identified

⁴⁴² It could result in Three holding close to three times the sub-1 GHz holdings of Eir, which would increase the level of current asymmetry from 25% to 275% (i.e. an 1100% increase in the level of current asymmetry).

in Article 5 of the RSPP Decision⁴⁴³.

6.255 Fifth, and in contrast, Three's Option 5(a) is not suitable because:

- i. it would unduly restrict Vodafone's, Eir's, Imagine's, Airspan's and any potential entrant/s' (MNO or otherwise) ability to acquire additional 700 MHz Duplex holdings in circumstances where such respective accumulations (in the context of sub-1 GHz holdings) are not considered to be likely to distort competition under Regulation 9(11) of the Authorisation Regulations;
- ii. Three has not set out persuasive reasons and supporting material as to why such additional restrictions on each of these other undertakings would be necessary to prevent a likely distortion to competition;
- iii. in addition, ComReg observes that a potential situation of Three not obtaining any 700 MHz Duplex spectrum and Vodafone and Eir each obtaining 2 x 15 MHz (which is the outcome sought to be avoided by Option 5(a)) would be materially different to that of Eir not obtaining any 700 MHz Duplex spectrum and each of Vodafone and Three obtaining 2 x 15 MHz (which is the outcome sought to be avoided by the Proposed Sub-1 GHz Cap);
- iv. Three's proposal would treat different situations the same by seeking a reservation of 2 x 5 MHz of 700 MHz Duplex, as it claims would be afforded Vodafone and Eir under the Proposed Sub-1 GHz Cap, but where it currently holds an additional block of sub-1 GHz spectrum compared to Vodafone and Eir; and
- v. It would be disproportionate to impose these additional restrictions upon the ability of other undertakings to acquire 700 MHz Duplex rights for the purposes of addressing Three's alleged pricing concerns, not least because Three itself has proposed an apparently less onerous measure to address its stated asymmetric pricing concerns (i.e. a 2 x 25 MHz sub-cap on price determination only ("Option 5b").

6.256 Sixth, Three's alternative proposed 700 MHz Duplex-only cap (of 2 x 10 MHz or 2 x 15 MHz), which would only count spectrum available in the Proposed Award, is also not suitable because:

- i. for the reasons set out in Document 19/124 and as further reflected upon and updated in this document, existing 800 MHz and 900 MHz spectrum holdings should be taken into account for the award of 700 MHz Duplex

⁴⁴³ The substance of which is now contained in Article 52 of the EECC. See, in particular, sub-paragraph 2(a).

rights;

- ii. a 700 MHz Duplex-only cap of 2 × 15 MHz would not be effective in preventing the extreme asymmetry in Sub-1 GHz holdings which ComReg considers would be likely to arise under a Sub-1 GHz cap level of 80 MHz and would likely distort downstream competition in mobile telecommunications services within the meaning of Regulation 9(11) of the Authorisation Regulations;
- iii. a 700 MHz cap of 2 × 10 MHz or 2 × 15 MHz would also unduly restrict Vodafone's, Eir's, Imagine's, Airspan's and any potential entrant/s' (MNO or otherwise) ability to acquire additional 700 MHz Duplex rights in circumstances where such respective accumulations (in the context of Sub-1 GHz holdings) are not considered to be likely to distort competition under Regulation 9(11) of the Authorisation Regulations; and
- iv. whilst Three could only obtain two 700 MHz Duplex lots under both its 2 × 10 MHz 700 MHz Duplex-only cap proposal and ComReg's Proposed Sub-1 GHz Cap, Three's proposal is clearly more restrictive on other potential bidders than ComReg's Proposed Sub-1 GHz Cap⁴⁴⁴.

6.257 Seventh, the Proposed Sub-1 GHz Cap would not produce adverse effects which would be disproportionate to the aim pursued. In particular, while it would limit Three to acquiring two 700 MHz lots (compared to three 700 MHz lots for each of Vodafone and Eir because of their lower existing sub-1 GHz holdings):

- i. It would still allow for a significant increase in the level of current asymmetry between Three and Eir from 25% to 40% (i.e. a 60% increase in the level of current asymmetry);
- ii. If there is no interest for the 700 MHz Duplex lots other than from the MNOs, then all three MNOs would be faced with the prospect of ending the auction with five, six or seven sub-1 GHz lots; and
- iii. If there is interest from at least one additional bidder, then Three is arguably in a more favourable position than Vodafone and Eir due to its

⁴⁴⁴ See, in particular, paragraph 6.203 of Document 19/124 which states:

“...For example:

- with a 70 MHz cap on sub-1 GHz spectrum, any (and potentially two) of the three MNOs could end the award with seven sub-1 GHz blocks, whereas under Three's proposal, only Three would have the option of acquiring a seventh sub-1 GHz block, with Vodafone and Eir able to end the auction with at most six;
- limiting any new entrant to 2×10 MHz in the 700 MHz Duplex (compared to when they would be able to obtain 2×30 MHz under ComReg's proposal) when they may reasonably require more sub-1 GHz spectrum rights to compete effectively with incumbent MNOs given incumbents' existing sub-1 GHz spectrum holdings.”

greater existing holdings (i.e. its additional block of 900 MHz spectrum); in that case it would be guaranteed five sub-1 GHz lots at the end of the auction, while the other two would only be guaranteed four.

6.258 For the avoidance of doubt, and given Three's concerns regarding the combination of the Proposed Spectrum Competition Caps and the proposed CCA format, ComReg considers the proportionality of same in Chapter 7.

6.6 Proposed Overall Cap

Summary of ComReg's position in Document 19/124

6.259 Having consulted upon a range of 380 MHz – 420 MHz for its proposed overall cap in Document 19/59R and having further considered the matter, including the views of interested parties submitted in response to Document 19/59R, ComReg considered that a **Proposed Overall Cap of 375 MHz** would, compared to alternative caps within the 380 – 420 MHz range, better guard against distortions to competition arising from extreme asymmetries in post-award spectrum holdings, particularly in light of:

- (i) the current (post-Merger) MNO market structure, including the risk of the MNO with the smallest spectrum holding not being able to effectively compete, thereby leading to the possible creation of an effective duopoly; and
- (ii) the significant potential for non-MNO bidders to acquire spectrum in the Proposed Award and thereby exacerbate the level of asymmetry between Three and Eir post-award.

6.260 ComReg also noted that an overall cap at this level would still allow the MNOs with larger spectrum holdings to acquire a considerable amount of spectrum rights (e.g. Three and Vodafone could still increase their current holdings by 55% and 80%, respectively) and noting that MNOs are only now just starting to deploy networks using their 3.6 GHz Band rights of use.

6.261 ComReg also clarified that any 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz holdings obtained under the Proposed Award may be taken into account for a competition cap/s for the award of sufficiently substitutable and/or complementary spectrum bands in the future.

Views of interested parties

Eir

6.262 In its response to Document 19/124 (page 11), Eir submits that:

- i. *“[it] agrees that the aggregate spectrum cap should be set at no higher than 375MHz (in total) and that allocations in the 3.6GHz band should be measured by reference to the highest holding in any region”*; and
- ii. *“[it] agrees that existing holdings in the 2.3GHz band should not count towards the spectrum cap particularly as the spectrum is used for non-mobile / non-broadband services and its use is transitory in nature.”*; and

Imagine

6.263 In its response to Document 20/32, Imagine submits:

- iii. *“The overall cap proposed by ComReg at 375MHz whilst addressing the objective of avoiding the creation of an effective duopoly and reducing the possibility of exacerbating the level of asymmetry between Three and Eir post-award [citing Document 19/124 Para 6.252] could, had it been lower, have reduced the likelihood that the majority of the spectrum will be acquired by the three MNO at the expense of other operators and new entrants, particularly existing and potential FWA operators.”*

Vodafone

6.264 In its response to Document 19/124, Vodafone submits:

- iv. In relation to the overall cap: *“For the overall spectrum figure, we supported the range 375-420 identified by ComReg in their last Consultation. ComReg have now chosen a value at the lower end of this range. In deciding on an appropriate figure ComReg appear to have set the cap value with reference to inputs from small players and by calculation of the most extreme possible outcome of Three versus Eir. We do not believe that this is the appropriate measure for the calculation of the overall competition cap value. It would be more appropriate to use market percentages as were used previously.”*
- v. *“We would also note we disagree with Eir's proposal to have a Band specific cap for the 2.1GHz band.”*

Three

- vi. *The aim in designing the process should be to deliver an auction that is open and non-discriminatory, and that delivers an efficient outcome through competition among bidders. ComReg seems to have a preference to avoid certain outcomes which conflicts with these objectives⁴⁴⁵:*

“ComReg would be primarily concerned with a situation where the

⁴⁴⁵ Pages 21-22 of Three's response to Document 19/124.

two larger MNOs could bid up to a sub-1 GHz cap in order to make the smallest MNO (i.e. Eir) a more marginal player by denying it 700 MHz rights of use.[ComReg 19/124, paragraph 6.186].”

This, it seems extends to protection of Eir in circumstances where there is competition in bidding from new entrants⁴⁴⁶:

“ComReg considers that an overall spectrum competition cap of 375 MHz would, compared to alternative caps within the 380 – 420 MHz range, better guard against distortions to competition arising from extreme asymmetries in post-award spectrum holdings, particularly in light of: „,„the significant potential for non-MNO bidders to acquire spectrum in the Proposed Award and thereby exacerbate the level of asymmetry between Three and Eir post-award [ComReg 19/124, paragraph 6.247]”.

ComReg’s assessment

6.265 First, ComReg notes Eir’s agreement with the Proposed Overall Cap.

6.266 In relation to Imagine’s submission, ComReg recalls its assessment of Imagine’s proposal of an overall cap of no more than 25% of the total available spectrum (i.e. an overall competition cap of 290 MHz) at paragraphs 6.219 - 6.225 of Document 19/124. While Imagine does not put forward a specific overall cap level in its response to Document 19/124, ComReg observes that it has not meaningfully addressed the considerations set out by ComReg in Document 19/124, including that Imagine has not identified how accumulations by existing MNOs at the proposed level of 375 MHz would likely distort competition so as to justify a level lower than 375 MHz.

6.267 In relation to Vodafone’s submission regarding the proposed overall cap level of 375 MHz, ComReg outlines its response as follows:

- a) first, ComReg’s proposal to implement an overall cap of 375 MHz in Document 19/124 followed consideration of the views (including alternative proposals and alternative metrics for calculating asymmetry) of all interested parties who provided a submission in response to Document 19/59R;
- b) second, ComReg observes that Vodafone does not appear to be concerned with the level of the Proposed Overall Cap but rather the methodology used for determining same; and

⁴⁴⁶ Page 22 of Three’s response to Document 19/124.

c) in that regard, ComReg notes and agrees with DotEcon's view that⁴⁴⁷:

“Our understanding of Vodafone’s suggestion is that it would be better to place a cap on the proportion of the available spectrum that could be held by any one bidder. It is unclear to us which award Vodafone is referring to when recommending ComReg “use market percentages as were used previously”,⁴⁴⁸ and we note that for the 3.6 GHz award, we recommended that ComReg set caps to ensure a minimum number of winners of the spectrum would be able to compete effectively, while also ensuring bidders could express a reasonable level of demand.⁴⁴⁹ An alternative metric based on the proportion of spectrum that a bidder could hold would need to be set at a level determined by similar considerations about the ability of winning bidders to compete after the award, and therefore would probably be a less direct way of applying the same principles.”

6.268 In relation to Vodafone's disagreement with Eir's 2.1 GHz band-specific proposal, ComReg notes same and further that Eir has not raised its proposal since the publication of Document 19/124 or addressed ComReg's considerations of its proposal in Document 19/124. Accordingly, ComReg does not believe that it would be appropriate to implement the 2.1 GHz band specific cap proposed by Eir.

6.269 In relation to Three's point regarding the “*protection of Eir in circumstances where there is competition in bidding from new entrants*”, ComReg does not consider this claim to be persuasive.

6.270 First, ComReg observes that Three refers to “new entry” (and presumably new entry into the mobile markets concerned) when, in fact, the text cited by Three from paragraph 6.247 of Document 19/124⁴⁵⁰ refers to the significant potential for “non-MNO bidders to acquire spectrum”. That is, the impacts that acquisitions of spectrum rights by bidders not participating in the mobile markets (e.g. Imagine and Dense Air) would have on the level of spectrum asymmetry between Three

⁴⁴⁷ Page 81 of DotEcon Report (ComReg Document 20/122a).

⁴⁴⁸ Vodafone response to ComReg 19/124, p. 9, published as ComReg Document 20/56s

⁴⁴⁹ ComReg 15/71, paragraphs 103 -113

⁴⁵⁰ Paragraph 6.247 in full states:

“In light of the above, ComReg considers that an overall spectrum competition cap of 375 MHz would, compared to alternative caps within the 380 – 420 MHz range, better guard against distortions to competition arising from extreme asymmetries in post-award spectrum holdings, particularly in light of:

- *the post-merger MNO market structure, including the risk of the MNO with the smallest spectrum holding not being able to effectively compete, thereby leading to the possible creation of an effective duopoly; and*
- *the significant potential for non-MNO bidders to acquire spectrum in the Proposed Award and thereby exacerbate the level of asymmetry between Three and Eir post-award.”* (text omitted by Three emphasised)

and Eir post-award (the latter clearly in the context of the competition for mobile services). ComReg's rationale is also clear from paragraph 6.242 of Document 19/124⁴⁵¹.

6.271 Second, ComReg observes that Three has omitted and has not addressed the first bullet point of paragraph 6.247 of Document 19/124.

Conclusion

6.272 In light of the above, ComReg does not consider that it has received any material from respondents, or is aware of any other material, so as to reasonably require a change to its Proposed Overall Cap.

6.7 Other issues raised

Views of interested parties

Eir

6.273 In its response to Document 19/124, Eir submits:

"It is conceivable that one or more operators could surrender some of their existing holdings in advance of the proposed spectrum award. eir requests ComReg to clarify what steps it will take should such an event arise, specifically:

- *The transparency measures it will deploy. eir expects that should such an event occur it will be communicated transparently and publicly in advance of the award process commencing. As such it may be appropriate for ComReg to set a moratorium during the award process during which existing holdings may not be relinquished. This may be the effect of ComReg's intention when reference is made to "existing holdings...at the time of the procedure". However this is not clear because "time of the procedure" is not defined.*
- *In the event that an operator surrenders some of their existing holdings in advance of the "time of the procedure", eir would expect that the spectrum be included in the award process. If not, how*

⁴⁵¹ Paragraph 6.242 states:

"As the more relevant market in relation to the Proposed Award is for mobile services, it is particularly important to consider the impact on competition in that market if non-MNOs were assigned spectrum in the Proposed Award. If Three and Vodafone win spectrum up to the cap and bidders (other than Eir) also win spectrum, the level of asymmetry between Eir and Three would increase by the amount won by other non-MNO bidders. It is difficult to make any clear assumptions about what non-MNO bidders and/or new entrants may be assigned. However, it is clear that the higher end of the range carries a greater risk of extreme asymmetries between MNOs arising." (emphasis added).

would such spectrum be made available to interested parties, other than the operator that has surrendered the spectrum.

- *Will ComReg revisit the proposed spectrum caps if such an event arises?”*

Three

6.274 In its response to Document 20/78, Three raised a number of points regarding Vodafone’s response to Document 20/56:

- i. We note that Vodafone has sought to mischaracterise Three’s objection to the award proposed by ComReg as Three somehow seeking to gain or retain an advantage in the award process. This is a recurring position throughout Vodafone’s response and is simply incorrect. We are only seeking to eliminate the bias against Three that emerges from the proposed use of a CCA with asymmetric bidding caps.*
- ii. It is perhaps not surprising that Vodafone would opt to retain the advantage conferred on it by ComReg’s proposals as they stand - we have pointed out throughout the consultation process that the CCA format benefits larger market players over smaller bidders and that in this case Vodafone would be the main beneficiary. The proposed use of a CCA with a cap that allows Vodafone to express a value for 3 lots of 700MHz but limits Three to expressing a value for only 2 lots bestows a direct advantage on Vodafone relative to Three, as pricing will be determined by opportunity cost. As a result, it is not surprising that Vodafone would seek to retain that advantage. In assessing the responses, we trust ComReg to look beyond any self-serving preferences and to seek objective substantiation of any points raised or positions adopted.*
- iii. As an example, Vodafone has stated of Three that “instead of removing discrimination they seek to copper fasten Three’s very significant spectrum advantages gained through the O2/Three merger process”. This is simply incorrect. Three is only seeking to be able to participate in the auction on an equal basis. We note that Vodafone has referred back to the acquisition of O2 Ireland by the Three Group and we would reiterate that the acquisition was examined and approved by the European Commission, including consideration of the spectrum holdings on a competition law basis. We also note that subsequent to the acquisition Vodafone sought through the High Court to force ComReg to carry out a review and to take some action in relation to spectrum holdings among mobile operators. ComReg rightly rejected this action by Vodafone and stated at the time that Vodafone had not provided, nor was ComReg aware of, any facts that demonstrate that Three had or would be likely to*

use the spectrum controlled by it inefficiently or ineffectively, “or in any way that would require intervention by ComReg using its radio spectrum management powers”. ComReg’s view at the time was that there was no significant disparity in spectrum holdings and that Vodafone was essentially attempting to re-open matters that had already been considered by the European Commission. Ultimately Vodafone’s case was without merit and was withdrawn, however, there are signs that Vodafone’s attitude towards the current auction is still driven by the same mistaken beliefs and that Vodafone is again trying to revisit the issue.

- iv. In relation to the question of which award format is most suitable, Vodafone has stated that a CCA mechanism is required if “the complex set of lots emerging from the Time Slice structure” is retained, and further that “an SMRA could be run if the time slices are removed”. This position would seem to be aligned with the general view that the Time-Slicing should be removed, in which case then Option 2(b) is a preferred format, with Option 3 also being suitable.*
- v. In its response, Vodafone states that “Redesigning the auction to allow Three to maintain a spectrum advantage at low cost would clearly be discriminatory”. This statement contains multiple misconceptions. ComReg has already stated its position that there is no significant disparity in spectrum holdings at this time. Vodafone has misunderstood Three’s response as we are not seeking to maintain any advantage at low cost – Three is simply seeking to have its price in the auction determined on an equal basis to its two main competitors, and this would not be discriminatory. We are seeking to eliminate discrimination in the proposal that currently favours Vodafone (and Eir) and we note Vodafone’s recognition of this discriminatory effect (see below).*
- vi. Vodafone also refers back to the 2012 multiband auction and the use of spectrum caps. In that regard, we notice that there are significant differences between the manner in which caps applied in that award and those now proposed by ComReg. In 2012, Time-Slices were chosen to coincide with the expiry of existing licences that were counted within the caps. This meant that a spectrum holding could not count against a spectrum cap beyond its expiry. This is not the case under ComReg’s current proposal as this would require additional Time-Slices, most importantly in 2030 when the current sub-1GHz licences expire. We note that TS1 in the 2012 had a duration of 2.5 years whereas TS2 was 6 times longer at 15 years. Throughout all of TS2, which is the majority of the licence duration, the caps had the same effect on all bidders – only counting spectrum available in the award itself.*
- vii. It is completely erroneous for Vodafone to suggest that the rules adopted*

by ComReg in 2012 somehow disqualify Three from seeking equal treatment in the current award. We note the acceptance by Vodafone that ComReg's current proposal does in fact confer an advantage on Vodafone within the award process "Now that positions are reversed, and Three are starting with more spectrum, they cannot reasonably complain that a possible outcome of the planned award could be that they will pay more".

- viii. *While Vodafone has rejected options 5(a), 5(b) and 5(c) we believe they have erred in their analysis. In proposing these modifications, Three is not seeking to gain an advantage over other bidders in the award but merely equal treatment. We welcome the recognition by Vodafone that ComReg's current proposal may be contrary to ComReg's non-discrimination obligations "Just as it would be entirely inappropriate for Comreg to and [sic] introduce specific rules to guarantee a number of blocks of 700Mhz spectrum to Vodafone only it is against the non-discriminatory principles of section 12 of the Act of 2002 to introduce rules that preserve Three's spectrum advantage". Vodafone seems to have interpreted the effect of caps in the sub-1GHz band as guaranteeing that other bidders will win a minimum amount of spectrum, and that it would somehow be discriminatory for the same to apply to Three.*
- ix. *We note that Vodafone's position in relation to spectrum caps in the current consultation contrasts with that adopted by its sister company in the UK. Despite already having access to over 42% of sub-1GHz spectrum before the 700MHz award in the UK, Vodafone argued that there is no justification for a sub-1GHz spectrum cap on bidders in the upcoming UK spectrum auction. This leads us to conclude that Vodafone is content to maintain the advantage conferred on it in the award as currently proposed by ComReg rather than to objectively consider the matter.*

Other issues raised – Eir's request for clarification - ComReg's assessment

6.275 In relation to Eir's comments regarding transparency, ComReg confirms that it would, of course, comply with its obligations in relation to transparency.

6.276 In relation to Eir's request for clarification regarding the potential return of existing holdings by one or more operators in advance of the Proposed Award, ComReg outlines its response as follows. It is difficult to set out what steps ComReg may take in relation to any return of spectrum as it may affect the structure of the proposed award without knowing the specifics of the particular spectrum rights being returned⁴⁵². For example, whether the returned right of use ought to be

⁴⁵² For example, which band/s and the location/s of the right/s within the band/s, existing licence conditions etc.

included in the proposed award and on what terms. Accordingly, it is not possible to provide meaningful answers to the various questions raised by Eir but ComReg can confirm that it would assess any return of spectrum and its impact on the award, if any, in accordance with its statutory functions, objectives and duties.

6.277 In relation to Eir's query regarding "*existing holdings...at the time of the procedure*", ComReg recalls that paragraph 3.49 of the Draft IM identifies that ComReg would assess the existing holdings of an undertaking of the purposes of the Proposed Spectrum Competition Caps at the time of ComReg's receipt of an Application to participate in the Proposed Award.

Other issues raised – Three's various comments on Vodafone's response to Document 20/56 - ComReg's assessment

6.278 ComReg notes **Three's various comments on Vodafone's response to Document 20/56** and outlines its observations on same below.

Other issues raised – Three's various comments – point (i) regarding bias

6.279 In relation to **point (i)** raised by Three (regarding bias), ComReg refers to its consideration of this claim in Section 6.3.2 above.

Other issues raised – Three's various comments – point (ii) regarding claimed benefits to Vodafone

6.280 In relation to **point (ii)** raised by Three, ComReg addresses Three's pricing claims in Chapter 7.

Other issues raised – Three's various comments – point (iii) regarding "equal basis" and judicial review proceedings

6.281 In relation to **point (iii)** raised by Three, ComReg notes that it has addressed Three's point regarding seeking to participate on an "equal basis" earlier in this chapter. In relation to Three's comments regarding the judicial review action taken by Vodafone, ComReg observes that the documents relating to that matter speak for themselves.⁴⁵³

Other issues raised – Three's various comments – point (iv) regarding Vodafone's preference for SMRA format if time slice structure was removed

6.282 In relation to **point (iv)** raised by Three, ComReg firstly refers to its consideration of the issue of Time Slices in Chapter 4. Secondly, ComReg also observes the tension between Three's claim that "*the CCA format benefits larger market*

⁴⁵³ See, in particular, Document 15/56.

players over smaller bidders and that in this case Vodafone would be the main beneficiary” (in point ii), on the one hand, and seeking to rely on Vodafone’s point that it would prefer an alternative to the CCA (i.e. the SMRA) if the time slice structure was removed (in point iv), on the other. That is, if the proposed CCA format actually provided the material benefits to Vodafone as Three is claiming, then one would not reasonably expect Vodafone to readily relinquish any such material benefits by supporting an alternative auction format.

Other issues raised – Three’s various comments – point (v) regarding discrimination

6.283 In relation to **point (v)** raised by Three, ComReg refers to its assessment of Three’s claim of discrimination in Section 6.3.2 above. ComReg also refers to its assessment of Three’s pricing concerns in Chapter 7.

Other issues raised – Three’s various comments – point (vi) regarding the spectrum competition caps used in the 2012 MBSA

6.284 In relation to **point (vi)** raised by Three (regarding the spectrum competition caps used in the 2012 MBSA) ComReg outlines its response below.

6.285 First, and by way of background, ComReg recalls in relation to the 2012 MBSA that⁴⁵⁴:

- a) it involved the award of spectrum rights in the:
 - i. 800 MHz band - a new band for mobile, similar to the 700 MHz Duplex in the Proposed Award; and
 - ii. the 900 MHz and 1800 MHz bands (being existing bands for mobile) (noting that the only other existing band for mobile services at the time was the 2.1 GHz band and that each of the existing MNOs had an equal quantum of spectrum holdings in this band);
- b) in light of various existing spectrum rights in the 900 MHz and 1800 MHz bands which would co-exist with new rights being awarded (i.e. the GSM 900 MHz and GSM 1800 MHz licences of Meteor which did not expire until 12 July 2015, and the GSM 1800 MHz licences of Telefónica O2 and Vodafone which did not expire until 31 December 2014), ComReg adopted the following Time Slices for new rights of use:
 - i. Time Slice 1: 1 February 2013 - 12 July 2015; and
 - ii. Time Slice 2: 13 July 2015 - 12 July 2030 (with 12 July 2030 being

⁴⁵⁴ See Document 12/25.

the date of final expiry of all new rights);

c) at the time, there were four MNOs with the following pre-award spectrum holdings:

- i. 900 MHz: Vodafone, O2 and Meteor with 2 × 7.2 MHz each, noting the different expiry dates above, and a contiguous unassigned block of 2 × 12.7 MHz;
- ii. 1800 MHz: Vodafone, O2 and Meteor with 2 × 14.4 MHz each, noting the different expiry dates above, and a contiguous unassigned block of 2 × 26.3 MHz;
- iii. 2.1 GHz (not part of the 2012 MBSA): Vodafone, O2, Meteor and Three with 2 × 15 MHz each (with the different expiry dates identified in present document);

d) it imposed the following spectrum competition caps:

- i. a 2 × 10 MHz cap to 900 MHz spectrum rights in Time Slice 1⁴⁵⁵;
- ii. a 2 × 20 MHz cap applied to 800 MHz and 900 MHz (i.e. sub-1GHz) spectrum rights for each of Time Slice 1 and Time Slice 2;
- iii. a 2 × 50 MHz spectrum cap to 800 MHz, 900 MHz and 1800 MHz spectrum rights for each of Time Slice 1 and Time Slice 2; and
- iv. where existing spectrum holdings other than those in the 900 MHz and 1800 MHz bands (i.e. the 2.1 GHz band⁴⁵⁶) should not count towards a spectrum cap in this award process.

6.286 In light of this background, ComReg addresses Three's point below.

6.287 First, ComReg observes that existing spectrum holdings in the bands being re-awarded via the 2012 MBSA and which fell within the duration of new rights being

⁴⁵⁵ As noted in paragraph A.533 of Document 12/25a, this reflected:

- even though the 800 MHz and 900 MHz bands have similar propagation characteristics, the ecosystem for transmission equipment and handsets currently differs considerably. The 900 MHz band was harmonised for 2G services many years ago and has enjoyed the benefits of deployment of mature technologies for quite some time, whereas 800 MHz has only recently been harmonised and hence there is limited equipment available in the band at this time;
- accordingly, in the short term, 800 MHz and 900 MHz spectrum rights may not be sufficiently close substitutes (noting that this should change over time);
- the sub-1 GHz and overall spectrum caps (discussed above) would not, in ComReg's view, necessarily address competition concerns as a result of the 800 MHz and 900 MHz spectrum bands not being close substitutes in the near term; and
- the 800 MHz band is likely to be well established towards the end of Time Slice 1 (2015) and so there should not be a requirement to maintain the 900 MHz cap into Time Slice 2.

⁴⁵⁶ This reflected the fact that there were symmetric 2.1 GHz holdings between the four MNOs.

awarded (i.e. Eir's GSM 900 MHz and 1800 MHz rights, and Vodafone's and O2's 1800 MHz rights, in Time Slice 1) counted towards those operator's respective caps in Time Slice 1.

- 6.288 Second, ComReg observes that the same approach is being proposed with Eir's existing 2.1 GHz rights in Time Slice 1 in the Proposed Award (i.e. it would be counted against Eir in Time Slice 1 for the Proposed Overall Cap).
- 6.289 There are, however, important differences between the 2012 MBSA and the Proposed Award which Three does not take into account.
- 6.290 First, as noted above, ComReg decided that the only other existing rights of use at the time (i.e. 2.1 GHz rights) expressly did not count towards the 2012 MBSA caps (because of the symmetric holdings between the four MNOs at the time).
- 6.291 Second, and in the context of the one block of 900 MHz which Three won in the 2012 MBSA, there were no other sub-1 GHz bands for mobile at the time.
- 6.292 Accordingly, while Three is correct that the 2012 MBSA only counted spectrum available in the award itself, this is because ComReg had expressly excluded existing 2.1 GHz rights from counting and there were no other bands for mobile at the time that could/ought to be counted towards the caps in that award.
- 6.293 That situation is clearly different to the Proposed Award where there is a large range of existing rights of use (i.e. in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz bands) which are not part of the Proposed Award but, for the reasons set out previously by ComReg, ought to be taken into account in the Proposed Spectrum Competition Caps.
- 6.294 In addition, ComReg observes that Three's points would not affect the conclusion drawn by NERA in respect of the 2012 MBSA including that:⁴⁵⁷

"Although H3G was expected to be the weakest bidder, the spectrum caps placed it in a strategically advantageous position. In the absence of a 5th bidder, it was de facto guaranteed to win one 900 MHz lot at reserve price."

Other issues raised – Three's various comments – point (vii) regarding the 2012 MBSA and Three seeking "equal treatment"

- 6.295 In relation to **point (vii)** raised by Three, ComReg:

a) firstly, refers to its consideration of Three's claim of discrimination set out in

⁴⁵⁷ See, Nera Economic Consulting, 'Price Distortions in the Combinatorial Clock Auction – a Bidder perspective', published April 2015.
https://www.ofcom.org.uk/data/assets/pdf_file/0020/82226/telefonica_-_annex_3.pdf

Section 6.3.2 above and, in that regard, again observes that the three MNOs are not in the same position vis-à-vis existing spectrum rights;

- b) refers to its observation regarding **point (vi)** immediately above; and
- c) refers to its assessment of Three's pricing concerns in Chapter 7.

Other issues raised – Three's various comments – point (viii) regarding Vodafone's views regarding Options 5(a), 5(b) and 5(c)

6.296 In relation to **point (viii)** raised by Three, ComReg:

- a) observes that there is no guarantee of a certain number of blocks to either Vodafone or Eir under the Proposed Sub-1 GHz Cap, because it is unknown whether there will any be interest in 700 MHz Duplex spectrum from parties other than the existing MNOs;
- b) refers to paragraph 6.196 of Document 19/124 in this regard; and
- c) refers to its consideration of Three's claim of discrimination set out in Section 6.3.2 above.

Other issues raised – Three's various comments – point (ix) regarding Vodafone UK's submission

6.297 In relation to **point (ix)** raised by Three, ComReg does not consider that any such inconsistency diminishes ComReg's assessment of the material before it.

6.8 Spectrum Competition Caps - ComReg's final position

6.298 In light of the above, ComReg's final position is that it will apply spectrum competition caps, which will apply to each Qualified Bidder in the competitive selection procedure, and only for the duration of that procedure, as follows:

- i. 70 MHz in aggregate across the 700 MHz Duplex, 800 MHz and 900 MHz Bands, taking into account all existing holdings in these bands at the time of ComReg's receipt of an Application to participate in the procedure; and
- ii. 375 MHz in aggregate across the 700 MHz Duplex, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and 3.6 GHz Bands, taking into account all existing holdings in these bands at the time of ComReg's receipt of an Application to participate in the procedure (with the exception of existing holdings in the 2.3 GHz Band and, in the case of 3.6 GHz Band holdings, the highest holding in any 3.6 GHz Band Region held by that Bidder), in each of Time Slice 1 and 2.

6.299 ComReg would also clarify that:

- a) any 700 MHz Duplex, 2.1 GHz, 2.3 GHz and/or 2.6 GHz band spectrum holdings obtained under the Proposed Award may be taken into account for a competition cap/s for the award/s of sufficiently substitutable and/or complementary spectrum bands in the future (such as any award of 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz band rights of use), noting, however, that these matters would be determined by ComReg based on the particular facts and circumstances at the relevant time. That said, the weight of the material before ComReg would certainly indicate that 700 MHz Duplex holdings obtained in the proposed award would count towards any spectrum competition cap/s for any competitive selection procedure for the award of 800 MHz and 900 MHz spectrum rights in or around 2030;
- b) paragraph 3.49 of the Draft IM identifies that ComReg would assess the existing holdings of an undertaking of the purposes of the above spectrum competition caps at the time of ComReg's receipt of an Application to participate in the Proposed Award.

Chapter 7

7 Auction Format RIA

Introductory remarks

What are the issues?

The primary issue arising in respect of the Auction Format, and as regards which ComReg carried out an Auction Format Regulatory Impact Assessment (“RIA”), is to determine what auction format would be the most appropriate by which to assign rights of use in the Proposed Award.

What did ComReg propose?

ComReg proposed a Combinatorial Clock Auction (“CCA”) whose key features include:

- package bidding to manage aggregation risk;
- switching rules to allow bidders to express a range of demand for many different packages; and
- a second-price rule using minimum revenue core (MRC) pricing which incentivises bidders to reflect their valuations for alternative packages of spectrum while also minimising the amount that bidders pay subject to each winner (and group of winners) paying its opportunity costs.

Further, ComReg proposed the use of Exposure Pricing which provide additional helpful information to bidders during the course of the auction clock rounds to help bidders assess the financial exposure resulting from their bids.

What Respondents said?

Three expressed support for the following auction formats:

- Hybrid-SMRA with alternative spectrum packaging;
- Simple Clock Auction (SCA) or enhanced Simple Clock Auction (eSCA) with Time Slicing;
- Hybrid SMRA with Time Slicing; and
- CCA with symmetric in-auction competition caps and Time Slicing.

Vodafone favoured a CCA with exposure pricing while an SMRA could be run if the time slices are removed.

Eir expressed support for the following auction formats:

- An SMRA with unlimited withdrawals;
- A Simple Clock Auction and variants; and

- An 'iterative' CCA.

Eir welcomed exposure pricing noted that further changes would be required for a CCA.

Imagine supported the use of a CCA but would also prefer a SMRA depending on the circumstances of the Proposed Award.

***What has
ComReg finally
decided, and
why?***

Having:

1. set out all of the proposed options;
2. eliminated those options that were not aligned with its final position on specific matters arrived at in other chapters including spectrum competition caps (Chapter 6), linear reserve prices (see Chapter 5) and the need for time slices (Chapter 4); and
3. carried out a RIA on the remaining six options (and variants of same).

ComReg's final position is that the CCA is its preferred Option because, among other things, it:

- (i) avoids aggregation risks,
- (ii) mitigates substitution risks and the risk of inefficiently unsold lots,
- (iii) mitigates the risk of, and destabilises, tacit collusion,
- (iv) provides incentives for bidders to compete for additional spectrum:
- (v) provides good incentives for all bidders, large and small, to express potentially complex preferences over different packages of spectrum across the various bands; and
- (vi) allows for the possibility of non-uniform prices, which might be the only way of supporting an efficient outcome when valuations are based on being assigned complementary rights of use.

ComReg formed this view having assessed each of the six options and having regard to the impacts of those options on stakeholders, competition and consumers.

7.1 Introduction

- 7.1 As set out in Annex 4, ComReg's final position in the 'Assignment Process' RIA is to make available all relevant spectrum rights using an appropriate auction format (i.e. Assignment Option 1 in Chapters 3 and Annex 4). This Chapter sets out ComReg's Auction Format RIA which determines the most appropriate auction format by which to assign the spectrum rights of use in the Proposed Bands.
- 7.2 In Document 19/59R, ComReg considered a number of Award Risks⁴⁵⁸ outlined by DotEcon as likely to arise in the Proposed Award, and assessed five auction formats to determine which auction format best mitigated those Award Risks, and met with ComReg's statutory objectives (See Annex 2). In doing so, ComReg was of the preliminary view that the CCA was the auction format best suited to deal with the Award Risks identified.
- 7.3 In Document 19/124⁴⁵⁹, subsequent to and in light of the responses received to Document 19/59R, and, further, having considered the latest views of DotEcon⁴⁶⁰, ComReg stated that it remained of the preliminary view that the CCA was the auction format best suited to deliver on its objectives and deal with the risks that arise in the proposed award process.
- 7.4 In response to Document 19/124, ComReg received views in relation to alternative auction formats and modifications to its proposed auction format (in particular from Three) and received a request from Three (and subsequently from Eir) that ComReg carry out a regulatory impact assessment (RIA) on the appropriate auction format.
- 7.5 Accordingly, ComReg published Document 20/56⁴⁶¹. With regards to a RIA, while ComReg observed that it has already conducted a number of substantive assessments on the auction formats available, notwithstanding, in light of the alternative auction proposals that had been submitted, ComReg observed that it would reflect on whether it would be appropriate to consider the various auction format options for the Proposed Award in a formal RIA format. ComReg, thus, undertook such consideration in Document 20/56. In that connection, Document 20/56 described various potential auction format options, and also noted the potential for Three to return spectrum, and sought the views of interested parties to help inform consideration of those options under any Auction Format RIA that

⁴⁵⁸ See 'Award Risks' below.

⁴⁵⁹ Document 19/124, 'Proposed Multi Band Spectrum Award - Response to Consultation and Draft Decision The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands', published 20 December 2019.

⁴⁶⁰ DotEcon Report Document 20/122a.

⁴⁶¹ Document 20/56, 'Proposed Multi-Band Spectrum Award - Information Notice', published 6 July 2020.

ComReg may decide to undertake.

- 7.6 Having considered the views of respondents to Document 20/56, ComReg is of the view that, in the present case, it would be appropriate to conduct an Auction Format RIA in order to understand of the relative merits of different auction formats and their potential impact upon industry stakeholders, competition and consumers.
- 7.7 In relation to Three's option to return spectrum, Annex 14 of this document sets out ComReg's assessment of the respondents' submissions to this option, noting that Three has not proposed to return spectrum in accordance with the option outlined in Document 20/56.
- 7.8 Additionally, Annex 14 assesses Three's proposal of 3 December 2020 (see Annex 15 of this document) to contingently return a block of 900 MHz spectrum. As discussed in Annex 14, and in light of the assessment therein, and in particular the significant concerns, potential discrimination to other bidders and complications for the Proposed Award raised by Three's proposal, ComReg's final position is that it is not appropriate to adopt Three's proposal for a contingent return of a block of 900 MHz spectrum. ComReg also notes that the significant concerns identified in Annex 14 would be present in any kind of contingent grant back of sub-1 GHz spectrum by Three and so does not consider it necessary to seek further information or clarifications around Three's proposal, or potential amendments to same, in order to reach a decision on this matter. Three's letter of 3 December was in any event adequate in terms of providing the requisite details on the proposal.
- 7.9 In response to recent consultations, ComReg received various submissions from interested parties on ComReg's preliminary consideration of different auction formats and various design elements that can be applied to assign rights of use. Further, respondents have provided detailed views on their preferences between the options set out in Document 20/56 and otherwise and on the various issues of relevance to the impact analysis. ComReg has considered these views and other related views in preparing this RIA.
- 7.10 In some cases, respondents have raised matters which are related to the assessment provided in the Auction Format RIA. ComReg of course considers these matters in determining its preferred option. However, the specific points raised by interested parties are responded to separately in Annex 7. This approach aids in the reading of the Auction Format RIA and allows ComReg to address the specific points raised by respondents more directly. In this way, ComReg's preferred option at the conclusion of this Chapter is informed by the assessment provided in this RIA and related matters in Annex 7.
- 7.11 The remainder of this chapter is structured as follows:

- An overview of the RIA Framework including the structure of a RIA and an overview of the relevant stakeholders and the approach to Steps 3 and 4 of the Auction Format RIA;
- Some upfront and useful information of relevance to the considerations set out in the Auction Format RIA; and
- The Auction Format RIA itself (Steps 1 to 5).

7.12 The chapter then concludes with an assessment of the Preferred Option against ComReg's relevant statutory functions, objectives and duties.

7.13 Separately, Annex 7 sets out ComReg's consideration of other auction related submissions received in response to Document 19/124, Document 20/32⁴⁶² (where relevant)⁴⁶³ and Document 20/56.

7.2 RIA Framework

7.14 In general terms, a RIA is an analysis of the likely effect of a proposed new regulation or regulatory change, and, indeed, of whether regulation is necessary at all. A RIA should help identify the most effective and least burdensome regulatory option and should seek to establish whether a proposed regulation or regulatory change is likely to achieve the desired objectives, having considered relevant alternatives and the impacts on stakeholders. In conducting a RIA, the aim is to ensure that all proposed measures are appropriate, effective, proportionate and justified.

Structure of a RIA

7.15 As set out in ComReg's RIA Guidelines⁴⁶⁴, there are five steps in a RIA. These are:

Step 1: Identify the policy issues and identify the objectives.

Step 2: Identify and describe the regulatory options.

Step 3: Determine the impacts on stakeholders.

Step 4: Determine the impacts on competition.

⁴⁶² Document 20/32, 'Proposed Multi Band Spectrum Award - Draft Information Memorandum and Draft Regulations', published 13 May 2020.

⁴⁶³ ComReg notes that issues relating to the responses to the Draft IM (Document 20/32) will be dealt separately, however, some of the issues raised in response to Document 20/32 relate to the Decision and ComReg assesses same in this consultation document.

⁴⁶⁴ See Document 07/56a – Guidelines on ComReg's approach to Regulatory Impact Assessment – August 2007.

Step 5: Assess the impacts and choose the best option.

7.16 In the following sections, ComReg identifies the specific policy issues to be addressed and relevant objectives for the Proposed Award (i.e. Step 1 of the RIA process). Before moving on to Step 1 of the RIA, ComReg first makes some relevant observations below on the stakeholders involved and on ComReg's approach to Steps 3 and 4.

Identification of stakeholders and approach to Steps 3 and 4

7.17 The focus of Step 3 is to assess the impact of the various regulatory options on stakeholders. A precursor to the subsequent steps in the RIA, therefore, is to identify the relevant stakeholders. Stakeholders consist of two main groups:

- i. consumers (for the purposes of this draft RIA, consumers include both business and residential consumers), and
- ii. industry stakeholders.

7.18 There are a number of key industry stakeholders in relation to the matters considered in this chapter:

- Existing MNOs (Vodafone, Three and Eir) each of which who hold different amounts of existing spectrum rights of use in the 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 3.6 GHz Bands.
- Other operators who currently provide services using other spectrum rights (licensed or licence-exempt) for whom the spectrum being considered for inclusion in the Proposed Award may be of particular interest to satisfy existing and potential demand. This includes:
 - Fixed Wireless Operators ("FWOs") such as Imagine who are currently assigned 3.6 GHz rights of use.
 - Network Densification Operators ("NDOs") such as Airspan who are currently assigned 3.6 GHz rights of use.
- Potential 'New Entrants' which may include companies that are already otherwise engaged in the electronic communications sector in the State, in other Member States or further afield. Further, New Entrants could be new entrant MNOs or other operators providing other services (i.e. Imagine and Dense Air were new entrants in the 3.6 GHz Award).

7.19 The focus of Step 4 is to assess the impact on competition of the various regulatory options available to ComReg. In that regard, ComReg notes that it has various statutory functions, objectives and duties which are relevant to the issue of competition. See Annex 2 'Legal Framework'.

7.20 Of themselves, the RIA Guidelines and the RIA Ministerial Policy Direction provide little guidance on how much weight should be given to the positions and views of each stakeholder group (Step 3), or the impact on competition (Step 4). Accordingly, ComReg has been guided by its statutory objectives which it is obliged to seek to achieve when exercising its functions. ComReg's primary statutory objectives in managing the radio frequency spectrum for ECN/ECS, as outlined in Annex 2, include:

- the promotion of competition;
- contributing to the development of the internal market; and
- the promotion of the interests of users within the Community.

7.21 In this document, ComReg has adopted the following structure in relation to Step 3 and Step 4 – the impact on industry stakeholders is considered first, followed by the impact on competition and consumers. This order does not reflect any assessment of the relative importance of these issues but rather reflects a logical progression. In particular, a measure which safeguards and promotes competition should also, in turn, impact positively on consumers. Accordingly, the assessment of the impact on consumers draws substantially upon the assessment carried out in respect of the impact on competition.

7.3 Identify the policy issues & the objectives (Step 1)

Policy issues

7.22 The "Assignment Process RIA" (Annex 4) determined that an auction is the most appropriate assignment mechanism by which to assign the spectrum rights of use considered appropriate for award (e.g. auction or administrative assignment). However, there are several different auction formats available and each has different design elements that can be used in order to better ensure the efficient assignment of rights of use.

7.23 The primary policy issue for the Auction Format RIA is to determine what auction format would be the most appropriate by which to assign rights of use in the Proposed Award having regard to ComReg's statutory framework and associated objectives and the particular facts and circumstances of the Proposed Award.

7.24 In that regard, ComReg has previously set out in Document 19/59R the main Award Risks associated with the current award, being aggregation risks, gaming opportunities, strategic demand reduction, inefficiently unsold lots, substitution risks, bidder information deficits and complexity; and notes that the preferred award format would be the format that best mitigates or eliminates these risks

given the circumstances particular to this award.

Objectives

- 7.25 ComReg aims to design and carry out this assignment process in accordance with its broader statutory objectives (as outlined in Annex 2) including the promotion of competition in the electronic communications sector.
- 7.26 A key objective in designing and carrying out this assignment process is to seek to encourage the efficient use and ensure the effective management of the radio frequency spectrum.
- 7.27 Further, in light of ComReg's decision to limit the number of individual rights of use that can be granted for the Award Bands (See Section 5.1.3), and in light of ComReg's conclusion that such limited individual rights should be granted by way of an auction (see Section 3.5 and Annex 4), there are three particularly relevant key statutory provisions in relation to the choice of the appropriate auction format:
- a) Selection criteria:
 - i. Regulation 11(2) of the Authorisation Regulations requires that, when granting the limited number of rights of use for radio frequencies it has decided upon, ComReg does so on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate and which give due weight to the achievement of the objectives set out in Section 12 of the 2002 Act and Regulations 16 and 17 of the Framework Regulations.
 - b) Selection procedures:
 - i. Regulation 9(4)(a) of the Authorisation Regulations relevantly provides that ComReg shall, having regard to Regulation 17 of the Framework Regulations, establish open, objective, transparent, non-discriminatory and proportionate procedures for the granting of rights of use for radio frequencies and shall cause any such procedures to be made publicly available;
 - ii. Article 5 of RSPD Decision provides that Member States shall ensure that the authorisation and selection procedures for ECS promote effective competition for the benefit of citizens, consumers and business in the Union" (which includes, in the context of promoting effective competition and avoiding distortions to competition, "limiting the amount of spectrum for which rights of use are granted to any undertaking").
- 7.28 ComReg would also highlight Regulation 19 of the Authorisation Regulations

relating to fees for spectrum rights of use which:

- permits ComReg to impose fees for rights of use which reflect the need to ensure the optimal use of the radio frequency spectrum; and
- obliges ComReg ensure that any such fees are objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose and consider the objectives of ComReg as set out in Section 12 of the 2002 Act and Regulation 16 of the Framework Regulations.

7.29 ComReg's other overarching objectives are to contribute to the development of the internal market and to promote the interests of users within the Community.

7.30 ComReg also notes that, in achieving its objectives, its ultimate aim is to choose regulatory measures which maximise the benefits for consumers in terms of price, choice and quality.

7.4 Identify and describe the regulatory options (Step 2)

7.31 Prior to identifying and describing the regulatory options for this award, ComReg **first** notes that the only auction format that could mitigate or remove the perceived distortions to competition caused by Three's two lot category approach (See 'Auction Mitigation' in Chapter 4) would be a sealed combinatorial bid award (SBCA).

7.32 However, ComReg notes that no respondent to ComReg's previous consultations, including Document 20/56, proposed the use of a sealed bid format. Furthermore, the large Bidder Information Deficits (common value uncertainty, conflicts in demand, bidder error etc.) that are likely to arise in the Proposed Award would likely lead to inefficient outcomes that would affect all bidders.

7.33 As described in Document 19/59R, the SBCA is unsuitable to mitigate against these concerns for several reasons, including:

- where there is common value uncertainty, bidders may want to update their own valuation considering information received about the valuations of other bidders, which reduces uncertainty and promotes efficiency. However, in a SBCA, there is only one round of bidding and bidders would be unable to adjust their own valuation considering the bidding behaviour of rivals; and

- where there are conflicts in demand⁴⁶⁵, a SBCA does not provide any information to bidders about the demand from competitors' that could help bidders to identify which packages they might be able to win within their budget/valuation.

7.34 An open auction format would also reduce the risk of an inefficient outcome due to bidder error. This is because, (unlike in a sealed bid auction) open auction formats provide opportunities to recover (subject to auction rules) from bidder errors and it cannot be ruled out that new (and potentially inexperienced) bidders may wish to participate in the award.

7.35 In the context of the Proposed Award, bidders are likely to have a high preference for switching over and back across bands in response to the evolution of prices, rather than simply selecting their preferred packages at the start of the auction absent information from other bidders.⁴⁶⁶ Under a SBCA, bidders' risk being out-bid for preferred packages of spectrum without having an opportunity to re-bid in light of new information provided by the open round. Accordingly, it is desirable to allow bidders to switch between different bands as the award process progresses.

7.36 In that regard, ComReg notes the views of DotEcon that without the benefit of an open stage, it may be difficult for a bidder to know which lots/packages are more likely to be compatible with the demand of others, and which it would therefore stand a good chance of winning. In a sealed bid auction where bidders are limited in their ability to express valuations over all possible combinations of lots, a bidder might fail to win anything simply because every one of its package bids conflicts with a winning bid of another bidder when it could (in an efficient outcome) have been awarded a package that it did not submit a bid for.⁴⁶⁷

7.37 ComReg is of the view that any distortions to competition arising from the two lot category proposal that would be removed or mitigated through the use of a SBCA would not be justified due to the creation of significant bidder information deficits that would likely lead to an inefficient outcome and potentially large stakeholder impacts.

7.38 Therefore, a sealed bid format is not considered further in this RIA.

7.39 **Second**, ComReg recalls earlier chapters of this document where ComReg has

⁴⁶⁵ When there is a large amount of spectrum available (as in the proposed award) it may be impractical/infeasible for bidders to express their full demand for all possible combinations of lots that may be of interest in the absence of additional information.

⁴⁶⁶ For example, as noted by DotEcon in its report (p88) where bidders are unable to express demand for their preferred lots at given prices, this is not only bad for the individual bidder, but also creates a risk of an inefficient allocation of the available spectrum.

⁴⁶⁷ DotEcon Report, Document 20/122a, p90.

already reached final positions on related award design matters noting that any potential auction format proposal would need to be consistent with these final positions in order to be considered further in this RIA:

- In Chapter 3 and Annex 4 ('Spectrum for Award' RIA), ComReg's final position is to include the 700 MHz Duplex, the 2.1 GHz Band, the 2.3 GHz Band and the 2.6 GHz Band in the Proposed Award.
- In Chapter 4 ComReg's final position is that:
 - it is appropriate to make available rights of use in the 2.1 GHz, 2.3 GHz and 2.6 GHz Bands across two Time Slices; and
 - an alternative two lot category approach would only be appropriate if a SBCA was the preferred auction format.
- In Chapter 5, ComReg's final position is that:
 - frequency-generic spectrum should be offered using lot sizes of 5 MHz or 2 × 5 MHz, as appropriate (Section 5.5.5).
 - that a sub-1 GHz competition cap of 70 MHz (2 × 35 MHz) and an overall cap of 375 MHz is appropriate for the Proposed Award and that no other competition caps would be required to guard against distortions to competition arising from extreme asymmetries in post-award spectrum holdings (Section 6.9).
 - that linear reserve prices at the levels set out in Section 5.7 (notwithstanding any benchmarking updates as may be required before the beginning of the Proposed Award) are appropriate for the Proposed Award.

Identifying regulatory options

7.40 In order to ensure that all potential auction formats are given due consideration, ComReg provides a full list of all auction formats/types (and associated design features) proposed by ComReg and/or respondents since Document 18/60. Table 11 provides the following:

- details on the source of the proposed auction format ("Column 2");
- the proposed auction formats ("Column 3");
- whether the proposed auction format should be assessed in the Auction Format RIA ("Column 4"); and
- a short assessment of why the proposed auction format is suitable, or not,

for further assessment in the Auction Format RIA.

Table 11. Long List of potential RIA options

#	Reference	Auction Format	Valid option	Assessment
1	Document 19/59R	Standard SMRA with Time Slices	Yes	Can be implemented in line with all final positions listed in Paragraph 7.39
2	Three in response to Document 19/59R & 20/56	Hybrid SMRA with two 2.1 GHz Band lot categories	No	Cannot be implemented as it is not in line with ComReg's final position on the need for Time Slices.
3	Eir in response to Doc 19/59R	Simple Clock Auction with relaxed activity rule.	Yes	Can be implemented in line with all final positions listed in Paragraph 7.39
4	Document 19/59R	CMRA	Yes	Can be implemented in line with all final positions listed in Paragraph 7.39
5	Document 19/59R.	CCA with Exposure Pricing	Yes	Can be implemented in line with all final positions listed in Paragraph 7.39
6	Three in response to Document 19/124	CCA with a joint cap of 2 x 25 MHz in 700 MHz Band on 2 winners for purposes of winner and price determination	No	Cannot be implemented as it is not in line with ComReg's final position on spectrum competition caps and Reg 9(11) of Authorisation Regs in particular.
7	Three, in response to Document 19/124	CCA with a joint cap of 2 x 25 MHz in 700 MHz Band on 2 winners for purposes of price determination and asymmetric caps for winner determination.	Yes	Can be implemented in line with all final positions listed in Paragraph 7.39
8	Three, in response to Document 19/124	CCA with a third lot value cap	Yes	Not suggested as an independent option but can be considered as part of Option 7 above.
9	Document 20/56	Increase 700 MHz Reserve Prices	No	Cannot be implemented as it is not in line with ComReg's final position on linear reserve prices for the 700 MHz Band. See Section 5.7.3.
10	Document 20/56	Place a higher value on 700 MHz unsold	No	ComReg is of the view that the use of such a rule in the Proposed

		lots in Price Determination		Award would be unlikely to promote an efficient assignment, noting that respondents agree with same. ⁴⁶⁸
11	Document 20/56	Introduce non-linear 700 MHz Reserve Prices	No	Cannot be implemented as it is not in line with ComReg's final position on linear reserve prices for the 700 MHz Band. See Section 5.7.3.
12	Document 20/56	Use weighted Vickrey nearest prices	No	ComReg is of the view that the use of such a rule in the Proposed Award would be unlikely to reduce the asymmetry in prices between MNOs, noting that respondents agree with same. ⁴⁶⁹
14	Eir, in response to Document 20/56	Assigning 700 MHz on its own using a uniform price auction (SMRA / clock hybrid auction) & not time slicing 2.3 or 2.6 GHz bands	No	Cannot be implemented as it is not in line with ComReg's final position on the 'Spectrum for Award' RIA.
15	Document 19/59R	Simple Clock Auction without relaxed activity rules	Yes	Can be implemented in line with all final positions listed in Paragraph 7.39.
16	Eir, in response to Document 20/56	An iterative CCA	Yes	Can be implemented in line with all final positions listed in Paragraph 7.39.
17	Eir, in response to Document 20/56.	SMRA with rules allowing clean switching between lot categories	Yes	Can be implemented in line with all final positions listed in Paragraph 7.39 and will be considered as part of Option 1.
18	Three, in response to Document 20/56.	CCA with symmetric in-auction caps	No	Cannot be implemented as it is not in line with ComReg's final position on spectrum competition caps and Reg 9(11) of Authorisation Regs in particular.

⁴⁶⁸ ComReg notes and agrees with DotEcon such an approach only serves to increase price uniformity (which in any case is not relevant to ComReg's objectives), and is likely to reduce incentives to bid straightforwardly, and therefore risks an inefficient outcome and is not supported by any of the respondents.

⁴⁶⁹ ComReg notes and agrees with DotEcon, that while this creates some small disincentive to compete for third lots, it is not guaranteed to reduce price asymmetry (e.g. if MNOs win two 700 MHz lots each) and there does not seem to be any particular rationale for introducing the more complex rule that is not supported by any of the respondents.

19	Three, in response to Document 20/56	“Enhanced” SCA with Time Slicing in 2.1 GHz Band.	Yes	Cannot be implemented as it is not in line with ComReg’s final position on the need for Time Slices in other bands. However, for completeness and for the purpose of comparison to other formats ComReg extends this format and the associated rules to time slice the other Performance Bands.
20	Eir, in response to Doc 20/78.	Hybrid SMRA where bidders are informed of the exact level of excess (or aggregate) demand after each round	No	This can be considered as part of Option 1 as it only concerns the information policy which would work in the way described by Eir across all options.

7.41 Considering the preceding discussion, and having regard to responses received to Document 19/124, Document 20/32 and Document 20/56, ComReg has identified the following regulatory options for consideration in this draft RIA.

Option 1 – Simultaneous Multi-Round Ascending (“SMRA”) Auction

- Option 1 (a) Standard SMRA:
 - A description of the SMRA and how it would operate is provided in Annex A of Document 19/59a.
- Option 1 (b) Hybrid SMRA:
 - i. Allows an unlimited number of withdrawals with only a limited penalty being imposed on the bidder if some or all of the relevant lots remained unassigned at the end of the auction e.g. a penalty of only 10% of the withdrawn bid amount. (“Eir amendment”); and
 - ii. Works in line with Annex II of Three’s response to Document 20/56 (See Document 20/78). (Three amendment). In summary, this includes:
 - provision for waivers;
 - bids for a number of lots within a lot category;
 - determination of standing high bids based on ranking of bidders; and
 - clock style collection of bids.

Option 2 - Simple Clock Auction (“SCA”)

- Option 2 (a) Standard SCA (i.e. without relaxed activity rules):
 - A description of the SCA and how it would operate is provided in Annex A of Document 19/59a.
- Option 2 (b) SCA with relaxed activity rules:
 - The same as Option 2 (a) but with relaxed activity rule similar to that typically used in a CCA.
- Option 2 (c) “Enhanced” SCA⁴⁷⁰:
 - See Annex II of Three’s response to Document 20/56 (As noted above, this option has been amended to include time slicing). In summary, this includes rules on the following:
 - Demand Retention Rules;
 - Optional Exit Bids;
 - Compulsory Exit Bids; and
 - Supplementary Round for lots unassigned at the end of the clock stage.

Option 3 – Combinatorial Multi-Round Ascending Auction (“CMRA”):

- A description of the CMRA auction format and how it would operate is provided in Section 7.2.3 of Document 19/59a.

Option 4 – CCA with Exposure Pricing (apart from Exposure Pricing, this is essentially the Option identified as the preferred option in Document 19/124):

- A description of the CCA auction format and how it would operate is provided in Section 7.2.2 of Document 19/59a. More generally the detailed rules of this format, including the definition of Exposure Pricing information, are set out in Document 20/32 (the draft Information Memorandum).

Option 5 - CCA with Price Determination changes and value limits:

⁴⁷⁰ Note Three considers this proposal in relation to Time Slicing the 2.1 GHz Band only. This is not consistent with ComReg’s previously stated views on Time Slices. However, for completeness, ComReg extends this option to cover time slicing in other bands.

- Option 5 (a) CCA with joint cap of 2 × 25 MHz in the 700 MHz Duplex on any two winners for price determination only.
 - This follows the same approach as Option 4 except that a 2 × 25 MHz cap Joint Cap is applied for price determination only in specific circumstances where there would otherwise be price discrimination against Three.
 - In summary, where there are three winning bidders, including a winning bidder that is excluded from bidding for 3 lots (i.e. Three), any bid sets that include exactly two bids by other winning bidders of 700 MHz and do not include any reserve price bids are excluded for the purposes of price determination.
- Option 5 (b) is the same as Option 5 (a) with an additional rule that a cap would be placed on the value of a third 700 MHz Duplex lot.⁴⁷¹

Option 6 – An iterative CCA which would have a clock round as in a standard CCA except:

- that primary bid rounds proceed the same as a CCA under Option 4 except the bid amounts are set equal to exposure prices; and
- the supplementary round is used as per Option 4 only if there are no unassigned lots at the end of the primary bid rounds; or
- if there are any unassigned lots at the end of the final primary round, the supplementary round is replaced by one or more 'additional rounds' to elicit further bids from bidders.

7.5 Background information relevant to Award format

7.42 Prior to setting out its assessment of the various award formats, ComReg sets out some relevant background information in order to assist readers understanding of the assessment provided in this RIA.

I. Spectrum for Award RIA;

⁴⁷¹ In that regard, Three's proposal is that:

"...a cap on the marginal valuation that can be expressed for a third 700 MHz lot, such that it cannot be higher than the final clock price for 700 MHz – Three suggest that this could be implemented via a requirement that bidders bidding for packages containing three 700 MHz lots also submit a supplementary bid for otherwise identical packages with two 700 MHz lots, with a price difference no greater than the final clock price for 700 MHz." (Page 22 of Three's response to ComReg 20/56.)

- II. Auction features;
- III. Complementarities;
- IV. Auction Format Information Notice (Document 20/56); and
- V. Exposure Pricing.

I. Spectrum for Award RIA

- 7.43 For the reasons set out in the 'Spectrum for Award' RIA (See Annex 4), ComReg's final view was that its preferred option is to include the 700 MHz Duplex, 2.6 GHz Band, 2.3 GHz Band and 2.1 GHz Band in the Proposed Award.
- 7.44 Among other things (including the relevance of complementarities, assessed separately below), ComReg noted that assigning 700 MHz rights of use in a separate sequential award is not appropriate. Assigning complementary (and substitutable) spectrum in a single award rather than in one or more sequential awards instead offers several well-established benefits for competition and consumers. (See Annex 4 'Spectrum for Award' RIA). Many of the problems relating to the sequential award of complementary spectrum would also arise if the spectrum was awarded in multiple, sequential stages of the same award process, and therefore this is also inappropriate.

II. Auction features

- 7.45 Prior to setting out the options below, this section provides an overview of the key auction features that typically make up a particular auction format and will be relevant in determining an appropriate auction format for a particular award. Readers are also referred to Annex A of Document 19/59a for a more detailed description of the rules of each award format.
- 7.46 Based on the use of spectrum awards internationally, there are typically three broad features that make up a spectrum auction (though some variants of each are available) each of which varies depending on the auction format:
- Combinatorial or non-combinatorial bidding;
 - Open or closed bidding; and
 - Pricing rules.

Combinatorial or non-combinatorial bidding

- 7.47 Auction formats use either combinatorial or non-combinatorial bidding formats in terms of how spectrum is made available.

- 7.48 In a non-combinatorial format, the lots available for auction are offered separately from each other where bidders can make bids for each one of the lots and each lot is assigned to the bidder that submitted the highest bid for that lot. Under this approach, bidders bid on the basis that they may win each lot independently from the other. For example, with a lot size of 2×5 MHz, if a bidder has a requirement for only 2×10 MHz, it would place two separate bids for 2×5 MHz each.
- 7.49 In a combinatorial format (package bidding), bidders are permitted to specify bids for combinations or 'packages' of lots, with the understanding that each bid may only be accepted in its entirety and can never be subdivided. In an auction that supports package bidding, bids for combinations of lots are assessed in their entirety rather than lot by lot. For example, in the same example as above, a bidder would place a package bid for 2×10 MHz and either be assigned that package or not at all. Therefore, if a bidder considers that 2×5 MHz alone is not viable, bids should be made only for a package of 2×10 MHz.

Pricing rule

- 7.50 There are two broad methods of determining prices in spectrum auctions:
- Pay-as-bid pricing; or
 - Opportunity cost pricing (also known as the 'second price rule').
- 7.51 Prior to summarising these pricing rules below, ComReg notes that it commissioned DotEcon to produce a report on pricing in spectrum awards which, among other things, reviewed a variety of different pricing methodologies. Readers are referred to this report for a more detailed discussion of the pricing methodologies discussed below.⁴⁷²

Pay-as-bid pricing

- 7.52 Pay-as-bid pricing means that bidders pay what they bid for the lots they win. In the context of an open⁴⁷³ multi-round auction, bid amounts are increased progressively and only if this is required to outbid competitors. Provided that price increments are reasonable, the potential difference between bid amounts under a pay-as-bid pricing method and an opportunity cost pricing method should be small. In this way, there is little material difference between a pay-as-bid rule and

⁴⁷² Document 20/32, Annex 12, 'Vickrey and minimum revenue core pricing in combinatorial spectrum awards - A report for ComReg', published 13 May 2020 ("DotEcon Exposure Pricing Report").

⁴⁷³ In a sealed bid award, with a pay-as-bid rule, bidders will find it difficult to establish an optimal bid amount, where the bids of other bidders are not revealed during the auction. In this context, bidders would need to establish their bid amounts based on their expectations on the bids that other bidders would submit. If the expectations of bidders are wrong and they shade their bids accordingly, then the auction process could result in an inefficient assignment. The likelihood of inefficient outcomes is high in such award formats.

a second price rule for open non-combinatorial multi-round formats (e.g. SMRA). However, if a package bidding (i.e. combinatorial) format is required there is a need to determine whether a pay-as-bid rule (e.g. SCA or CMRA) or an opportunity cost pricing rule (e.g. CCA) is preferred to account for the circumstances of the award as the difference could be more pronounced with implications for what bidders will have to pay under either method.⁴⁷⁴

- 7.53 Pay as bid formats are suitable where valuations of all bidders have declining marginal valuations (i.e. the valuation of a lot is only reduced by winning other lots as well). In such situations, uniform prices⁴⁷⁵ should support an efficient assignment because a price per lot for each category that supports an efficient assignment of lots can always be found.⁴⁷⁶ However, where the marginal valuations are increasing due to complementarities (e.g. synergies across lots) **it may be impossible to assign rights of use efficiently in an auction format that uses uniform pricing** as the value for a lot may depend on what other lots it is combined with and this may result in an inefficient assignment and/or lots going unsold unnecessarily. See below for ComReg's assessment on complementarities in the Proposed Award.
- 7.54 Note that because valuations are not available to an auction designer prior to the award, a degree of judgment is required in determining whether complementarities exist (e.g. synergies existing across spectrum lots) such that the award format should be designed with that in mind⁴⁷⁷. Further, even where they do exist (to a greater or lesser extent) the potential for inefficient outcomes arising from using one pricing method over another needs to be balanced against other Award Risks and the importance of an efficient assignment to downstream competition and society more generally.
- 7.55 Finally, in a pay-as-bid format, bidders can have an incentive to strategically reduce their demand (i.e. strategic demand reduction) even if current prices are below their valuation for additional lots if they expect that doing so leads to lower final prices for that reduced demand. In this case a bidder may prefer to settle for less spectrum at a lower price over trying to win more, even if the additional

⁴⁷⁴ In some scenarios where there are limited or no complementarities the difference between the two approaches will be at most one price increment above the second highest valuation. With multiple items, the situation is not quite as straightforward, and opportunity cost pricing might make a difference in some cases where bidders have strong complementarities across lots (See 'Price Determination' Impacts below).

⁴⁷⁵ Prices are linear if the price for a combination of items is equal to the sum of the individual prices for the items. Prices are uniform if they are the same for each bidder.

⁴⁷⁶ See Vickrey and minimum revenue core pricing in combinatorial spectrum awards,' A report for ComReg', 13 May 2020, p2.

⁴⁷⁷ Further, it should be noted that an award designed with complementarities in mind would likely result in an efficient outcome, even if those complementarities did not arise in practice. The same is not true of the reverse, and an award could result in highly inefficient outcomes if an award was designed without complementarities in mind but subsequently arose in practice.

spectrum had value well in excess of prices. This arises because under the pay-as-bid pricing rule⁴⁷⁸ competing for a larger number of blocks and keeping the auction running only drives up the price of all blocks and increases the amount that the winner has to pay. The incentives to reduce demand early are stronger if a bidder anticipates that it will need to reduce demand later in the auction anyway, but doing so earlier could ensure a much cheaper price for the smaller number of lots it ultimately expects to win.

Box 1: Where an efficient assignment cannot be supported by uniform prices

Consider a simple example with two bidders competing for two identical spectrum lots. Assume that their valuations are as shown in the following table.

	Bidder A	Bidder B
One Block	4	9
Two Blocks	12	10

Table 1: Bidder valuations

- If bidders make bids at valuation, then the winning outcome that maximises the sum of winning bids subject to taking at most one bid from each bidder is: A wins 1 lots; and
- B wins 1 lot.

This is the efficient outcome and produces a total value of €13m, compared with at most €12m from giving both blocks to Bidder A.

However, there is no uniform per-block price that would support such an outcome.

This is because there is no linear price at which A's demand is exactly one lot. Any price at which Bidder A would be prepared to buy one lot, it would prefer to have two lots (i.e. its surplus for two lots is greater). If the price per lot is slowly increased from a low level, then initially Bidder A will demand 2 lots, but once the price per lot exceeds 6, it drops out entirely.

Bidder B will demand two lots at any price below 1 one lot at a price above 1 but below 9. Therefore, there is no uniform lot price (i.e. a price per lot that is the same for all bidders) at which aggregate demand exactly equals supply. There is excess

⁴⁷⁸ This is normally true of all pay-as-bid formats. However, the CMRA can mitigate these risks to some extent (See Strategic demand reduction below).

demand up to a price of 6, but above this Bidder A drops entirely and Bidder B wants at most one lot, creating strict excess supply.

Bidders A and B behave differently because of the different structure of their valuations:

- Bidder A has an increasing marginal valuation for a second lot (i.e. it values the second at double the price of one lot), which causes a reduction in demand of more than one lot as the price increases, as once one lot is dropped, the value of any remaining lot would be reduced, so it too is dropped.
- Bidder B has a decreasing marginal valuation for a second lot (i.e. it values the second lot significantly less than the first. If the price is increased smoothly, then Bidder B responds by dropping one lot at a time.

As set out below, in a uniform price award, such valuations can lead to inefficient outcomes including unsold lots. The table shows how demand might evolve round by round in a simple clock auction assuming €1 price increments.

Price	Bidder A Surplus ⁴⁷⁹		Bidder B Surplus		Demand	
	1 Lot	2 Lots	1 Lot	2 Lots	A	B
€1	3	10	8	8	2	2
€2	2	8	7	6	2	1
€3	1	6	6	4	2	1
€4	0	4	5	2	2	1
€5	No demand	2	4	0	2	1
€6	No demand	0	3	No demand	2	1
€7	No demand	No demand	2	No demand	0	1

The auction would then finish with a price of €7 per lot (or more generally a little above €6 if smaller price increments were used), but with one lot unallocated. This is inefficient, as the efficient outcome is to award one lot to each bidder. Where a valuation structure demonstrates

⁴⁷⁹ Where the surplus refers to the difference between the price of one or more lots and the bidders valuation for same. For example, at a price of €1, Bidder A's surplus is €3 (Valuation €4 – price of one Lot €1).

declining marginal valuations as more lots are added, a uniform/linear price auction would achieve an efficient allocation on the assumption that bidders bid straightforwardly in line with valuation. However, there will be other issues to consider though, as there will typically be incentives to bidders to bid less than true valuation when bidding for more lots in auctions with uniform price structure in order to moderate the price paid. However, where there are many competitors (not typically the case in spectrum auctions) each contributing only a small proportion of overall demand, then formats such as clock auctions should be able to achieve efficiency outcomes if bidders have declining marginal valuations.

Opportunity cost pricing

- 7.56** Under an opportunity cost pricing rule, winners are only required to pay the minimum amount that is required to outbid competitors (regardless of whether it wins an individual lot or a package of lots). The opportunity cost of a winning bid is the value that is forgone by assigning lots to the winner, rather than making those lots available to other bidders. Opportunity cost pricing in a combinatorial auction is based on the opportunity cost of winning bids, where the winning price for a package is determined by competition from other bidders (where the relevant set of bids that determines prices varies across bidders)⁴⁸⁰.
- 7.57** An auction is more likely to generate an efficient outcome if the bids submitted are based on truthful valuations for different spectrum packages (or combination of lots). In that regard, an important feature of opportunity cost pricing is that it provides good incentives (though not perfect) for straightforward bidding because expressing the full value for packages should not affect how much one will have to pay.
- 7.58** This arises because while the winner determination process (i.e. the winning package) is determined based on a bidder's bids, it does not determine the winning price, as this is determined only by competition from rivals. As a result, there should be good incentives for bidders to have a relatively simple bid strategy and bid truthfully with respect to valuation in order to maximise its chances of winning⁴⁸¹ (i.e. there are no incentives for strategic demand reduction).

⁴⁸⁰ A property of the opportunity cost of a winner is that it cannot be negative (as the lowest value that other bidders can place on lots is zero). Moreover, the opportunity cost of a winning bid cannot exceed the amount of winning bid (otherwise it would not have been optimal to select this bid as winning when determining winners).

⁴⁸¹ ComReg is aware that this approach does not provide perfect incentives to bid at valuation, as there could be situations where bidders might seek to adjust their bids to reduce the price they pay. However, ComReg notes that such concerns are theoretical because of the lack of knowledge that bidders have about which bids are most relevant in the price determination process. As such, truthful bidding is unlikely to be improved upon as a bidding strategy.

- 7.59 In that regard, the opportunity cost pricing rule typically used seeks to **minimise auction revenue** subject to winners paying enough (Minimum Revenue Core (“MRC”) pricing). MRC pricing requires that every possible group of winners must pay at least its joint opportunity cost (i.e. the best alternative that could be obtained by reassigning the lots awarded to that group of winners amongst other bidders). This ensures that every subset of winners will jointly pay a price that is sufficient to outbid the offers made in competing bids.
- 7.60 Therefore, any efficient assignment requires winning bidders to pay at least the opportunity cost imposed by others otherwise there will be unhappy losers. If spectrum is assigned at below opportunity cost, then there will be an alternative bidder who could complain that it would have been prepared to pay more and that the winning bidder is paying less than the true market value of the spectrum. In effect, happy winners are collectively paying the least amount possible subject to still winning the packages arising from winner determination. If those bidders paid less there would be unhappy losers.
- 7.61 While the second price rule is attractive from an efficiency perspective because the winning price is determined by competition, the second price rule has been criticised for facilitating price driving strategies. Further, because a format using the rule is not pay-as-bid, concerns have been expressed that the rule might create some pricing uncertainty for bidders and lead to inefficient outcomes. The price derived using a second price rule is potentially lower than the price bid because it is at a level that ensures the winning bidder covers the opportunity cost of assigning the spectrum to it rather than any other bidders. However, given the price paid can be lower than the price bid (but never higher) there may be uncertainty about what bidders would ultimately be required to pay having made certain bids.
- 7.62 Therefore, when determining an appropriate pricing rule, it is important, (particularly where a combinatorial format is required), to assess the specific circumstances of each particular award and assess the extent to which inefficient outcomes could arise, particularly where a large amount of harmonised spectrum is being made available and any inefficiency or distortions to competition could impact downstream markets for a significant period (i.e. 20 years in the current case).

Open v sealed formats

- 7.63 ComReg notes that while a decision is normally required in relation to an open or sealed format, such decisions are less relevant in the Proposed Award given the obvious need for an open award format as set out in Document 19/59R. See sealed combinatorial format above (Paragraph 7.31 - 7.38) for ComReg’s final views on same.

III. Presence of complementarities

7.64 As noted above, where complementarities exist the pricing rule can impact the ability of an auction to deliver an efficient outcome to a greater or lesser extent.

7.65 Lots are complementary when a bidder's valuation of a combination exceeds the sum of the standalone values of the individual lots (i.e. valuations are synergistic). In previous consultations, ComReg has already established that complementarities are likely to arise in the Proposed Award across a number of different areas:

- i. across bands (e.g. 700 MHz and 2.6 GHz);
- ii. within bands and across bandwidth (e.g. 2×10 MHz v 2×5 MHz)⁴⁸²; and
- iii. across Time Slices.

7.66 **In relation to (i)**, the value of spectrum lots in a band may depend on whether the bidder holds or may be able to acquire spectrum in complementary bands. In that regard, ComReg notes that the 700 MHz band is the only sub-1 GHz (i.e. coverage band) being made available in the Proposed Award and is highly complementary to the 2.6 GHz Band (and other Candidate Bands) and its inclusion provides Interested Parties with the opportunity to obtain rights of use to coverage and capacity spectrum in the same award which also provides greater opportunities for new entry.

7.67 **In relation to (ii)**, bidders will typically have a valuation for a block of spectrum in a band that corresponds to multiple lots, which could exceed the sum of its valuation for each of these lots individually. In that regard, ComReg notes the following:

- a) bidders are likely to have increasing marginal valuations for two 700 MHz lots over one. For example:
 - i. existing MNOs would be able to carrier aggregate 2×10 MHz in each of the 700 MHz Duplex, 800 MHz and 900 MHz bands in the future;
 - ii. when used in conjunction with the existing sub-1 GHz bands, 2×10 MHz of 700 MHz Duplex would provide MNOs with:

⁴⁸² Note that this could include complementarities between frequency generic and specific blocks.

- A. 65% coverage area gain for speeds of 30 Mbit/s compared to 30% with 2 × 5 MHz.⁴⁸³
 - B. 30% speed gain, a point recognised by ComReg in providing that coverage obligations would be reduced to 20 Mbit/s throughput in the case that an operator won only 2 × 5 MHz.⁴⁸⁴
- iii. ComReg notes and agrees with NERA's view that "*the minimum unit of demand is 2x5 MHz, but operators may have a strong preference for a block of **at least 2x10 MHz** to provide sufficient capacity to justify investment in a third sub-1 GHz band.*" [emphasis added].⁴⁸⁵
 - iv. while the minimum unit of demand is 2 × 5 MHz, operators may have a strong preference for a block of at least 2 × 10 MHz to provide sufficient capacity to justify investment in a third sub-1 GHz band.
- b) There may be additional complementarities and increasing valuations for three 700 MHz lots for certain bidders. For example, Vodafone and Eir are likely to have an additional incentive to obtain three 700 MHz lots in order to reduce the existing sub-1 GHz spectrum asymmetry relative to Three. Further, New Entrants without existing spectrum holdings are likely to have an increasing valuation for 3 lots with the increased need for capacity across a wide area (given lack of existing sub 1 GHz holdings).
- c) In the Performance Bands (i.e. 2.1 GHz, 2.3 GHz 2.6 GHz), bidders may require a minimum amount of spectrum in excess of the lot size within any given band, so there are likely to be complementarities across lots within the Performance Bands. For example:
- i. Complementarities within a given band arise because of

⁴⁸³ See Chapter 2, Document 19/59R and LS Telecom Report and Section 4.3.2 where it was noted that:

- An operator using carrier aggregation with 10 MHz in each of the 700, 800 and 900 MHz bands would be able to achieve 30 Mbit/s of capacity at ranges of around 4.5 km from a cell-site.
- An operator using carrier aggregation with 10 MHz in each of the 800 and 900 MHz bands would be able to achieve 30 Mbit/s of capacity at ranges of up to around 3.5 km from a cell-site.

⁴⁸³ Two lots would allow three band sub-1 GHz carrier aggregation to be deployed, using 2 × 10 MHz in the 700, 800 and 900 MHz bands.

⁴⁸³ Further, because of the usage requirements of different bidders the point at which increasing marginal valuations ceases and a spectrum requirement or a bandwidth threshold is met is likely to vary significantly across operators who already have existing spectrum holdings. This could lead to valuations jumping when the corresponding bandwidth thresholds are met, and to bidders placing a relatively low value on being allocated less spectrum than what they would require to benefit from such efficiency gains.

⁴⁸⁴ Two lots would allow three band sub-1 GHz carrier aggregation to be deployed, using 2 × 10 MHz in the 700, 800 and 900 MHz bands.

⁴⁸⁵ Preparing for the 2019 Irish multi-band spectrum award Prepared by NERA Economic Consulting with the support of Three Ireland (Hutchison) Limited, December 2018.

efficiency gains from deploying larger bandwidths. Spectral efficiency may require a minimum bandwidth of contiguous spectrum greater than the minimum lot size.⁴⁸⁶

- ii. An MNO is likely to have increasing valuation for 2×15 MHz lots in the 2.1 GHz Band (as it already has existing holdings for 2×15 and it would likely prefer to retain same at a minimum given the existing dimensioning of its network.)
- iii. There may also be synergies from being assigned TDD and FDD spectrum for services in which uplink and downlink traffic is asymmetric and the value of paired spectrum used for providing symmetric traffic is dependent on whether the operator may also use unpaired spectrum to respond to asymmetric traffic increases as may arise in the future.⁴⁸⁷
- iv. Depending on competition in certain bands, some bidders' minimum spectrum requirement may increase as the competition progresses. For example, if spectrum in one band becomes relatively expensive, a bidder may need to increase its spectrum requirement in other relatively cheaper bands in order to compensate for not winning rights of use in its preferred band, increasing the marginal valuation associated with acquiring these additional lots.

7.68 Further, where bidders have decreasing marginal valuations for additional lots there may be complementarities because having all the spectrum in one band may be preferable to having lots across different bands. For example, a bidder may consider 2×20 MHz in the 2.6 GHz Band to be a reasonable substitute for 2×20 MHz in the 2.1 GHz Band but may not be interested in having only 2×10 MHz in each band. If the spectrum is offered in 2×5 MHz blocks, such a bidder might be interested in winning four lots in one band or four lots in the other band but not split across both.

7.69 **In relation to (iii)** of paragraph 7.65, there are likely to be strong complementarities across Time Slices as bidders are likely to have a strong

⁴⁸⁶ Further, because of the usage requirements of different bidders the point at which increasing marginal valuations ceases and a spectrum requirement or a bandwidth threshold is met is likely to vary significantly across operators (even for those operators who already have existing asymmetric spectrum holdings).

⁴⁸⁷ All current consumer broadband platforms are asymmetric and generally deliver much higher speeds in the downlink direction than in the uplink. As noted in the 'Spectrum for Award' RIA overall average traffic asymmetry ratio (Uplink (UL)/ Downlink (DL)), which is currently dominant (from 1/4 to 1/9) in favour of DL is expected to increase in favour of DL (from 1/7 to 1/10 or more) due to growing demand for audio-visual content.

preference for avoiding only being assigned one Time Slice in one or more bands (See Aggregation Risks below).

IV. Auction design and Award Risks

7.70 In order to assess which of the different auction formats is best suited to a particular spectrum award, it has been ComReg's approach (across a number of different spectrum awards) to consider a number of Award Risks as likely to arise, and determine which auction format best mitigates those risks while ensuring spectrum is awarded to those users who value it the most. The preferred award format would be the format that best mitigates or eliminates these risks given the circumstances particular to the award.

7.71 In that regard, Document 19/59R outlined several risks that are likely to arise in the proposed Award Process. As set out therein, the main risks (together the "**Award Risks**") associated with the Proposed Award are:

1. Aggregation risks;
2. Substitution risks;
3. Gaming opportunities;
4. Strategic demand reduction;
5. Inefficiently unsold lots;
6. Bidder information deficits; and
7. Complexity.

7.72 Readers are referred to Chapter 7 of Document 19/59R and the DotEcon Report (Document 19/59a) for further discussion on the above risks and why they are likely to arise in this award.

V. Exposure Pricing

7.73 In arriving at its preliminary view in Document 19/124⁴⁸⁸, ComReg also assessed concerns in relation to transparency and noted that it was working on whether additional information could be provided over the course of clock rounds to assist bidders in assessing the financial exposure resulting from their bids. This mechanism will be set out as part of ComReg's information policy during the award (i.e. currently set out in the draft Information Memorandum).

7.74 In that regard, in Document 20/32, ComReg published its preliminary view that

⁴⁸⁸ Document 19/124, Section 6.1.5.

an Exposure Pricing mechanism (as described therein) would provide additional helpful information to bidders and reduce the internal governance challenges without the risk of distorting the outcome of the Award Process. ComReg therefore proposed to provide this additional information to bidders during the Main Stage of the Award Process.

7.75 Having assessed the responses to Document 20/32 as they relate to Exposure Pricing, ComReg notes that the proposed introduction of Exposure Pricing was broadly supported and not opposed by any respondent. For example:

- a) *eir welcomes ComReg's proposals regarding exposure pricing transparency*^{489 490};
- b) *Imagine is of the view that providing Exposure Pricing as outlined in ComReg 20/32 sections see Section 1.3, 4.2.2 and Annex: 12 is a welcome addition to the auction process as a tool that helps address transparency concerns and governance challenges that may in particular impact smaller operators and therefore should be included*⁴⁹¹;
- c) *Vodafone "strongly support the addition of a process to provide Exposure Pricing information to the auction rounds.*⁴⁹² *And including this mechanism would be a significant positive change in the auction design, with no apparent down-side for the auctioneer or the process; and*
- d) *Three does "not oppose the addition of an exposure tracker in ComReg's CCA implementation, but we also do not think that it meaningfully addresses the concerns about the format as already described to ComReg in detail in the Earlier Response."*⁴⁹³

7.76 In light of the responses received, DotEcon advise that Exposure Pricing should provide bidders with significantly improved information about what they could ultimately expect to pay for a package if there were to win it.⁴⁹⁴

7.77 In light of the detailed literature review, the proof of concept provided by the

⁴⁸⁹ Eir Response to ComReg Consultation: Proposed Multi Band Spectrum Award – Draft Information Memorandum and Draft Regulations ComReg Document 20/32 – Page 3.

⁴⁹⁰ Separately, Eir remains of the view "that ComReg has failed to appreciate the fundamentally different nature of risk faced by a budget constrained bidder in a CCA as compared with an SMRA or SCA".

⁴⁹¹ Imagine response to: ComReg 2032, Proposed Multi Band Spectrum Award – Draft Information Memorandum and Draft Regulations, Page 5.

⁴⁹² Proposed Multi Band Spectrum Award – Draft Information Memorandum and Draft Regulations The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands

⁴⁹³ Three response to Document 20/32, 'Multi-Band Spectrum Award – Draft Information Memorandum Response to Document 20/32', from Three 24th June 2020

⁴⁹⁴ DotEcon Report, Document 20/122a, p91.

auction simulations, and the response to Document 20/32, ComReg is of the view that in assessing a CCA against other auction formats below, the CCA would include an Exposure Pricing mechanism as set out in Document 20/32⁴⁹⁵. Further, there would be no benefit in having an additional option for a CCA without Exposure Pricing since there is no obvious downside to including the Exposure Pricing mechanism.

7.6 Impact on industry stakeholders, competition and consumers (Steps 3 and 4)

7.78 The focus of this section of the RIA is to assess the impact of the regulatory options on:

- i. industry stakeholders as described in Section 7.2 above.
- ii. competition and consumers.

7.79 ComReg sets out below a comparative analysis of each of the six auction options outlined above, in terms of their impact on stakeholders, competition and consumers.

7.6.1 Impact on Industry Stakeholders

7.80 Industry stakeholders can be broadly split between MNOs and other typically smaller potential bidders that are currently active in the electronic communications sector and potential New Entrants that may be considering entry. In that regard, ComReg sets out below the relevant stakeholders and some high-level observations on their likely requirements and other relevant information:

- a) MNOs (Vodafone, Three and Eir):
 - i. MNOs already have existing spectrum holdings across multiple coverage and Performance Bands (often referred to as capacity

⁴⁹⁵ In relation to other information that could be provided, Eir believes that the outcome of the auction could be enhanced if each bidder were provided with the following information, in addition to that already proposed by ComReg in the Draft IM:

- The minimum bid that the bidder could make for its final primary package in the supplementary bids round for that bid to win. We anticipate that this could be calculated by assuming that all other bidders that made a non-zero bid in the final primary round made the knock-out bid for their final primary package in the supplementary bids round, and no other supplementary bids were made by any bidder.
- The minimum bid that the bidder would need to make for its final primary package in the supplementary bids round for that bid to win if no other supplementary bids were made by any other bidder.

ComReg is of the view that this information is already available, the particulars of which are discussed separately in Section Annex 7 (A7.1.3).

bands by MNOs) and would likely be interested in all rights of use being made available.

- ii. MNOs have mature networks (including 2 - 2.5K base stations) and bases stations that typically cover multiple bands (this means that even if an MNO won a small amount of spectrum less than its preferred package, it could still potentially utilise that spectrum to a greater or lesser extent.

b) Other licenced operators (Dense Air & Imagine):

- i. Imagine and Dense Air have existing spectrum rights of use of use in the 3.6 GHz Band only and would likely be interested in obtaining rights of use in the Performance Bands. Other similar operators (i.e. Fixed Wireless Operators) have small amounts or annually renewable rights of use or licence exempt spectrum. Such operators may have a requirement for a minimum amount and mixture of spectrum in order to justify upgrade or rollout of base stations).
- ii. Such operators do not have networks which are as widespread or as dense as MNOs (each network has circa 100 – 300 sites).

c) New Entrant operators. ComReg makes the following background observations on same:

- i. A New Entrant MNO would likely require rights of use in both the 700 MHz and the Performance Bands; and
- ii. FWO/NDO entrants would likely have a requirement for rights of use in the Performance Bands.

7.81 Auctions⁴⁹⁶ are used to determine (i) the nature and quantum of spectrum rights of use to be assigned to winners (“**Assignment Impacts**”) and (ii) what price should be paid by those winners for those rights of use (“**Pricing Impacts**”). This section assesses the extent which each option exposes stakeholders to various Assignment and Pricing Impacts.

7.82 In relation to ‘**Assignment Impacts**’, the choice of auction format can impact on a bidders ability to obtain its preferred package or to win any rights of use altogether.

7.83 In relation to ‘**Pricing Impacts**’ each of the Award Risks can also impact the

⁴⁹⁶ ComReg notes that this RIA is an assessment of different auction formats only. It does not directly consider the potential impact arising from the Award Process more generally. For example, competition caps and minimum prices would be the same regardless of the Auction format and are assessed separately in this document.

price a winning bidder has to pay or the surplus it could obtain.

7.84 Further, different auction formats have different processes for determining the price that winning bidders have to pay in order to best ensure the efficient assignment of the radio spectrum. In that regard, the price determination process for each auction format could impact bidders in different ways and ComReg provides an assessment of same (“**Price Determination Impacts**”).

7.85 The remainder of this section (‘Impact on Industry Stakeholders’) is therefore laid out in three Parts as follows.

7.86 **Part I** discusses each option in the context of the seven Award Risks referred to in Paragraph 7.71 above:

- First, it describes the Assignment and Pricing Impacts that could arise under each Award Risk.
- Second, it assesses the extent to which each Award Risk would likely arise under each Option.
- Third, it assesses whether those impacts would vary depending on the stakeholder group. (i.e. do the Assignment/Pricing impacts apply to some or all stakeholders).

7.87 **Part II** assesses the Price Determination Impacts arising from the use of the pay-as-bid or opportunity cost pricing rules.

7.88 **Part III** provides the views of stakeholders and which option would likely be preferred by each.

7.89 In discussing Award Risks and auction formats more generally below, ComReg often refers to and relies upon observations made by DotEcon in its detailed 2019 report (Document 19/59a) rather than in its more recent reports. This is because the content of DotEcon’s more recent reports largely addresses submissions made by interested parties in response to Document 19/59 and to subsequent ComReg documents. For the avoidance of doubt, DotEcon confirms that, unless stated otherwise in subsequent reports, the observations made by it in its 2019 report remain valid.

Part I Award Risks

1. Aggregation risks

7.90 Aggregation risks arise because of complementarities between lot categories. There are various complementarities likely to arise in the Proposed Award as discussed in the background section of this RIA.

Assignment and Pricing Impacts

Assignment Impacts

- 7.91 The main Assignment Impact arising from a failing to address aggregation risk is that bidders end up winning some but not all of their minimum spectrum requirements. This impact can be very large where bidders have increasing returns for additional rights of use (i.e. complementarities) and do not have existing spectrum holdings. The impact can be particularly detrimental for smaller bidders or New Entrants who may have little or no other radio spectrum to fall back on.
- 7.92 In the Proposed Award, there are three main Assignment Impacts arising from aggregation risks:
- a) Where a bidder requires multiple blocks of spectrum but is assigned 'stranded' lots resulting in unwanted subsets of demand, (i.e. one 2 × 5 MHz lot when two was preferred). Such scenarios create significant Assignment Impacts where a bidder wins below its requirement and subsequently has no use for the spectrum in that band.
 - b) Where a bidder requires multiple blocks of spectrum across different bands but is assigned rights of use only in some but not all bands (e.g. need for mix of coverage of capacity) resulting in enough spectrum in one band but unwanted demand in others. Such scenarios create Assignment Impacts where a bidder could potentially hold large amounts of spectrum in one band but has no requirement for it because it failed to be assigned rights of use in a complementary band.
 - c) There are potentially significant Assignment Impacts due to the aggregation risks associated with winning rights of use in one Time Slice rather than both Time Slices.⁴⁹⁷ In that regard, there are likely to be particularly strong complementarities across Time Slices and bidders would likely have a strong requirement for rights of use across both Time Slices in all relevant bands and would prefer to avoid winning rights of use in one Time Slice but not the other. For example:
 - i. If only Time Slice One was assigned when both Time Slices are preferred, liberalised rights of use would not be available from 2027.

⁴⁹⁷ ComReg notes that there are number of potential scenarios that could arise noting that the magnitude of the impacts would depending on how rights of use are assigned across different time slices. For example, if Bidder A's preferred package is 2 × 20 MHz across both Time Slices a format that does not address aggregation risks could result in complete or partial aggregation such as:

- All of preferred rights of use in one Time Slice but no rights of use in the other Time slice (e.g. 2 × 20 MHz in Time Slice One but no rights of use in Time Slice Two); or
- All of preferred rights of use in one Time Slice but partial rights of use in the other Time slice (e.g. 2 × 20 MHz in Time Slice One and 2 × 5 MHz in Time Slice Two).

This could impact those MNOs in several ways (noting that the magnitude of the impacts would depend on the amount of spectrum assigned in both time slices) For example:

- A. It would be unable to offer LTE 2100 to consumers in the period after 2027.
 - B. It would effectively reduce the licence duration for those rights of use to 5 years (instead of 18 years).
 - C. It would increase the risk of inefficient rollout if those operators would have preferred to use 2.1 GHz rights of use but instead had to use alternative liberalised rights of use (e.g. 2.3 GHz and 2.6 GHz) in the period after 2027.
 - D. MNOs in such a position would have to re-dimension their network (i.e. base station rollout and reconfiguring of other spectrum rights of use) to account for the expiry of 2.1 GHz rights.
- ii. Further, only winning one Time Slice would be less likely to justify the investment required to rollout a network as it would significantly reduce the time to earn a return on any investments made.⁴⁹⁸
 - iii. If only Time Slice Two was assigned when both Time Slices are preferred, existing 2.1 GHz rights of use would expire in 2022 and new liberalised rights of use would be delayed 5 years until 2027. This could impact MNOs in several ways (noting that the magnitude of the impacts would depend on whether some or all rights of use were acquired):
 - A. LTE 2100 would not be available from 2022 (and to the extent that liberalised rights of use are already available using temporary rights⁴⁹⁹) such services would have to be removed. In that regard, ComReg notes the widespread use of the bands under current temporary licensing measures⁵⁰⁰.
 - B. It would effectively reduce the licence duration for those

⁴⁹⁸ The potential Assignment Impact would be significantly less for Eir because it already has existing rights of use for 2 x 15 MHz for the period of Time Slice One and would have the option to liberalise those rights of use as set out in the Timing of Liberalisation RIA (See Annex 6). Therefore, if it was only assigned rights of use in Time Slice 2 it would still be able to provide LTE 2100 over the duration of the licence.

⁴⁹⁹ See: <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/covid-19-temporary-spectrum-management-measures>

⁵⁰⁰ See Paragraph 3.13 – 3.19 of Document 20/86R.

rights of use to 13 years (instead of 18 years).

- C. Operators would have to decide on whether to re-dimension their network (i.e. base station rollout and reconfiguring of other spectrum rights of use) to account for the expiry of 2.1 GHz rights when such rights of use would not become available again until 2027.

Pricing Impacts

- 7.93 There is also a substantial risk of a winning bidder overpaying for a subset of its spectrum requirements because the valuation for its preferred package was in expectation of it winning its full requirement rather than part of it (e.g. where two lots in combination were more valuable than a single lot). Note that such scenarios could arise even where existing spectrum holdings reduce the Assignment Impacts (i.e. the potential Assignment Impacts may be reduced but the winning bidders could still potentially pay more for those rights of use.)
- 7.94 There is potential for these impacts to occur generally across all bands and across Time Slices, but the impacts are likely to be more significant in the higher valued bands such as the 700 MHz Band where valuations across multiple lots are likely to be high.
- 7.95 Consider, for example, an existing operator and the 700 MHz Band. It is likely that this operator would have a valuation for 2×10 MHz that is more than twice its valuation for 2×5 MHz given the efficiencies associated with same. In such cases, if the bidder is stranded on a subset of the lots upon which it bid (only one 2×5 MHz lot in this case), the bidder may face prices that are above its valuation of the lot won.
- 7.96 While the single 2×5 MHz 700 MHz lot assigned would still likely be utilised, there is an increased risk that a bidder would end up paying above valuation for that lot⁵⁰¹. In order to mitigate such risks a bidder could stop bidding for a second lot as soon as prices are equal to its value of one lot. This would ensure that the bidder is not exposed to the risk of overpaying for a single lot. However, the result might not be desirable because the winning price could end up below the valuation it has for two lots. In effect, if it does not win two lots, a bidder could either end up with no 700 MHz or overpay for one lot.

Aggregation Risks under Option 1 (i.e. SMRA variations)

- 7.97 ComReg agrees with DotEcon's observation that under SMRA-based formats

⁵⁰¹ This risk applies for spectrum more generally where operators with increasing marginal valuations of spectrum (i.e. for whom the value of spectrum portfolios grows disproportionately with size) is that, if they win less spectrum than they bid for, they might end up overpaying for the amount of spectrum they win.

bidders would be likely be exposed to material aggregation risks.⁵⁰²

7.98 In a standard SMRA auction, Option 1 (a), bidders must bid on each lot independently. Where a bidder submits a number of individual bids for a combination of lots, it may be exposed to the risk of being 'stranded' on a subset of the combination of lots they wanted.

7.99 Alternatively, Option 1 (b)(i) can allow for the withdrawal of bids in order to mitigate aggregation risks. For example, a bidder with standing high bids⁵⁰³ can withdraw them in order to switch to a different combination of lots. However, there are restrictions on the number of withdrawals allowed (unlimited in Eir variant) and often also financial penalties if a withdrawal then leads to a lot being left unsold. Where penalties on withdrawals are applied⁵⁰⁴, bidders may still be subject to a cost for withdrawing bids from unwanted lots.

7.100 Option 1 (b) (ii) includes some measures to mitigate aggregation risks. For example:

- the determination of standing high bids means the need for minimum requirements within a band is slightly less problematic under this Option compared to than the standard version.
- the proposed revised lot structure mitigates aggregation risks between frequency generic and frequency specific lots within the same band.

7.101 However, DotEcon also notes that because complementarities are broader than accumulating spectrum within bands, aggregation risks remains significant⁵⁰⁵ and measures to reduce aggregation risks across frequency-generic and specific lots come at the cost of reducing the flexibility bidders have to demand different quantities of spectrum).

7.102 Further, ComReg notes that the withdrawal of standing high bids are not permitted under Option 1 (b) (ii) and bidders cannot withdraw from bids where they are stranded on a subset of lots.

7.103 Therefore, ComReg is of the view that while there are measures to mitigate

⁵⁰² Document 19/59a, p74.

⁵⁰³ A standing high bidder is effectively a 'provisional winner' nominated by the auctioneer based on the bids received at the end of each round. If there is more than one bid for a lot (excess demand), the auctioneer will increase the price of this lot in the next round and invite new bids. The process continues until there is no excess demand for either lot. The 'provisional winner' in the final round will be the winner of the lot and will pay its standing high bid for the Lot.

⁵⁰⁴ For example, in the 2015 ACMA award referred to by Eir, Bid withdrawal penalties applied in a number of scenarios in order to discourage bidders making frivolous bids and then withdrawing them. See p.53 of the Auction Guide.

<https://www.acma.gov.au/sites/default/files/2019-10/Auction-guide-1800-MHz-spectrum.zip>

⁵⁰⁵ DotEcon Report, Document 20/122a, p128.

aggregation risks, these risks arise in different ways and would remain significant under all SMRA options and bidders would be exposed to the impacts referred to above.

Aggregation risks under Option 2 (c)

- 7.104 The demand retention rules proposed for this option would result in relatively small aggregation risks across time slices within each of the bands and these risks would be lower than under an Option 1 where aggregation risks across time slices remains a significant concern.
- 7.105 However, ComReg notes and agrees with DotEcon that the compulsory exit bids rule means that the format does not fully remove aggregation risks resulting from time slicing in the 2.1 GHz band.⁵⁰⁶ In particular, if a bidder is forced to submit compulsory exit bids for individual lots (which would be for individual lots in one time slice or the other), it faces the risk of winning lots in one time slice but not getting the equivalent number in the other and paying over its valuation. Although, this risk is small it would not exist under Option 2 (a) or 2 (b).
- 7.106 Further, and in relation to aggregation risks across bands, the demand retention rules introduce problems associated with the SMRA (i.e. being stuck on standing high bids) because bidders are unable to reduce their demand in a band where the price remains the same. This has the effect of preventing a bidder who has complementarities across lots from switching across those combination of lots and may prevent a bidder dropping entire combinations. This risks winning lots it may not want if prices stay the same.⁵⁰⁷
- 7.107 This could be particularly detrimental for bidders that do not have existing holdings and may have a requirement across for rights of use across bands. DotEcon⁵⁰⁸ provides the example of a potential new entrant that needs a mix of 700 MHz and 2.6 GHz spectrum, but winning either band on its own is not viable for its business case. If the prices for the 2.6 GHz lots at some point stop increasing, the bidder's demand for those lots would be retained for future rounds. If the 700 MHz price then increases beyond the point at which the total price across all of the lots the bidder needs is above its valuation, the bidder could drop out of the 700 MHz Band (potentially with exit bids) but its demand for 2.6 GHz would remain active and end up winning (when the bidder would no longer want those lots) if there were no further changes in that band. In such cases, would potentially win lots it has little or no demand for.
- 7.108 ComReg notes that the demand retention rule and compulsory exist bids are an attempt to mitigate gaming possibilities and the risk of inefficiently unsold lots.

⁵⁰⁶ See DotEcon Report, Document 20/122a, p133.

⁵⁰⁷ See DotEcon Report, Document 20/122a, p132.

⁵⁰⁸ Ibid.

However, such mitigation reopens aggregations risk into a format that would not normally suffer from same. This may be a particular problem for entrants who are more likely exhibit complementarities across bands (i.e. no existing holdings).

7.109 Therefore, ComReg notes that this option would introduce aggregation risks (risks that would not arise under Option 2 (a) or 2 (b)).

Remaining options

7.110 All remaining options are combinatorial auctions that allow for package bidding and would remove each of the Assignment and Pricing Impacts described above.

Relevant stakeholder impacts

Assignment Impacts

7.111 As existing MNOs already have existing spectrum holdings across multiple bands (Coverage and Performance Bands) the Assignment Impact's arising from being assigned rights of use to some but not all their preferred spectrum packages in the proposed award are lower compared to MBSA 2012.⁵⁰⁹ For example, if an existing MNO won 2 × 10 MHz in the 2.6 GHz Band when its preferred package was 2 × 20 MHz, it would likely still be useful compared to a situation where a bidder did not have any rights of use and may not be able to use the spectrum at all.

7.112 In relation to FWO and NDOs, the Assignment Impact arising from winning below a spectrum requirement is higher than what would apply to MNOs because rights of use won below that requirement may not justify the roll out of additional base stations. For example, if an FWO had a minimum requirement for 40 MHz in the 2.3 GHz Band and only won 20 MHz it might not justify investment in base station equipment whereas the same may not be true of MNO's who already have better flexibility in adjusting their already extensively rolled out networks.

7.113 Potential entrants are likely to have a requirement for coverage and performance spectrum and Option 1 and Option 2 (c) could expose such bidders to only winning part of that requirement. Rights of use that are below this requirement would be unwanted and new entry would not be possible because any rights of use assigned would be insufficient to justify investment in a national rollout (i.e. unlike MNOs who already have existing network).

7.114 The Assignment Impacts described in relation to Time Slices above would apply equally for all bidders in relation to the Performance Bands (i.e. the 700 MHz

⁵⁰⁹ While complementarities are likely to exist within and across all bands such complementarities are likely to be smaller relative to the 2012 MBSA given MNOs existing spectrum holdings across a range of different bands.

Band is not time sliced).

7.115 In relation to Option 2 (c), the aggregation risks might be less for MNOs with existing holdings but remain substantial for other bidders. As noted by DotEcon, the possibility of non-MNO bidders who may have different requirements cannot be precluded, and this needs to be considered when determining the most appropriate award format⁵¹⁰. For example:

- a) a bidder looking to enter the mobile market might require a combination of sub-1 GHz and higher frequencies;
- b) non-mobile operators interested in the higher frequency bands may have a need for spectrum across multiple bands for network capacity or performance; or
- c) bidders with no (or low) existing spectrum holdings may have minimum requirements for their business case to be viable.

7.116 ComReg is of the view that such bidders would be exposed to higher levels of aggregation risks compared to MNOs under Option 2 (c) (noting that option 2 (c) would still expose MNOs to aggregation risks depending on their demand structure.

Pricing Impacts

7.117 The same Pricing Impacts described above generally apply to all bidders and Option 1 and Option 2 (c) could result in bidders being assigned rights of use above valuation.

7.118 In addition, because FWO/NDOs and New Entrants have limited scope (or no scope) to roll out a range of different bands on their network (i.e. network is almost entirely specific to one band) such bidders would have no use for spectrum below a minimum requirement and would need:

- i. to return rights of use to ComReg despite having to still pay its Spectrum Access Fee; or
- ii. transfer or lease rights of use to other operators.

7.119 Under either scenario such a bidder is unlikely to recover the amounts paid in the Auction (i.e. since other bidders were not willing to pay that price during the award). Further, such issues would be known to these stakeholders prior to the Award discouraging participation altogether.

7.120 Pricing Impacts are potentially most significant for new entrant MNOs given the

⁵¹⁰ DotEcon Report, Document 20/122a, p132.

synergies across Coverage and Performance Bands are likely to be higher than within those Bands. (e.g. if a New Entrant bidder won only 2 × 5 MHz in the 700 MHz Band when its minimum requirement was 2 × 10 MHz in 700 MHz and 2 × 10 MHz in one of the Performance Bands, the price paid would have been on the basis of winning those other rights of use also).

Conclusion on Aggregation Risks

7.121 Aggregation risks only arise in relation to Option 1 and Option 2 (c).

7.122 ComReg notes that all variations of an SMRA are exposed to Aggregation Risk and bidders would be exposed to each of the Assignment Impacts outlined above. Hybrid SMRAs and bid withdrawal mechanism would mitigate the Assignment Risks to some extent. However, this exposes the award to gaming risks as described separately below.

7.123 Option 2 (c) significantly mitigates aggregation risks across time slices, but not in relation to aggregation risks across bands.

2. Substitution risks

7.124 Substitution risks can arise when one or more bidders view at least some alternative combination of lots as substitutes but cannot switch its bidding from one combination of lots to another based on prices because of some impediments to switching.

Assignment and Pricing Impacts

Assignment Impacts

7.125 The Assignment Impacts arising from substitution risks have the potential to be large depending on competition during the award. This arises because some bidders who would prefer to be assigned certain lots at final (or round) prices may have been unable to express their willingness to do so through their bids.

7.126 In summary:

- i. Bidders could win some combination of spectrum lots when it would have preferred a different combination but could not switch to that combination because of switching impediments.
- ii. Bidders could win a lower amount of spectrum because it was unable to bid above eligibility and move to a higher eligibility package (even if consistent with previous revealed preferences).
- iii. Bidders might not win any spectrum at all when unsold lots exist that the bidder would have been willing to acquire at final prices but was unable to express their willingness to do so through their bids.

7.127 Such impacts could also arise due to a bidder not having made all of the relevant bids because the auction format did not provide for the ability to make a wide range of bids for packages of interest.

7.128 Further, in order to prevent such outcomes arising under (i) and (ii) above, bidders may choose not to reduce eligibility and switch to lots (or a combination of lots) and simply stay on their initial preference regardless of whether it would obtain a higher surplus (the difference between their bid and the price actually paid) from switching. If the bidder's motivation to do so is that it wishes to be able to bid on a higher activity package later (in the event that it again becomes the preferred package), then the distorted information provided during the award⁵¹¹ would be a consequence of the limitations to switching arising from the award format. This would undermine the price discovery process which all bidders use to formulate and guide their bidding strategies.

Pricing Impacts

7.129 In relation to Pricing Impacts, ComReg notes that impediments to switching in response to relative price changes prevents bidders winning a package that **maximises their surplus**. For example, bidders could end up with a package with a surplus of €5m when an alternative package with a surplus of €10m would have been preferred at final prices.

Substitution Risks under Option 1 (SMRAs)

7.130 ComReg has considered and agrees with DotEcon's observations that SMRA-based formats would create impediments for bidders to switch across different portfolios of interest in response to price changes.⁵¹²

7.131 Under Option 1 (a) the SMRA allows bidders to respond to price differences of alternate lots. However, because standing high bids on each lot are determined independently of other lots, this limits a bidder's ability to switch to a preferred combination of lots in a straightforward fashion.⁵¹³ This arises because standing high bids remain valid and committing, unless they are overbid in a subsequent round. A bidder may become stranded as the standing high bidder on one or more lots when the same bidder would prefer to switch its demand to an alternative combination of lots.

⁵¹¹ The information provided in the award is important because, among other things, bidders may want to update their own valuation considering information received about the valuations of other bidders. However, in this case, the information would not be based on a bidder's preference or valuation at given prices but rather a fear of dropping eligibility. In this case, other bidders' bidding decisions could be made based on less reliable information.

⁵¹² Document 19/59a, p74.

⁵¹³ Note that switching impediments often arise when bidders would want to switch between combinations of lots rather than individual lots and are thus closely linked to aggregation risks.

- 7.132 Under Option 1 (b) (i), allowing bidders to switch all their bids without any associated penalties allows them to move their full sets of bids in order to target spectrum more effectively (though this has gaming consequences which are discussed separately).
- 7.133 Substitution risks can be reduced (though not removed) using waivers as described by Three⁵¹⁴ under Option 1 (b)(ii). Waivers allow bidders to maintain their eligibility even if their activity falls below the required levels. DotEcon notes that waivers can also help manage substitution risk by allowing bidders who wish to switch to a different combination of lots, but are stuck with some standing high bids, to wait to see if they are outbid on their standing high bids, so that they can switch to a new aggregation in one step.⁵¹⁵ Each bidder typically has a limited number of waivers that could be placed during the auction in cases where otherwise the bidder would lose eligibility.⁵¹⁶
- 7.134 In relation to the SMRA options, as noted by DotEcon⁵¹⁷ even if bidders are aware of the problem, it remains possible that a bidder could prefer lots in one band at round prices, and then be left as a standing high bidder on only a subset of its demand, leaving it unable to switch fully into another band which it prefers at the next rounds prices. Given that bidders will not know their rivals' valuations, it is unclear how they could be expected to precisely predict whether they would end up in this situation, and therefore this creates strategic complexity for bidders attempting to anticipate this, and avoid be standing high bidder on lots it no longer wants.
- 7.135 Therefore, ComReg is of the view that while there are measures to mitigate substitution risks, these risks would remain significant under all SMRA options and bidders would be exposed to the impacts referred to above.

Substitution Risks under Option 2 (i.e. SCA variations)

- 7.136 DotEcon notes that when there are different lot categories (as for this Proposed Award) the SCA may expose bidders to substitution risk (if the activity rules limit the extent to which bidders can switch between alternative portfolios of interest).⁵¹⁸ This significantly restricts the number of potential assignments across bidders that can be considered and limits the extent to which bidders' preferences over alternative packages can be accounted for when determining

⁵¹⁴ See Three response to Document 20/56 – Annex I.

⁵¹⁵ Document 19/59a, p98.

⁵¹⁶ In practice, the bidder can wait one round to see if it is outbid on its standing high bids, in which case it will be able to switch its full demand. If it is not, it may prefer to continue to bid on the lots where it holds its standing high bids to avoid a situation where it wins a small number of lots in that band.

⁵¹⁷ DotEcon Report, Document 20/122a, p138.

⁵¹⁸ Document 19/59a, p74.

the auction outcome.⁵¹⁹

- 7.137 Under Option 2 (a) (i.e. standard SCA without relaxed activity rules) switching impediments are reduced relative to Option 1 as switching can occur across packages of lots rather than individual lots. The SCA has the advantage that it supports package bidding, in that the auction will only end if all bidders can be assigned all the lots they bid for in the most recent round. However, it is still subject to substitution risks (as it does not allow bidders to bid for mutually exclusive alternatives) and seems likely to result in lots going inefficiently unsold under some reasonable demand scenarios because the Proposed Award is a multi-band spectrum award with a large amount of substitutable and complementary spectrum.
- 7.138 Further, switching between different categories of lots may be inhibited by the activity rules, which are put in place to ensure that bidders do not increase demand as prices increase. This Option would allow bidders to switch demand across lot categories in one go. However, when a bidder reduces its eligibility then it would be unable to submit any further bids that would involve an activity level greater than its current eligibility level. Consequently, bidders would not be able to switch back and forth between packages with different eligibility (even if consistent with previous preferences). As there are differences in eligibility points across packages of interest in the Proposed Award this can create impediments to switching.⁵²⁰
- 7.139 For example, suppose that a bidder switches from package A to package B, and that A has greater eligibility than B. It is possible that the price for B might then increase relative to the price of A, and that the bidder may wish to switch back from B to A. It should be noted that this could potentially happen in a large multi-band award, as the switch has the effect of increasing demand for B while decreasing demand for A. However, the bidder cannot do this under Option 2 (a) because it would not have sufficient eligibility to bid back on package A, which likely has more rights of use associated with it.
- 7.140 Under Option 2 (b) (i.e. SCA with relaxed activity rule) such switching would be permitted using relaxed activity rules similar to those used in a CCA. However, while this promotes substitution better than Option 2 (a), it is a poor mitigation because it allows bidders to withhold or misrepresent their demand until late in the auction promoting significant gaming strategies (see gaming below). The proposals by Eir go some way to removing substitution risk, but they do not address the other significant and fundamental issues that would be created by

⁵¹⁹ Document 19/124a, p41.

⁵²⁰ Once a bidder has reduced its activity below the level of eligibility points for a larger package it will be unable to switch from the smaller package back to the larger lots, even if the larger package become relatively more attractive following an increase in the price of smaller lots. This could reduce the spectrum assigned to a winning bidder.

using a SCA for this award.

7.141 In relation to Option 2 (c), DotEcon notes⁵²¹ that this format does not appear to do anything to address the substitution risks arising under Option 2 (a) and in fact seems to make the issue worse. In particular:

- bidders cannot switch demand for more than one lot into another band in any given round means that, if a bidder is bidding for more than one lot in these bands (as is likely), it cannot switch its full demand cleanly into an alternative, substitutable band;
- bidder wanting to switch all of its demand out of one band into another would need to do this one lot at a time in successive rounds, which creates the risk that the auction ends with the bidder only part way through its switch, and could also lead to inaccurately reporting demand at given prices; and
- bidders with genuine demand for spectrum in the 2.1 GHz and or 700 MHz bands but who consider themselves weaker bidders would refrain from bidding in those bands simply in anticipation of difficulties switching to alternative bands in later rounds.

7.142 Therefore, ComReg is of the view that substitution risks are high under the SCA formats and cannot be sufficiently mitigated without increasing other Award Risks.

Substitution risks under Options 3, 4, 5 and 6

7.143 ComReg notes that the likelihood of substitution risks is very low in relation to Option 3, 4, 5 and 6:

- a) In a CMRA (i.e. Option 3) switching impediments are removed by allowing bidders to make a list of mutually exclusive bids each round, and by allowing bidders to increase their demand in response to changes in relative prices.⁵²²

⁵²¹ DotEcon Report, Document 20/122a, p131.

⁵²² The CMRA adopts the relaxed activity rules similar to CCA, which allow bidders to increase their demand relative to the preceding round if doing so is consistent with the relative caps. This allows bidders to make bids that they would have been able to do in the supplementary bids round of a CCA.

- b) A CCA (i.e. Options 4, 5 and 6) allows bidders to express a range of demand and their relative value for many different packages of lots that are substitutes for the bidder and selecting a winning combination of bids from the pool of all feasible combinations.⁵²³
- c) Bidders have the option to bid for a range of alternative packages and the winner determination mechanism maximises bidder surplus given the bids received and the price rule adopted.⁵²⁴ (i.e. surplus is maximised given the bids made).
- d) However, ComReg notes while **the mechanism for switching** permits bidders to switch across preferred packages in line with valuation the information on which such decisions are based varies across Options 4, 5 and 6 which impacts overall efficiency (See 'Bidder Information Deficits' and 'Bidder Incentives' below).

7.144 As noted by DotEcon, substitution risks can be addressed more generally by offering bidders the option to bid for alternative packages and adopting a winner and price determination mechanism that maximises bidder surplus given the bids received. This means that a bidder can express its valuations for several alternatives, and then rely on the auction mechanism to select the most preferred outcome against those valuations. The CCA and CMRA both adopt this approach.⁵²⁵

7.145 Therefore, **in relation to substitution risks**, there are little or no Assignment Impacts or Pricing Impacts arising under these Options (again noting that this refers to the mechanism and overall impact would need to consider the information on which any switching was based).

Relevant stakeholder impacts

Assignment Impact

7.146 ComReg notes that each of the Assignment Impacts referred to above would broadly apply to all bidders in the same way, depending on each bidders particular spectrum requirements (i.e. winning a combination of lots when it would have preferred an alternative).

7.147 However, the Assignment Impacts are likely to be higher for New Entrants and other smaller bidders (e.g. FWO/NDOs). Impediments that prevent such bidders

⁵²³ The CCA adopts relaxed activity rules, which facilitates switching across categories when relative prices change, if doing so is consistent with the preferences revealed in earlier rounds where the bidder has contracted demand.

⁵²⁴ This means that a bidder can express its valuations for a number of alternatives and then rely on the auction mechanism to select the most preferred outcome against those valuations.

⁵²⁵ DotEcon Report, 19/59a, p 70.

switching to larger (or smaller) portfolios of spectrum (which they would have preferred) would likely have a disproportionate impact on bidders that have lower existing spectrum holdings. For example, if such bidders could have been assigned an additional 2 × 10 MHz in the Performance Bands but were unable to bid due to switching impediments, that 2 × 10 MHz denied would likely be a higher percentage of existing holdings by comparison with incumbent MNOs.

Pricing Impact

7.148 ComReg notes that each of the Pricing Impacts (referred to above) would broadly apply to all bidders in the same way depending on each bidder's particular spectrum requirements (i.e. winning a combination of lots when it would have preferred an alternative with a higher surplus).

7.149 However, New Entrants and other smaller bidders (e.g. FWO/NDOs) typically have a lower budget for spectrum meaning that the Pricing Impacts are likely to be higher. Further, because some bidders may not switch from a higher package and run down their budget (as described above), round prices might be less indicative of the final outcome of the auction. This could hinder all bidders, particularly those that are budget constrained who would need to focus on packages they could realistically win.

Conclusion on substitution risks

7.150 Considering the above, and in summary, ComReg notes the following.

- a) substitution risks are highest under Option 1 (a) and bidders would be exposed to the various Assignment and Pricing Impacts referred to above;
- b) substitution risks are less likely to occur under Option 1 (b) compared to Option 1 (a). However, bidders would still be exposed to the various Assignment and Pricing Impacts even if the risks of such impacts arising are lower. In any event, this approach increases risks of gaming (see below);
- c) under Option 2 (a) substitution risks are reduced, relative to Option 1, primarily because switching can occur across packages of lots rather than individual lots. However, bidders would still be exposed to the various Assignment and Pricing Impacts due to not being able to bid above eligibility even where such switching would be consistent with revealed preferences;
- d) Option 2 (c) retains some of the substitution risks under Option 2 (a) bidders would not be able to switch back and forth between packages with different eligibility (even if consistent with previous preferences). Further, bidders cannot switch its full demand cleanly into alternative substitutable bands;

- e) Option 2 (b) reduces substitution risks by allowing for switching above eligibility under certain scenarios (though creates significant gaming possibilities); and
- f) all remaining options provide appropriate switching mechanisms (without creating additional risks⁵²⁶) and would be preferable to Options 1 and 2. (noting ComReg separate concerns in relation to Bidder Information Deficits and Bidding Incentives).

3. Gaming

7.151 Gaming opportunities refer to all opportunities for bidder behaviour aimed at acquiring spectrum at a price below what would have been paid had the auction been run in a competitive manner, acquiring more spectrum than they would have acquired in normal competition or at compromising downstream competition. Such behaviour can be facilitated by poor auction design or by providing too much information to bidders regarding the valuation of other bidders.

Assignment and Pricing Impacts

Assignment Impacts

7.152 Gaming concerns can create Assignment and Pricing Impacts that are desired by all bidders but would be harmful to competition (i.e. tacit agreements)⁵²⁷. However, there are impacts that harm some bidders at the expense of others.

7.153 The main Assignment Impacts associated with gaming are as follows:

- a) Bidders can attempt to exhaust a competitor's budgets by making other bidders spend more on one spectrum band thereby limiting its ability to compete **for additional rights of use** in other bands.⁵²⁸ This is likely to be important for the Proposed Award which could have a mix of large and small bidders (and potentially New Entrants) competing for different spectrum bands (see example in following paragraph below).
- b) Predatory bidding could reduce or prevent a bidder being **assigned rights of use** which it would have obtained if the auction format had provided

⁵²⁶ Although, Option 5 (b) would specifically limit the ability of Vodafone and Three to express their full valuation for a third 700 MHz Lot and switch to same at certain price.

⁵²⁷ See Chapter 5 for discussion of gaming risks in relation to a two-lot category approach.

⁵²⁸ As previously noted, such concerns are not theoretical. For example, in relation to bidders targeting budget constrained bidders see the German multi-band spectrum award which assigned similar rights of use to the Proposed Award (i.e. 700 MHz, 900 MHz and 1800 MHz).

<https://www.dotecon.com/assets/images/dp1501.pdf>

appropriate protections.

- c) Price driving can be used as punishment for deviating from a collusive/tacit agreement where a bidder would prefer to compete for additional rights of use but **settles for a lesser amount** out of fear of having its prices increased for that higher amount.
- d) Price-driving may also be aimed at increasing the risk of unsold lots⁵²⁹ in order to avoid the use of same by rival bidders (i.e. sterilisation strategies). A bidder might be able to drive prices beyond a certain level in a given category and then withdraw its demand **so that lots remain unsold that could have been assigned** to that bidder in a competitive award.
- e) If bids are not binding, bidders can hide demand early in the open rounds, only to reveal true preferences later in the auction. Among other things, the quality of the information made available in the open rounds would make it **difficult for bidders to pick their preferred package** at any point during the award as the aggregate demand information would be unreliable.

7.154 For example, suppose Bidder A (an existing operator) is only interested in Band 1 (coverage band), while Bidder B (a new entrant) wishes to acquire Bands 1 and 2 (Performance Band). Further assume that Bidder B has a budget constraint that limits the total amount it might be able to spend across both bands. Bidder A can start by bidding on Band 2 to increase the overall cost faced by Bidder B, as this will reduce the residual budget that B may spend on Band 1 (which would be the total budget minus the price B has to pay for rights of use in Band 2). Once the price in Band 2 is sufficiently high, Bidder A can switch to Band 1. This may allow Bidder A to win at a lower price than if it had bid straightforwardly, as Bidder B's residual budget for Band 1 will be exhausted at a lower Band 1 price.

Pricing Impacts

7.155 The main Pricing Impacts associated with gaming are as follows:

- a) predatory bidding where some bidders may try to **increase the cost** of specific competitors, or push them out of the auction altogether, or threaten to behave in this manner;
- b) price driving can be used as punishment for deviating from the collusive agreement **increasing the price a bidder** would have to pay if it decided to continue competing for additional rights of use; and
- c) in such scenarios the pricing impacts can be significant for the bidders

⁵²⁹Noting that ComReg's policy on unsold lots is generally that they remain unsold for 2 years after an award.

subject to the price driving strategy, **forcing them to pay more** or withdrawing from lots they might have won under conditions of normal competition.

7.156 In all cases, the behaviour is aimed at keeping one's own prices down and increasing or threatening to increase the prices paid by others.

Gaming Risks under Option 1

7.157 ComReg has considered and agrees with DotEcon's observations that the SMRA is vulnerable to a range of gaming strategies, especially when bidding is for multiple lots across various lot categories.⁵³⁰ These include, for example, price-driving in non-target categories, hiding demand in the early stages of the auction, predatory bidding or signalling to orchestrate a tacitly collusive outcome.

7.158 ComReg notes that Option 1 (a) provides a wide range of gaming opportunities, especially when bidders can acquire multiple lots across different bands. For example:

- a) signalling by using bid amounts to signal bidding intentions to other bidders for the purposes of tacit arrangements. Different types of predatory bidding are also possible that can support tacitly collusive outcomes ("if you bid on my lots, I'll bid on yours");
- b) price driving by deliberately bidding up the price of specific lots that would interest certain bidders or bidders with less flexible bid strategies (e.g. budget constrained bidders or New Entrants);
- c) targeting other bidders to withdraw demand for specific lots by threatening to drive up the price of other lots that they also want; and
- d) bidding on lots which the bidder ultimately does not want, so as to retain eligibility to switch demand to other lots. (e.g. to keep the prices on desired lots from increasing too quickly and to maintain the flexibility to punish competitors).

7.159 Much of the opportunity for gaming in an SMRA arises from the ability of certain bidders to switch between lots, combined with the fact that other bidders that have certain spectrum requirements may face aggregation risks across those lots. For example, this structure may create incentives for bidders seeking smaller combinations of lots to bid for lots outside their requirement in order to create holes in the footprint of larger bidders so that they lose synergies across complementary lots, or to drive prices and exhaust the budget they have available for other bands.

⁵³⁰ DotEcon Report, Document 19/59a, p.100.

- 7.160 ComReg notes that the Hybrid alternatives (Option 1 (b) (i) and (ii) mitigate some of the substitution and aggregation risks described above. However, this comes at the cost of increased risk of gaming opportunities. The use of waivers under Option 1 (b)(ii) could be used as a strategic instrument to try and signal potential accommodation strategies. For example, a bidder may reduce its own demand and place a waiver, thereby testing the possibility of reducing demand whilst retaining the ability to bid back on more spectrum if the demand reduction is not matched by other bidders.
- 7.161 Further, as noted by DotEcon, there is a downside to allowing withdrawals in that they may also facilitate gaming, principally by allowing bidders to withdraw strategic bids on lots they do not wish to acquire.⁵³¹ Similarly, bidders can use withdrawals under Option 1 (b) (i) (aimed at mitigating aggregation risks) as signalling devices instead of withdrawals being used to avoid being stranded on subsets of demand.
- 7.162 Allowing withdrawals in only limited cases and subject to penalties would help avoid highly undesirable outcomes (as bidders may be willing to incur the cost of withdrawal to avoid such outcomes); however, restrictions and penalties need to be sufficiently harsh so as to discourage bidders from strategically bidding on lots they do not wish to acquire (thereby imposing costs).

Gaming Risks under Option 2

- 7.163 DotEcon notes that gaming risks in the SCA arise from the fact that a bidder will only need to honour its final round bid (i.e. the auction ends when supply exceeds demand which by definition would be the last round). DotEcon notes that this is a serious concern in the context of a multi-band award, as a bidder can be reasonably sure that the auction will not close if there is high excess demand for any single one of the lot categories.⁵³²
- 7.164 Under Option 2 (a) bids submitted in any round are not binding, if a new round is needed, which provides flexibility for bidders to switch across different lot categories particularly early on when aggregate demand is high and there is little danger that the auction would end suddenly.
- 7.165 This could allow a bidder to bid for lots (which it does not have demand for) simply to raise the cost to competitors who are bidding across a number of lots, or to exhaust a competitors budget for rights of use in bands in which the bidder does have a requirement. Price-driving may also increase the risk of unsold lots where such strategies may be used to deliberately leave some lots unsold, thereby denying them to other bidders. For example, a bidder might be able to drive prices beyond a certain level in a given category and then withdraw its demand

⁵³¹ Document 19/59a, p98.

⁵³² Document 19/59a, p107.

so that lots remain unsold.

7.166 Under Option 2 (b), ComReg notes that it is not possible to adopt a relaxed activity rule in the SCA format without introducing a significant risk of gaming. As noted by DotEcon⁵³³, allowing bidders to increase their demand if some conditions on relative prices are met would create a wide range of gaming possibilities, permitting bidders to hide their demand and/or distort prices.

Gaming Risks under Option 3

7.167 Under Option 3 (CMRA), all bids received at the end of each round are taken into account in order to determine whether it is possible to achieve the highest possible value with a bid from each bidder who remains active in the auction (i.e. who still bids for lots at clock prices). This increases the risks associated with making bids for unwanted packages (for instance to drive prices) relative to when bidding under Option 1 and 2, as any bids made may become winning bids. (i.e. there is a significant disciplinary affect associated with such bidding in a CMRA).

7.168 Therefore, the gaming risks associated with the CMRA are likely to be low relative to Option 1 and 2.

Gaming Risks under Option 4

7.169 Option 4 would be more robust to gaming strategies than Option 1 or Option 2. The CCA provides good incentives for bidders to bid straightforwardly according to valuations thereby reducing incentives to game (See Bidding Incentives below). The CCA considers all bids submitted during the auction in the determination of winning bids and prices. Bids submitted in the clock rounds set constraints on the bids that a bidder can submit in the supplementary bids round. Importantly, the CCA is the only open auction format that has a sealed bidding stage (supplementary bids round) which provides some opportunities for bidders to deviate from any tacit understandings, thereby undermining it.

7.170 The CCA has been subject of criticism that it is possible that some bidders may try to submit bids that are not reflective of their demand and are simply aimed at increasing competitor's prices. ComReg previously addressed such concerns⁵³⁴ and noted that these strategies are high risk when limited information is available about other bidders and their willingness to pay. This could lead to the bidder winning a less preferred package, possibly at a price above valuation. This risk should have a desirable disciplinary effect and discourage such behaviour.⁵³⁵

7.171 Further, ComReg agrees with DotEcon's views in Document 20/32, that it is not enough to simply identify ways in which bidders can theoretically raise rivals'

⁵³³ Document 19/124a, p41.

⁵³⁴ See Paragraph 6.69 – 6.74 Document 19/124.

⁵³⁵ Ibid.

prices.⁵³⁶ Any price driving bids (in order to affect other bidders) would need to be at a sufficiently high level. If the bidder is not certain that such bids would fail to win, it would be taking a risk in making these bids, because, it could end up winning those lots which would likely be above the level at which that bidder valued those lots.

7.172 In that regard, ComReg notes that price-driving strategies are risky because bidders are unlikely to have enough information on rival bidders' valuations or the extent to which rival bidders may be sufficiently budget constrained. Such considerations are important because the risk of price driving strategies increases if budget constrained bidders are participating. (i.e. not only would the price driving bid be set at below valuation but also below rivals' budget). The bidder therefore needs to determine whether the risk of paying a high price and failing to win its most preferred package of spectrum is worth the unspecified gain⁵³⁷ it may perceive from pushing up the prices paid by competitors. It is very difficult to increase the price of rival bidders absent information about the point at which that price driving bid would become a winning bid, though increasing prices generally may be possible under certain scenarios.⁵³⁸

7.173 ComReg would also note that claims of price driving in a CCA should not be confused with bidders submitting bids on a wide range of packages that are of interest to them. While such bids increase the price rival bidders must pay, such bids are to be welcomed from an efficiency perspective and, absent same, the auction could suffer from claims of 'missing bids'⁵³⁹. Furthermore, all bidders expressing bids for all their packages of interest should reduce any pricing asymmetry arising from the Award.

7.174 Finally, ComReg also notes that the use of Exposure Pricing does not increase the risks of gaming⁵⁴⁰. DotEcon⁵⁴¹ consider the risk of gaming arising from the use of Exposure Pricing to be low. In complex spectrum auctions, the only way of inferring information about rivals' bid histories from the discount information

⁵³⁶ Document 20/32, p105.

⁵³⁷ In that regard, ComReg notes and agrees with DotEcon any price driving strategies are predicated on bidders having a motive to make other bidders pay more. See page 7-8 Annex 12 (Document 20/32).

⁵³⁸ There are some cases where bidders might be able to calculate supplementary bids that have a low likelihood of winning but have the effect of raising prices paid by others. However, ComReg notes that where such opportunities arise the impact is likely small as the situation only arises because of the constraints set in earlier rounds and any bid would be capped by the same constraints. (i.e. the constraints would limit the extent of any such behaviour). In any event, this corresponds to increasing rivals prices generally rather than targeting any particular bidder. (See Bidding Incentives below).

⁵³⁹ Missing bids occur where bidders do not to submit a full range of supplementary bids for packages they might win. This could lead to inefficient outcomes if supplementary bids do not cover all packages a bidder would be happy to win. See Section 'Missing Bids' p9 – DotEcon Report – Document 20/32.

⁵⁴⁰ DotEcon noted that potential concerns related to Exposure Pricing involves undermining measures such as limited transparency during clock rounds (e.g. reporting only aggregate demand information, rather details of individual bids made).

⁵⁴¹ See Document 20/32 – DotEcon Report - Section 5.3.3.

would be to simulate all possible histories and look at those that provide the observed discount. DotEcon notes that in the Proposed Award, it is not practically possible to simulate all these bid histories in auctions where there are at least several bidders, several lot categories and the bid history consists of at least several rounds.

7.175 Therefore, ComReg agrees with DotEcon's view that these concerns are unlikely to be material in practice as the risk of price driving is limited by the risk of ending up with an unwanted package or at a price that exceeds valuation.

Gaming Risks under Option 5

7.176 There are significant gaming possibilities created by Option 5 and mainly arise because Three would be able to deviate from a truthful bidding strategy as its final prices might not reflect the true opportunity cost of its bids (because the price determination rules proposed by Three would favour it). These concerns are discussed separately under Impact on Competition below as they also relate to the bidding incentives during the award.

Gaming Risks under Option 6

7.177 The risk of gaming under Option 6 would be similar to risks set out under Option 3 and 4. However, because the auction rules change depending on the outcome of the Primary Bids Rounds, bidders can 'game' the auction in order to ensure the use of one set of rules over the other. These are discussed under Impact on Competition below.

7.178 Separately, using the bid amount of each primary bid to represent the exposure price could introduce additional gaming risks that would not apply to a CCA (which uses Exposure Pricing as an additional piece of information rather than the lot price). These are set out in detail in the DotEcon Report.⁵⁴² However, in summary, such an approach introduces a first price element which can be exploited by some bidders by increasing the price paid by others.

Relevant stakeholder Impacts

Assignment Impact

7.179 ComReg notes that each of the Assignment Impacts (referred to above) would broadly apply to all bidders.

7.180 In relation to MNOs, ComReg also notes that Eir may become the target of gaming strategies (absent measures to avoid same) given it is the smallest MNO and gaming can increase the risks of certain operators consolidating or strengthening existing positions (e.g. creation of effective duopoly).

⁵⁴² Document 20/32, Annex 12, see Section 5.4.2.

7.181 Similarly, ComReg notes that gaming could also have notable impacts on smaller bidders who could be budget constrained. Larger bidders could target such entities to exhaust their budget as described above. Such an approach could result in such bidders obtaining less rights of use (or none at all) than would have occurred under a competitive auction (or new entry not occurring).

Pricing Impact

7.182 ComReg notes that each of the Pricing Impacts (referred to above) would broadly apply to all bidders although smaller bidders are more likely to be impacted by price driving strategies.

Conclusion on gaming

7.183 Considering the above, and in summary, ComReg notes the following:

- a) Gaming risks are highest under Option 1 (b) (i) due to use of unlimited withdrawals and bidders would be exposed to the various Assignment and Pricing Impacts referred to above.
- b) Gaming risks are less under Option 1 (a) and Option 1 (b) (ii) as no withdrawals are permitted but gaming risks remain high as bidders can target specific lots and/or create holes in the footprint of larger bidders so that they lose synergies across complementary lots.
- c) Under Option 2 (a) the risk of gaming is reduced compared to Option 1 as lots are offered in categories, so that bidders can specify the number of lots they wish to acquire in each category, but not target specific lots. This reduces the scope for signalling and/or targeting specific lots.
- d) Similarly, Option 2 (b) can provide opportunities for price driving and/or vexatious bidding by hiding demand in clock rounds.
- e) The risk of gaming under Options 3 and 4 are possible but low as there is a significant disciplinary effect associated with gaming in these mechanisms.
- f) There are significant gaming risks associated with Option 5 given the proposed changes to the price determination rules.
- g) The risk of gaming under Option 6 is low, however bidders could make bids in order to avoid a supplementary bids round in favour of so called 'additional rounds'.

4. Strategic demand reduction

7.184 Strategic demand reduction can occur when bidders seeking multiple lots benefit

from strategically reducing their demand at prices that are lower than their valuation for additional lots. Specifically, a bidder may reduce its demand early with the aim of keeping final prices low and achieve a higher surplus than it might expect if it were to compete for a larger package (even if the bidder would prefer the larger package at prevailing prices).

Assignment and Pricing Impacts

Assignment Impacts

7.185 The main Assignment Impact⁵⁴³ associated with strategic demand reduction is that⁵⁴⁴ bidders might ultimately have been **assigned more spectrum** but refrained from competing for additional spectrum through fear of having to potentially reduce demand later and pay a higher price as a result of competing for additional spectrum.

Pricing Impacts

7.186 The Pricing Impacts⁵⁴⁵ associated with strategic demand reduction occur where bidders require additional lots and compete for same but ultimately lose, thereby **increasing the price** that the bidder pays for fewer lots if it wins them.

Strategic Demand Reduction under Options 1, 2 and 3

7.187 These options are assessed together because they all use a pay-as-bid pricing rule and are therefore susceptible to strategic demand reduction. The incentive for strategic demand reduction is greater in circumstances where only linear prices apply, as a bidder wishing to maintain its bid for lots additional to a smaller package will need to increase its bid for all of the lots within the package in order to do so.

7.188 In that regard, DotEcon notes that the use of uniform prices (i.e. all lots in a category have a common price per lot) means that competing for additional lots will drive the price that a bidder would pay, even if it were ultimately to win a smaller number of lots in that category.⁵⁴⁶ DotEcon also notes that a SMRA also provides strong incentives for strategic demand reduction, a natural consequence of the property that prices can only increase as the auction

⁵⁴³ ComReg notes that in relation to 'Assignment Impacts' certain outcomes would be preferred by Bidders that participated in a collusive strategy. These impacts on the award are discussed separately under 'Impact on competition' below.

⁵⁴⁴ Note that strategic demand reduction is discussed in more detail in Annex 7 in response to concerns raised by Three.

⁵⁴⁵ ComReg notes that in relation to 'Pricing Impacts' certain bidders may end up with a smaller combination of lots at a lower price that would have been the case had it competed for more lots. However, these impacts on the award are discussed separately under 'Impact on competition' below.

⁵⁴⁶ Document 19/59a, p100.

progresses.⁵⁴⁷

- 7.189** Under Options 1 (a) and (b) and Option 2 (all sub options), the incentives for strategic demand reduction arise because as prices increase progressively bidders may benefit by avoiding further price increments and settling for a small number of lots early on. When bidders seek multiple lots, as is likely the case in the Proposed Award, they may benefit from strategically reducing their demand at prices that are lower than their valuation for additional lots. This happens because final prices increase as a result of there being excess demand and reducing demand early increases the chances that the auction will end with low prices, and therefore increasing the expected surplus for bidders.⁵⁴⁸
- 7.190** This is a particular issue in a multi-band award (i.e. the Proposed Award). For example, in an auction where only one item is for sale, a bidder can keep bidding if its valuation exceeds the current bid level. Bidding ends when the second highest bidder reaches its valuation and the item is won by the bidder with the highest valuation, and the outcome is efficient. This no longer holds in a multiband award as there is an incentive for bidders to reduce demand to keep prices low.
- 7.191** DotEcon notes that SCAs provide a clear incentive for bidders to strategically reduce demand to restrict competition in the auction and keep prices low.⁵⁴⁹ The use of package bidding (not available under Option 1) to express complementarities does not reduce the risk of strategic demand reduction under Option 2. A bidder may be willing to pay a higher price per lot for a larger package than for a small package due to complementarities across lots, however, if the large package becomes increasingly expensive the bidder would prefer to be assigned the smaller package. However, the SCA does not allow a bidder to submit alternative bids to express this preference since only one package bid is made during the clock round. (e.g. the supplementary bids round under Option 4 allows bidders to submit bids for multiple packages).
- 7.192** Therefore, such bidders will need to choose what package they bid for based on their expectation of likely prices. In such cases, the bidder may achieve a better outcome by reducing its demand early and acquiring the smaller package but at a lower price per lot. This may create a strong incentive for bidders to settle for a smaller number of lots at a lower price rather than compete for a greater

⁵⁴⁷ Document 19/59a, p100.

⁵⁴⁸ Setting prices close to expected clearing prices would reduce the potential benefits from strategic demand reduction. However, this may also increase the risk of choking off demand. DotEcon also advise that withholding information about aggregate demand might help to moderate the risk of strategic demand reduction by preventing bidders from assessing when they may be able to bring the auction to an end unilaterally. However, this would significantly limit the benefits from having an open stage. (See DotEcon 19/59a p109).

⁵⁴⁹ Ibid, p106.

number of lots, possibly unsuccessfully. This arises in all SCA format (i.e. Options 2 (a), 2 (b) and 2 (c)).

7.193 Under Option 3, a CMRA also uses a pay-as-bid pricing rule and there are incentives for strategic demand reduction. However, as noted by DotEcon the incentives to strategically reduce demand in headline bids is (partly) mitigated through allowing bidders to make additional bids below round prices.⁵⁵⁰ Therefore, this risk is lower under Option 3 compared to Option 1 and 2 because it allows bidders to make bids for alternative packages (e.g. for fewer lots) at a lower price per lot. As a result, bidders can maintain alternative bids in parallel with which they can compete for larger and smaller packages, at different prices.

Strategic demand reduction under Option 4, 5 and 6

7.194 Options 4, 5 and 6 use a second price rule that determines what each winning bidder must pay by reference to that bidder's opportunity cost, rather than what the bidder actually bid. If a bidder competes for a larger amount of spectrum but needs to reduce demand later this does not increase the price of this package. Therefore, the incentives for strategic demand reduction and the associated Assignment and Pricing Impacts do not arise in those options and are not assessed further (as noted later, under Option 5 bidders may reduce demand in order to avoid competition with Three given the amended price determination rules, though this is a separate issue from strategic demand reduction).

Relevant Stakeholder Impacts

7.195 In light of the above, ComReg is of the view that there are likely to be strong incentives for strategic demand reduction in the Proposed Award under Option 1 and 2, resulting in bidders reducing demand when more rights of use could have been assigned or in bidders competing for additional lots and paying a higher price when they reduce demand.

7.196 Larger bidders may view such strategies as attractive when there is enough spectrum to allow operators to obtain reasonable bandwidth without having to compete strongly. (i.e. relatively small drops in demand could reduce final prices by a proportionally greater amount.) This would be a relevant concern in the Proposed Award where 350 MHz rights of use are being made available.

7.197 However, smaller bidders who have relatively small existing holdings (or none at all in the case of New Entrants) would seem likely to prefer formats that allow them to bid up to their maximum willingness to pay for larger packages. Such a bidder could then test its position as the marginal bidder without fear of affecting the price it might have to pay for a lower number of lots later in the auction.

⁵⁵⁰ Document 19/59a, p90.

7.198 Strategic demand reduction has a particular impact on those bidders who expect that they may ultimately have to settle for a small number of lots, as any attempt to compete for additional spectrum would ultimately increase the price they pay for the lots they do win. This will lead to inefficient outcomes where a weaker bidder might ultimately have been able to acquire additional spectrum, but refrains from competing for it for fear of having to drop back and pay more than necessary as a result of having tried. Such bidders could include weaker incumbents, smaller bidders, New Entrants or budget constrained bidders.

Conclusion on strategic demand reduction

7.199 In light of the above, and in summary, ComReg notes the following:

- a) the risk of strategic demand reduction is highest under Options 1 and 2 given both use uniform pricing rules;
- b) the risk of strategic demand reduction arises under Option 3 (CMRA) but is lower compared to Option 1 and 2; and
- c) conversely, incentives to engage in strategic demand reduction under Options 4, 5 and 6⁵⁵¹ are largely removed by using a second price rule which allows bidders to compete for a large package without pushing the price they might have to pay to win smaller packages. This provides good incentives for bidders to compete for additional spectrum.

5. Inefficiently unsold lots

7.200 Unsold lots do not necessarily represent an inefficient outcome from an auction. However, if bidders have increasing returns for additional lots (i.e. synergies across lots) and such lots remain unsold, this would represent an inefficient outcome. Lots go inefficiently unsold if one or more bidders would have wished to acquire them at a price which is at least their reserve price.

Assignment and Pricing Impacts

7.201 The **Assignment Impact** associated with an inefficiently unsold lot is that certain bidders would have preferred to have been assigned additional rights of use at final prices but were unable to do because demand fell by an amount that caused supply to inefficiently exceed demand.

7.202 The **'Pricing Impact'** associated with inefficiently unsold lots is that had these lots been made available, there may have been an alternative package of lots

⁵⁵¹ There would however be a risk that other bidders may reduce demand under Option 5 in order to avoid artificially competing with Three which would likely benefit from the amended price determination rule under that option.

available with a higher surplus compared to the lots won.

Risk of inefficiently unsold lots under Option 1

- 7.203 In relation to Option 1 (a) the risk of inefficiently unsold lots is relatively low because it involves repeated rounds of bidding, with bidders being declared standing highest bidders on particular lots until they are overbid at a higher price, and all lots remain in play until the auction closes. Similarly, (Option 1 (b)(ii)) would be less likely to result in inefficiently unsold lots compared to Option 1 (b) (i) because no withdrawal of standing high bids are permitted.
- 7.204 However, the risk of inefficiently unsold lots increases in relation to Option 1 (b)(i) where the ability to withdraw standing high bids increases the risk of unsold lots. For example, a bidder might withdraw a standing high bid at a point in the auction when all other bidders that might want the lot had already lost their eligibility to bid for the lot. This would deny certain bidders' access to rights of use at a price they would have been willing to pay. If there are no provisions for withdrawal of standing high bids, or if withdrawals are subject to significant penalties, then the risk of lots going unsold when any demand for them is reduced.
- 7.205 Therefore, ComReg is of the view that the Assignment and Pricing Impacts as described above would be unlikely to arise under Option 1 (a) and Option 1 (b) (i). However, there is a higher risk that those impacts would arise under Option 1 (b)(ii).

Risk of inefficiently unsold lots under Option 2

- 7.206 Under Option 2 (a) and 2 (b) there is a high risk of inefficiently unsold lots because demand might drop too abruptly from one round to another (e.g. if multiple bidders reduce demand in the same round, or a small number of bidders reduce demand by relatively large amount in one round). Thus, in the course of just one round, the auction could go from a situation in which there is excess demand to a situation in which the auction ends with unsold lots.
- 7.207 As noted earlier, this can happen where a bidder's value per lot is increasing in the number of lots over some range. As a result of these increasing marginal valuations for lots, the number of lots demanded by the bidder can drop by many lots (or the bidder might drop out altogether) as the price per lot increases slightly.
- 7.208 ComReg also notes that the risk of unsold lots is potentially higher under Option 2 (b) as bidders would be permitted to bid above eligibility if some conditions on relative prices are met allowing bidders to hide their demand and reduce demand abruptly later in the award denying other users rights of use. This arises because there is no supplementary round where such strategies would be prevented as only certain bids would be permitted by the price caps.

7.209 The risk of inefficiently unsold lots is significantly reduced⁵⁵² under Option 2 (c) in a number of ways:

- a) First, by allowing or requiring bidders to make exit bids (Compulsory and optional) when they reduce demand. These exit bids would be the best offer that a bidder makes for lots on which it ceases to bid:
 - i. Exit bids allow bidders that reduce their demand in a lot category, potentially in step involving multiple lots, to specify prices between the price of the previous round and the prevailing clock price, up to which level they want to maintain their specified demand; and
 - ii. Such exit bids also help to reduce the risk of a sudden excess of supply because the auctioneer set the clock price too high and gives the auctioneer additional options for assigning more spectrum than would have been the case without the exit bids.
- b) Second, in the event that the clock rounds end with some unassigned lots, these lots will be made available in a series of sealed bid rounds, one for each band, as necessary. In this way, exit bids that were not identified as winning bids in the clock rounds may be carried over into the supplementary rounds, and bidders may submit new bids, subject to minimum bid amounts linked to the outcome of the clock round phase. However, bidders cannot then readily express complementarity or substitutability between different categories of lots.

7.210 In light of the above, ComReg is of the view that Options 2 (a) and 2 (b) would create a significant risk of inefficiently unsold lots with the associated Assignment and Pricing Impacts. The impacts associated with inefficiently unassigned lots would be significantly reduced under Option 2 (c) although as noted above these rules create aggregation and substitution risks.

Risk of inefficiently unsold lots under Option 3, 4, 5 and 6

7.211 The problem of **inefficiently** unsold lots is avoided through the use of combinatorial auctions that do not impose linear pricing (e.g. CCA and CMRA). These formats allow bidders to submit multiple bids that reveal the structure of their demand for spectrum at different prices. Winners (and prices) are established taking into account the whole range of bids submitted, with the consequence that (if bidders reflect their full demand profiles in their bids) lots will only remain unsold if there is no additional value that can be achieved by

⁵⁵² However, exit bids alone do not fully address the risk of unsold lots if there are multiple lot categories. For example, bidders may switch without any reduction in activity and would therefore not be reducing demand yet leave the category from which the switch with excess supply. Even if bidders were subsequently required to make exit bids as and when they reduce demand, these bids would not ensure that all the lots in the first category will be sold.

assigning them. Therefore, these formats do not suffer from the risk of inefficiently unsold lots.

7.212 Consequently, the Assignment Impacts and Pricing Impacts that could result from inefficiently unsold lots would not arise.

Difference in stakeholder Impacts

7.213 Inefficiently unsold lots would typically not correspond to a large amount of spectrum and would be unlikely to arise in respect of the 700 MHz Band (though could arise if gaming opportunities are available). In that regard, inefficiently unsold lots are likely to be more relevant in the Performance Bands.

7.214 A small amount of spectrum left unassigned might not be significant for larger bidders with existing holdings. However, it could be particularly relevant for smaller bidders who may have a requirement for small amount of spectrum to begin with. In this way, inefficiently unsold lots are likely to be particularly harmful to smaller bidders.

Conclusion on inefficiently unsold lots

7.215 In light of the above, and in summary, ComReg notes the following:

- a) the problem of inefficiently unsold lots is an issue that primarily arises under Option 2 but are largely removed under Option 2 (c);
- b) these risks can be magnified by the substitution risks that are also associated with these options because some bidders who would be willing to acquire these lots at final prices may simply have been unable to express their willingness to do so through their bids; and
- c) the risk of inefficiently unsold lots would be largely removed under Options 3 – 6.

6. Bidder Information Deficits

7.216 Bidder information deficits arise when a bidders' bids or preferences across different packages would have been different if it had more information about the nature of demand. A more efficient outcome could have been obtained if more information had been available to bidders prior to determining its final set of bids.

Assignment and Pricing Impacts

Assignment Impacts

7.217 All options are open bidding formats where bidding is conducted progressively over several rounds to provide information to bidders about demand. As noted

by DotEcon⁵⁵³ when there are many lots available, an open stage can help bidders to reduce uncertainty about what they may be able to win, and thus reduce the number of bids they need make to have a good chance of a satisfactory outcome.

7.218 However, ComReg notes that the information revealed in the open stage is primarily of value if bidders make bids that sufficiently reflect their true valuations. For example:

- a) the information disclosed during the open stage can mitigate common value uncertainty;
- b) it allows bidders to update their expectations on rights of use on offer including information that bidders might obtain about the outcomes that are likely to be achievable, and discard targets that are unlikely to be obtainable;
- c) where bidders have a limited budget, it allows them to assess likely demand from competitors and target bids according to expectations of the lots they may be able to win.

7.219 The main Assignment Impact is that it can create difficulties for bidders estimating the value for alternative packages and submitting a consistent set of bids for same. This could result in a bidder **failing to be assigned any lots and/or outcomes in which lots are left inefficiently unsold** because bidding decisions were based on incomplete or unreliable information. To the extent that information is not sufficient or unreliable, bidders may find it difficult to determine what packages it should focus on and realistically win.

Pricing Impacts

7.220 If the information bidders use to determine their bidding strategies is unreliable, it could lead bidders to bid more than is needed to win (thereby reducing its surplus) compared to a situation where information was based on truthful valuations provided by other bidders.

Bidder Information Deficits under Option 1 and 2

7.221 Option 1 and 2 provides bidders with various degrees of information regarding the demand for spectrum during the award (for example information about specific bids placed by bidders, aggregate demand for each lot/lot category, or whether or not prices need to increase for a lot/lot category).

7.222 The purpose of activity rules in an open auction is to prevent bidders from

⁵⁵³ Document 19/124a, p71.

withholding or misrepresenting their demand. However, the lack of relaxed activity rules in these options results in an information distortion and is a consequence of the limitations to switching, arising from the non-increasing activity rule.

7.223 If bidders were permitted to switch back to a higher eligibility package (as permitted under a CCA) this would reveal further information about the relative value of lots in different categories. However, such information is absent under Option 1 and 2 (a) which would be important in a large multiband award. While Option 2 (b) has provision for relaxed bidding this has significant gaming risks which would also pollute the price discovery process.

7.224 Under Option 2 (c), the substitution risks referred to above could result in bidder information deficits. For example, DotEcon⁵⁵⁴ notes that the rules under Option 2 (c) could lead to inaccurately reporting of demand at given prices. Further, bidders with genuine demand for spectrum but who consider themselves weaker bidders would refrain from bidding in those bands simply in anticipation of difficulties switching to alternative bands in later rounds. This could detrimentally affect the level of competition within the award and could lead to an inefficient outcome.

Bidder Information Deficits under Option 3

7.225 The CMRA also provides various degrees of information to bidders without compromising efficiency through increased risk of gaming.

7.226 However, the aggregate demand information that is presented in a CMRA is different from that normally presented (in a CCA, SCA or SMRA) and needs to be interpreted carefully or it could be misleading. This arises because the auction may end even if there is excess demand from headline bids, and it may continue even if headline bids could be accommodated.

Bidder Information Deficits under Option 4, 5 and 6

7.227 Under Option 4, the use of relaxed primary bids⁵⁵⁵ and the final price cap⁵⁵⁶ in more recent awards⁵⁵⁷ reduced such concerns by allowing certain bids to be

⁵⁵⁴ DotEcon Report, Document 20/122a, p133.

⁵⁵⁵ Relaxed primary bids (RPBs), which provide the possibility for bidders to submit primary bids for packages that exceed the bidder's current eligibility provided that doing so is consistent with the preferences that the bidder has previously expressed through bids made in primary bid rounds where the bidder has dropped eligibility.

⁵⁵⁶ A final price cap limits the amount of a supplementary bid on a package other than a bidder's final primary package relative to the amount bid on that bidder's final primary package, and taking into account the round prices in the final primary round.

⁵⁵⁷ The CCA used by Ofcom in the 800 MHz and 2.6 GHz award process in 2013 used a CCA where bidders were not allowed to make bids above eligibility in any circumstances. The Multi-Band Spectrum Award (2012) and 3.6 GHz Award (2016) in Ireland allow bidders to submit relaxed primary bids.

made in the clock stage that would previously need to have been made in the supplementary stage. Consequently, clock prices in these awards were better predictors of what the successful bidders would have to pay as the outcome of the clock rounds were more aligned with the award outcome. The CCA also discloses demand information during the clock stage that helps to assess what the bidder could realistically win. Based on this information, the bidder can assess how much it could reduce its bids without risk of undermining its chances of winning. By using these activity rules, the clock rounds can be very informative about potential winning packages.

7.228 Option 5 would have the effect of significantly undermining price discovery in the primary bid rounds because Three's bid for lots would be based on an expectation of an artificial discount in price determination stage of the award:

- a) bidders would be deprived of accurate information which would otherwise have been used to confirm or revise their valuations and bid strategy;
- b) it makes it more likely that bidders submit misguided bids resulting in outcomes that are inefficient both for bidders and ultimately for Irish society;
- c) bidders may adjust their bid strategies in the open rounds to account changes in the price determination process (which would be common knowledge to all bidders) further polluting the price discovery process.

7.229 Further, ComReg notes and agrees with DotEcon's views that while an amended Exposure Pricing information would be feasible under this rule change, it would not generally improve the information available to bidders, because the outcomes that would be restricted are not extreme in the way Three claims.⁵⁵⁸

7.230 The information provided in the primary bid rounds under Option 6 could be undermined if some bidders bid in a way to ensure the second stage of the auction uses the alternative set rules, as opposed to the supplementary bids round as would normally occur. (i.e. if there are unassigned lots at the end of the primary bid rounds there would be no supplementary round but rather a number of 'additional rounds' (see Impact on Competition below).

Relevant stakeholder Impacts

7.231 ComReg notes that each of the Assignment and Pricing Impacts (referred to above) would broadly apply to all bidders in the same way depending on particular requirements.

⁵⁵⁸ DotEcon Report, Document 20/122a, p91.

Conclusion on bidder information deficits

7.232 In light of the above, and in summary, ComReg notes the following:

- a) Options 1 and 2 would include some useful information for bidders however the lack of relaxed activity rules (which cannot be added to the format without increasing gaming risks) reduces the information about relative valuations if bidders are unable to switch to preferred packages in line with previous valuations;
- b) Option 3 would provide bidders with more relevant information about the nature of demand compared to Option 1 and 2 although the aggregate demand information under this format needs to be carefully interpreted;
- c) Option 4 provides relevant information to bidders without compromising efficiency through increased risk of gaming. The aggregate demand information is easily understood compared to Option 3;
- d) Option 5 is least likely to provide relevant information to bidders due to the substantial distortions to bidding incentives arising from amending the price determination process, thereby undermining price discovery and the information provided to other bidders;
- e) ComReg also notes Option 6 would be preferred to Option 5 and could provide information similar to Option 4 and 5 although price discovery could be undermined through bids designed to avoid a supplementary bids round.

7. Complexity

7.233 Complexity is an important consideration and the Proposed Award should, to the greatest extent possible, seek to minimise complexity for bidders.

7.234 There are 3 types of complexity relevant to the Proposed Award Process:

- a) computational complexity refers to the complexity involved in the process of determining the outcome of the award and the winning combination of bids that results in the most efficient outcome;
- b) mechanical complexity refers to the complexity arising from understanding the auction rules and operation of the auction; and
- c) bidding complexity refers to the complexity of the bidding process during the award and the extent to which bidders are able to evaluate their valuations for various options and reflect them in a straight-forward manner through bids.

7.235 The burden of computational complexity falls entirely on the auctioneer regardless of the Award Format and various processes (e.g. algorithms) can be used to determine which of the bids will be winning bids and to determine what the winning bidders pay. In order to ensure bidders have full confidence in the award process, a programme of tests independent from the auctioneer on the operation of the winner and price determination algorithms will be implemented for the Proposed Award.

7.236 For that reason, computational complexity is not discussed further.

7.237 Bidding complexity arises from the use of a pricing rule and is assessed separately under Price Determination Impacts below (i.e. Section “A. Bidding incentives/complexity”).

7.238 Accordingly, the following discussion focusses primarily on mechanical complexity.

Assignment and Pricing Impacts

Assignment Impacts

7.239 Mechanical complexity can lead to a number of Assignment Impacts including:

- a) inefficient outcomes whereby the bidder who has the highest value fails to acquire that spectrum because of mechanical complexity and a failure to adequately understand the assignment mechanism and the interaction of bids made by it and other bidders⁵⁵⁹; and
- b) distorted bids due to strategic complexity (where bidders may be unable to directly reflect their demand in their bids and may need to consider their expectations about the outcome when determining their bids).⁵⁶⁰

Pricing Impacts

7.240 Bidding error can arise from mechanical complexity resulting in a bidder obtaining a package of spectrum when it would have obtained a different package with a higher surplus if the bidders understood the auction rules better.

Complexity under Option 1 and 2

7.241 The rules in the SMRA and the SCA are relatively simple and transparent (in the

⁵⁵⁹ For example, bid errors arising from mechanical complexity, if the rules are complex and bidders fail to correctly anticipate the consequences of their bids or simply make mistakes when preparing their bids.

⁵⁶⁰ To take a simple example, a first price, sealed-bid auction is mechanically simple and easy for bidders to understand with the highest bidder winning and paying the amount of its bid. However, from the point of view of a bidder, determining the right bid in order to maximise its surplus is strategically complex and depends on how the bidder thinks other bidders will bid.

SMRA bids are made on a lot-by-lot basis and bidders only need to improve their offers in response to being outbid, whilst in the SCA bidders are given a clock price and simply need to indicate how many lots in each category they would want to acquire at these prices). However, as discussed below, while Option 1 and 2 are mechanically straightforward, it can increase bidding complexity due to the risks and uncertainties faced by bidders when lots are complementary for bidders.

- 7.242 In particular, Option 2 (c) contains demand retention rules which would be unfamiliar to bidders compared to the more standard SCA, SMRAs or CCA. Further because this option reintroduces aggregation risks (that are not normally present in a SCA) it creates bidding complexity for certain bidders.
- 7.243 In any event, bidder training will typically be required regardless of the auction format because some bidders may not have any experience of participating in auctions. For example, the 400 MHz Award used a SCA and an award participant, ESNB, noted that bidder training was necessary as bidders would likely have little or no exposure to utilising an Electronic Auction System, and that ComReg should facilitate a mock auction for each bidder if requested.

Complexity under Option 3, 4 and 5

- 7.244 Options 3, 4 and 5 have relatively complex mechanics in relation to activity rules and winner and price determination. However, once the format itself is understood and bidders have generated their valuations for different packages of lots, the process of bidding to reflect these valuations (and importantly, relative preferences between different packages) can be relatively straightforward.
- 7.245 Option 3 is a relatively new format, having been first introduced in 2016, and has not been used in Ireland to date. Consequently, bidders are unlikely to have prior experience with it. Alternatively, the CCA (Option 4) has already been used in Ireland for the 2012 MBSA and more recently the 3.6 GHz Award in 2017, so many potential bidders are likely to be familiar with its features.
- 7.246 That said, a considerable amount can be done by the auctioneer to aid bidders in developing an understanding of the auction rules through, for example, setting out examples to illustrate concepts that are somewhat abstract and providing tools necessary for bidders to simulate auction conditions. In that regard, ComReg aims to provide a detailed bidder training programme, including an auction workshop presentation⁵⁶¹, the use of mock auctions⁵⁶², bidder

⁵⁶¹ Where the main features of the award are stepped through in a face to face meeting (or facilitated via the internet) with interested parties.

⁵⁶² ComReg provides a mock auction scenario for each bidder, where the various features and auction rules are illustrated.

playgrounds⁵⁶³, and winner and price determination software⁵⁶⁴ which allows bidders to simulate auction scenarios and calculate prices paid for a given set of winning bids.

7.247 Note that this training primarily deals with mechanical complexity and only deals with bidding complexity to a certain extent because this form of complexity arises primarily due to bidders need to consider extraneous factors such as making expectations about the bids of competitors. Bidding complexity is best simplified through the use of auction rules which limit the need for bidders to consider extraneous factors (see 'Bidding Incentives' below).

7.248 While Option 5 has the same mechanical complexity of Option 4, it has significant bidding complexity arising from changes to the price determination rules as suggested by Three (see Price Determination Impacts above).

Complexity under Option 6

7.249 Option 6 increases the risk of mechanical complexity during the award compared with Option 4. While computational complexity would remain with the auctioneer, the use of different auction rules to account for certain situations that may or may not arise (i.e. whether there is unassigned lots at the end of the primary bids round) increase the complexity of the award as bidders would need to understand two set of rules (one of which would not be used). In particular, bidders would have to prepare for two potential formats given that the supplementary bids round and the procedure for additional rounds/headline bids is substantially different. This is likely to be particularly unhelpful for smaller, less experienced bidders. While bidder training could mitigate these concerns somewhat, bidders are likely to prefer preparing their bid strategies with one set of rules in mind.

Relevant stakeholder Impacts

7.250 ComReg notes that each of the Assignment Impacts (referred to above) would broadly apply to all bidders in the same way depending on each bidders particular requirements.

7.251 While smaller bidders may prefer formats that are mechanically simpler, Option 4 essentially removes the bidding complexity for bidders. There is still a clear and simple strategy available to bidders when bidding in the auction – work out valuations for each alternative package for which it has a surplus and bid in a straightforward manner based on these valuations and the relative prices of different packages.

⁵⁶³ This allows bidders access to the Electronic Auction System where it can create its own auction simulations including the number of bidders and associated bids.

⁵⁶⁴ This software allows bidders to easily calculate winning bids and prices based on hypothetical bids chosen by the bidder or resulting from the simulated auctions.

Conclusion on complexity

7.252 In light of the above, and in summary, ComReg notes the following:

- a) Option 1 and 2 are mechanically straightforward and easy for bidders to understand although the additional rules (demand retention and compulsory exit bids) create additional complexity for bidders that are not present under other options considered under Option 1 and 2;
- b) All remaining options are more complex mechanically. However, regardless of the format, bidder training would be required and ComReg's experience in the 3.6 GHz Award (and the detailed training programme) illustrates that concerns around mechanical complexity are manageable (even when engaging with less sophisticated / less experienced smaller participants); and
- c) Further, a trade-off exists between mechanical simplicity and the ability of bidders to ensure that their valuations deliver their optimum outcome. While second price formats rules may be perceived as complex by some, it is important to note that the complexity of bidding decisions and the risks faced by bidders in alternative formats may be significantly higher, even if the auction mechanics superficially appear straightforward. The trade-off may be particularly appropriate where additional complexity is justified by the significant risk that an efficient outcome for important spectrum rights of use may not be achieved without same.

Part II Price Determination Impacts

7.253 In the Background section of this RIA, ComReg described the two broad methods of determining prices in spectrum auctions:

- Pay-as-bid pricing; or
- Opportunity cost pricing⁵⁶⁵ (also known as the 'second price rule').

7.254 These two broad methods of determining prices are used under each of the six options where:

- Options 1, 2 and 3 use a pay-as-bid pricing approach; and
- Options 4, 5 and 6 use an opportunity cost pricing rule (though there are variations in each).

7.255 These price determination processes have the potential to impact potential bidders in different ways and some have been tangentially discussed in relation to the Award Risks above. ComReg assesses the potential impact of each price determination method under the following headings:

- A. Bidding complexity and incentives;
- B. Pricing Transparency; and
- C. Pricing Asymmetry.

7.256 ComReg notes that this assessment is conducted having regard to the circumstances of the Proposed Award and noting that there are circumstances under which either pricing rule may be appropriate to ensure efficient competitive outcomes.

A. Bidding incentives and complexity

7.257 This section assesses the extent to which bidders can evaluate their bidding options and have incentives to bid straightforwardly for different packages at their valuations.

Pay-as-bid pricing

7.258 The pay-as-bid format is simpler for bidders to understand because no calculations are required to determine prices. However, the bidding complexity

⁵⁶⁵ This is discussed further below but opportunity cost pricing is used in some spectrum auctions because it largely removes the incentive to bid strongly below valuation or for fewer lots than actually wanted in order to reduce winning prices.

associated with these rules depends on the demand structure rights of use being made available.

- 7.259 Under a pay-as-bid format, winning bidders simply pay the amount of their bid. Bidding strategies (and associated bidding complexity) are very straightforward for bidders with **decreasing marginal valuations** who do not need to consider switching between packages. SCAs and SMRAs (Options 1 and 2) perform best when bidders have little or no complementarities across lots.
- 7.260 In such cases, these formats would lead to a broadly efficient assignment if bidders bid straightforwardly (i.e. there are still incentives for strategic demand reduction and other gaming opportunities, as discussed above). Further, if complementarities are weak and take simple forms, these simple formats may perform reasonably well.
- 7.261 However, as complementarities (**increasing marginal valuations**) become more complex, and have more impact on the efficient outcome, these formats perform less well and there may be benefit in using formats that are better able to deal with complementarities. In the presence of complementarities, this apparent mechanical simplicity and transparency comes at the cost of **significant bidding complexity** because a winner's bid amount directly determines its winning price and bidders may need to make choices and trade-offs in relation lots of interest.
- 7.262 For example, Option 1 creates problems for bidders who may wish to:
- (i) pursue alternative spectrum combinations and would be exposed to the impact of winning too much spectrum by expressing demand for different alternative spectrum combinations; and/or
 - (ii) have synergies across lots and a bidder might win only a subset of the lots targeted in any particular combination (or lots across different portfolios).
- 7.263 In that regard, because the SMRA suffers from serious aggregation risks, it can create excessive complexity for bidders as they might either be forced to bid conservatively (thereby reducing competition in the auction) in order to avoid being stranded on unwanted lots, or bid aggressively (with the associated risk of being stranded with unwanted lots) in order to maximise the chance of being assigned their preferred lots. In a multi-band award such as the one proposed, it can become difficult for bidders who have a spectrum requirement across multiple lots to formulate a bidding strategy based on bidding for lots independently of each other.
- 7.264 Further, as discussed above, Options 1 and 2 may create switching impediments when bidders can acquire multiple lots and may wish to switch several lots across

different categories. This might lead to situations in which some bidders might be unable to switch their full demand in response to price changes (especially under Option 1) or where switching decisions might be irreversible. In these cases, bidders will need to make a choice between alternative packages on the basis of their expectations about final relative prices, to ensure they do not end up winning the wrong package.

7.265 Even under Option 2 where the matters outlined above could be mitigated against, bidders are unable able to express their full set of preferences across different spectrum portfolios and instead must select their preferred quantity at a given price in each round. For example, in each round a bidder selects its preferred package (i.e. quantity of lots) at the round price. However, with a large amount of spectrum this does not necessarily allow bidders to express a valuation for all relevant packages at round prices. Such bidders would need to be able to bid on mutually exclusive packages in order to be able to express their preferences for different spectrum options. This reduces the number of packages that can be considered and limits the extent to which bidders' preferences over alternative packages can be accounted for when determining the auction outcome.

7.266 Further, as described above, there are strong incentives for strategic demand reduction under Options 1 and 2.⁵⁶⁶

7.267 In relation to Option 3, the CMRA reduces bidding complexity by allowing bidders to make multiple additional bids in each round permitting bidders to express preferences for different spectrum requirements. However, as noted above, bidders still have incentives to reduce demand early in order to win some lots at a lower price. Bidders also have incentives to try to shade bids below valuation with a view to maximising their surplus (i.e. the difference between their valuation and the price paid) noting that such incentives do not exist in the second price rule.⁵⁶⁷

⁵⁶⁶ For example, as noted by DotEcon (See DotEcon Report, Document 20/122a, p124) with price uniformity there is an incentive not to compete for a larger number of 700 MHz lots unless there is a strong likelihood of winning those lots. In particular:

- Even if there is no competition for 700 MHz lots other than from the three MNOs, price uniformity incentivises Vodafone and Three not to compete for third lots. In turn, this reduces competition faced by Three. It also makes an even split of the six available 700 MHz more likely.
- If there is competition for 700 MHz lots from one or more entrants, under uniform pricing, there is an incentive for entrants to compete for a smaller amount of spectrum than straightforward bidding in line with their business cases would indicate. Unsuccessfully competing for a larger number of blocks than necessary may be unattractive given the difficulty of outbidding the existing MNOs.

⁵⁶⁷ Bid shading involves bidding less than valuations to increase the expected surplus. This may create a number of problems for bidders.

7.268 Further as noted in Document 19/59a, the CMRA may be challenging for bidders who may want to bid for many alternative packages, as such bidders may need to update a large number of bids in each round. Given the large number of lots available, it may be easier if bidders only need to consider all of these bids in the supplementary bids round of a CCA, where bidders typically have a number of days to prepare their final set of supplementary bids. As noted by DotEcon, bidders might need to consider a significant number of bids each round, which could be challenging; conversely, in a CCA bidders would only need to make a comprehensive assessment of all their bids in the supplementary bids round.⁵⁶⁸

7.269 However, the CMRA would have advantages over Option 4 (CCA) if some bidders are budget constrained because bidders pay the amount of their winning bids and prices are determined by competition with other bidders.

Second price rule

7.270 Option 4 (CCA) uses a second price rule where the bid amount set by the winner typically does not directly affect its price, but only the chances of winning. The bid amount only establishes what the bidder should win but not the surplus it may obtain in winning. The second price rule therefore simplifies bidding decisions by allowing bidders to bid straightforwardly in line with their valuations without needing to consider the impact that this could have on prices, or form expectations over the bids of competitors.⁵⁶⁹

7.271 Bidding at valuation ensures that the bidder will win if the price for the lots is below the bidder's valuation and lose if the price of the lots is above valuation. The second price rule helps to incentivise truthful bidding (i.e. bidding in line with valuations) so that the outcome can be based on accurate information about bidders' demands. In this way, the winning bid does not affect the price to be paid and there are no incentives for bidders to under-represent their valuation in their bids.

7.272 This is an attractive feature as Option 4 allows bidders to bid for alternative, mutually exclusive packages with a guarantee that the winner determination mechanism will select the package which would provide the greatest surplus to the bidder (in terms of the difference between the bid submitted by the bidder

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- First, it creates bidding complexity as bidders must second-guess what other bidders are likely to do when deciding what bids to make; and
 - Second, there is the potential for inefficient assignment, if a bidder wins a different assignment or none at all, not because it has a lower valuation than another bidder, but because it has shaded its bid (by more or the other bidder bid to valuation).

⁵⁶⁸ DotEcon Award Design Report, Document 19/59a, p87.

⁵⁶⁹ The second price rule largely removes any need for a bidder to consider the bidding strategies of rivals and allows a bidder to focus on expressing its own preferences across different packages. The winning price reflects the minimum amount that the bidder needs to pay to win given competition from rivals.

and the price it would need to pay for each package).

- 7.273 If bidders follow this straightforward strategy⁵⁷⁰, then the mechanism can assign lots in an efficient way (to those bidders who value them most), and winners can be assured that they will only need to pay the minimum amount they would have needed in order to outbid competitors. This is likely to be helpful to all bidders but particularly smaller bidders who have less scope to deal with the bidding complexity that can arise in relation to pay as bid formats where such guarantees would not be available.
- 7.274 It is worth noting that, while pay-as-bid auctions typically create incentives to understate demand because a bidders winning prices are determined by the bids it makes, opportunity pricing can create incentives for overstating demand in order to drive prices given that prices are determined by rival bidders. ComReg notes that while both are possible the incentives to reduce demand are significantly stronger because it does not require information about what other bidders might do. Alternatively, for a price driving strategy to be successful, it relies on the information that one bidder has about the likely valuations and bidding strategy of other bidders and bidding absent this information is inherently risky because it could win lots it that are not desired. (See discussion under 'Gaming' above for further discussion on price driving incentives in a CCA).
- 7.275 While Option 4 provides good incentives for bidders to compete for additional spectrum, budget constrained bidders⁵⁷¹ have some incentives to compete for smaller packages in the supplementary bids round. For example, some bidders may be unable to obtain a budget that reflects their highest valuation for a combination of lots, and so may not be able to bid at value for all possible packages. In particular, this may mean that a bidders cannot express its valuation differential between a larger and a smaller package of lots, as bidding the smaller package at value would cause the bid for the larger package to exceed its budget

⁵⁷⁰ The Vickrey-nearest MRC pricing rule proposed for this auction can in some cases create some incentives for bidders to bid below valuation, in order to affect prices where the Vickrey-nearest sharing rule needs to be applied. However, in practice this is difficult to achieve given the required knowledge of the structure of bids, even if such a strategy were successful, the prices across winners would still reflect the value denied to losing bidders. Therefore, it is reasonable to expect that incentives to bid at valuation will be largely unaffected by use of Vickrey-nearest MRC pricing rather than pure Vickrey pricing, and even in the case that an alternative bid strategy were adopted by one or more bidders, this is unlikely to have significant consequences for the efficiency of the award. This rule represents the best way to encourage truthful bidding without ending up in situations of unhappy losers. See Section 4.2.1 of Exposure Pricing Report Annex 11 Document 20/32 for more discussion on same.

⁵⁷¹ Budget constraints impose limits on the ability of bidders to express a full range of valuations in their bids particularly for larger packages. Bidders can face decisions about how to adjust their bids in order to maximise their chances of winning the best combination of lots given their budget. Budget constrained bidders can be smaller or larger but typically concern bidders with a wider range of alternative (smaller and larger) packages.

if the true valuation differential was expressed.⁵⁷²

- 7.276 Notwithstanding, the CCA can assist bidders in identifying which packages they are likely to win within their budget, especially under the activity rules and the Exposure Pricing mechanism. This allows bidders to focus on these packages and adjust bids to improve their chances of winning their preferred affordable package given their budget (this is achieved by disclosing demand information during the clock stage that helps to assess what the bidder could realistically win noting that this information would be based on bid of other bidders which are encourage to be truthful). Further, ComReg notes and agrees with DotEcon budget constrained bidders would still be able to make full use of whatever budget they do have to bid for large packages.⁵⁷³
- 7.277 ComReg notes that while Option 5 proposes to use a second price rule the same as a CCA, the bidding incentives would be significantly altered because the proposed price determination changes would create a situation where Three would be assigned rights of use below the opportunity costs imposed by other bidders. In this way, Three would have scope to bid more for rights of use in the knowledge that any pricing asymmetry above a certain level would be reduced post-award. In effect, the incentives for Three to bid truthfully could be significantly compromised creating a range of potential impacts for other bidders.
- 7.278 These impacts are provided in Paragraph 7.341 -7.348 below (Competition within the award) and arise primarily because Three could be assigned rights of use at price below opportunity cost of the spectrum because of changes to the price determination rules. Further, and in addition the above, Option 5 (b) would specifically limit the ability of Vodafone and Three to express their full valuation for a third 700 MHz lot.
- 7.279 In relation to Option 6, bidding incentives would be altered because some bidders may alter their bids in order to move the second phase of the auction to the additional rounds phase rather than a supplementary bids round. Further, replacing round prices with exposure prices would increase incentives for bid shading and expressing truthful valuations. The 'additional rounds' component works similar to a CMRA and would is subject to similar assessment as provided in relation to the under Option 3 (CMRA) above.
- 7.280 Further, as noted above the potential for using different sets of rules would create additional bidding complexity.

⁵⁷² The bidder would have a choice between bidding less for the smaller package and bid the large package at its budget, if it thought this would likely win the large package, or alternatively if it was unlikely to win the large package at its budget, bid for the small package at value, but then understate its valuation differential.

⁵⁷³ ComReg Document 20/32 – Annex 12 – p,63.

B. Pricing Transparency

Pay-as-bid

7.281 The pay-as-bid format is very straightforward in terms of pricing transparency because this form of price determination involves bidders only paying the amount bid (as the name suggests).

Opportunity cost (second price rule)

7.282 Under this approach the price a winning bidder has to pay is determined based on the concept of opportunity cost ('second price rule') and reflects the value that could have been generated by assigning lots won by it to other bidders. The price derived using the second price rule is potentially lower than the bid price because it is at a level that ensures that the winning bidder covers at least the opportunity cost of assigning the spectrum to it rather than to any other bidders. This could create some pricing uncertainty for bidders in certain circumstances.

ComReg Assessment

Option 1, 2 and 3

7.283 ComReg notes that the pay-as-bid format (i.e. Option 1, 2 and 3) provides all bidders with full transparency and bidders always know their financial exposure at any point in the award.

Option 4, 5 and 6

7.284 Given that the price paid can be lower than the price bid, there may be uncertainty about what bidders would ultimately be required to pay having made certain bids.

7.285 This could create some impacts for bidders. For example:

- I. budget constrained bidders may not be able to bid their full valuation for all the packages of interest, as this might exceed their budget. In such cases, determining the optimal bids for several alternative packages may be challenging and bidders may need to make decisions on which package (i.e. a larger budget constrained bid or smaller package within budget and valuation); and
- II. it could create governance issues for some bidders (typically larger bidders) if bidders may be reliant on board approval for certain bids. Even when bidders may be able to bid at valuation, they may face internal governance issues when seeking approval to make bids at levels significantly higher than expected prices.

7.286 However, an open award format with relaxed bidding provides an effective mitigation of this problem, which should help bidders in identifying the packages they may be able to win within their budget, and also determine the maximum prices they might be required to pay under normal circumstances for the packages they have bid for in the final clock round.⁵⁷⁴ (See also budget constraints discussion above).

7.287 Importantly, ComReg notes that these impacts cannot be viewed in isolation and need to be balanced against the other impacts arising from the pricing rule (see Bidding incentives above). In particular, ComReg agrees with DotEcon that to the extent that there is uncertainty about winning prices, this is caused by the MRC pricing methodology seeking to **minimise auction revenue** subject to winners paying enough.⁵⁷⁵

7.288 Further, ComReg notes that there are measures that could significantly reduce the pricing uncertainty arising from certain formats. As set out in Document 20/32, and following feedback from Interested Parties, ComReg commissioned DotEcon to consider and advise on whether additional information could be provided to bidders in the course of a CCA in terms of the final price a bidder would have to actually pay arising from bids made in the clock rounds (“Exposure Pricing”).

7.289 DotEcon’s findings are set out in a report provided in Annex 12 of this document and summarised at the outset of this RIA. In summary, the Exposure Pricing mechanism would provide additional helpful information to bidders and reduce the internal governance challenges without the risk of distorting the outcome of the Award Process. In that regard, ComReg notes and agrees with DotEcon’s views that while Exposure Pricing does not perfectly resolve the uncertainty issues, it should provide bidders with significantly improved information about what they could ultimately expect to pay for a package if there were to win it.⁵⁷⁶

7.290 ComReg is therefore of the view that, under Options 4 and 6, the addition of the Exposure Pricing sufficiently mitigates any pricing transparency issues that bidders may have through the use of those options in the Proposed Award. Furthermore, ComReg is of the view that to the extent that any price transparency issues persist, they are clearly outweighed by the positive aspects of the CCA format in terms of addressing Award Risks (as discussed earlier).

7.291 Separately, ComReg notes and agrees with DotEcon that Option 5 (b) creates excessive complexity that would prevent the Exposure Pricing functionality from

⁵⁷⁴ ComReg considers, in light of its experience in recent awards, such concerns to be relatively minor and manageable in the CCA, especially under the proposed activity rules.

⁵⁷⁵ Document 20/32, Annex 12 - DotEcon Report, p10.

⁵⁷⁶ DotEcon Report Document 20/122a, p91.

providing useful information to bidders.⁵⁷⁷

C. Pricing asymmetry

Pay-as-bid

7.292 In pay-as-bid formats, prices for similar lots will be near-uniform (with differences being limited by the size of the bid increment) so differences in prices paid across operators would be small. Bidders pay the amount of their winning bids and therefore the price paid is unaffected by the bids made by others for additional spectrum. (i.e. under second price the prices paid by winners are determined by the bids made by others for additional spectrum).

7.293 While Option 3 (CMRA) is a pay-as-bid format, it can result in asymmetric prices in order to better promote efficiency and reduce the risk of unsold lots in a similar way to a CCA. ComReg notes that this Option can be modified to mitigate the risk of asymmetric prices by discarding bids that fall below a certain threshold relative to prevailing clock prices (except those that are essential for the implementation of activity rules). However, this would reduce the benefits from allowing for the possibility of non-uniform prices where there are complementarities between lots and increases the risk of lots going inefficiently unsold.

Opportunity cost (second price rule)

7.294 Opportunity cost pricing can lead to bidders paying different amounts for similar spectrum packages due to those bidders facing different levels of competition from their rivals. For example:

- a) if a bidder competes for a variety of packages (including larger and smaller packages) but wins a smaller package, the larger packages for which it placed bids for (but did not win) can impose an opportunity cost on other bidders; and
- b) bidders who do not have a valuation for spectrum additional to its winning package creates little or no opportunity costs for others who may therefore pay relatively less compared to the amounts of their bids

ComReg's Assessment

7.295 While the impacts arising from uniform price auctions (i.e. Options 1 and 2) would appear, on the face of it, to be minor because all bidders would pay the same (or approximately the same for equivalent lots) such outcomes may not always be desirable from a bidder's perspective (although they may be) particularly where

⁵⁷⁷ DotEcon Report Document 20/122a, p109.

bidders have different objectives and the level of competition between each may vary.

7.296 For example, some bidders may prefer to have the flexibility to pay more than other bidders on a per lot basis:

- a) if that higher price is lower than any uniform price under an alternative format;
- b) if that higher price allowed a bidder to obtain a different and preferred set of rights of use compared to those assigned; or
- c) if that higher price resulted in the assignment of any rights of use that would not have been assigned in a uniform price format (i.e. such a bidder may have been outbid in an alternative format and left with no rights of use).

7.297 These concerns are particularly important in a multi-band spectrum award where a wide range of bidders competing for rights of use to deliver different services. Such concerns are likely to be particularly relevant for smaller bidders and New Entrants who likely have a small range of packages and winning no rights of use is a more realistic possibility compared to larger bidders.

7.298 The main aim for such bidders is to be assigned usable rights of use that maximise their surplus and pay at or below valuation. These bidders are unlikely to be concerned with per lot comparisons to larger bidders who are in objectively different situations in terms of the services they would provide and market maturity (in terms of New Entrants). For example, FWO or NDOs would likely prefer a format or pricing rule that provides them with the best opportunity to be assigned rights of use at or below valuation.

7.299 In relation to operators that compete more directly with one another in the same markets (e.g. mobile operators). ComReg notes such concerns have been raised primarily by Three. However, Three has not forward a credible theory of harm associated with asymmetric prices other than to claim that such prices (to the extent that they would be higher) would be 'unfair' when used in association with the spectrum competition caps. In that regard, the opportunity cost refers to bids that all bidders are permitted to make under the competition caps and bids that are not permissible are clearly irrelevant in the price determination process. The efficient assignment only has in mind bids permitted under the competition cap since any assignment (efficient or otherwise) which could result in extreme asymmetric outcomes would not be line with the promotion of competition and ComReg's broader statutory objectives.

7.300 Such concerns around prices being discriminatory are assessed separately in Annex 7 of this document.

7.301 ComReg notes the views of DotEcon⁵⁷⁸ that bidders more generally may be concerned with asymmetric prices for the following reasons:

- a) **First**, there is a principal-agent problem present in telecom companies, where shareholders and, to some extent, senior management may not be able to assess perfectly the performance of the team which submits bids in an auction. In the absence of a reliable way to rate the surplus achieved through the purchase of spectrum in the auction, they turn to comparing the cost paid by them versus that paid by competition; and
- b) **Second**, if a competitor has to bear a higher cost in a spectrum auction and they face limited liquidity / imperfect capital markets, they may find themselves cash-strapped and unable to invest in infrastructure, which lessens competition.

7.302 In relation to the first bullet above, DotEcon notes that if shareholders find it difficult to assess the success (or otherwise) of spectrum auction outcomes, there are broader issues at play than just auction design. In particular, this suggests that spectrum licences may be awarded when their use and value is highly uncertain.

7.303 In relation to the second bullet above, DotEcon notes that it is implausible that large telecoms operators would be subject to sufficiently strong capital constraints that their ability to compete in downstream markets might be limited by paying more for spectrum.

7.304 ComReg discusses the impacts arising from imposing a higher cost in spectrum auction in 'Impacts on Competition' below. However, it should be noted that any price paid by a competitor would be no greater than valuation and should not impact on an operators ability to deliver services, noting that operators are likely to apply a great deal of attention to valuations for important harmonised rights of use being made available over a 20 year period. In that regard, such cost would be considered a sunk cost such that it should not impact how that rival competes in downstream markets.

7.305 Further, ComReg agrees with DotEcon that concerns about relative performance may be an issue for bidders but observes that this is a stakeholder management problem and senior management should be able to set out realistic objectives to internal stakeholders prior to an award.

7.306 In relation to Option 5, the level of asymmetry (to the extent that an efficient assignment would normally require it) would be less than Option 4 because the

⁵⁷⁸ DotEcon Report, Document 20/122a, p102. See DotEcon Report Annex 12 (Document 20/32) alos.

amended price determination rules are designed specifically with that in mind. As noted above, this would likely create substantial distortions to bidding incentives and competition (as discussed below).

7.307 In relation to Option 6, the second price rule only applies regardless of whether a supplementary bids round or the 'additional rounds' are used. Therefore, any pricing asymmetry would be similar to Option 4.

7.308 Finally, ComReg refers readers to Annex 7 for its consideration of the examples of the NERA Annex (including pricing asymmetries that may arise) provided as part of Three's response to Document 19/124.

Industry sustainability

7.309 The Irish market consists of three mobile operators that own and operate their own network infrastructure. MNOs host five MVNOs in Ireland that operate mobile services using one of the MNOs networks. These operators provide voice, SMS, MMS and mobile data services using 2G, 3G and 4G. All MNOs offers a full range of prepaid and postpaid services, including mobile telephony and mobile broadband.

7.310 The market is characterised by the following:

- a) high levels of smartphone and 4G penetration and rapidly rising consumption of mobile data, which has risen over 19 times since 2013⁵⁷⁹;
- b) stabilising average retail mobile revenues at around €4 billion⁵⁸⁰ in the period since the last MBSA award;
- c) the three networks have high levels of network coverage following investments in the period since the first MBSA spectrum award; and
- d) MNOs continue to invest strongly in their networks with non-spectrum related investments [X ██████████ X] (the highest in four years).⁵⁸¹

7.311 ComReg notes that asymmetric pricing is highly unlikely to threaten the sustainability of Three's business in line with Policy Direction No.4 on Industry

⁵⁷⁹ ComReg Quarterly Reports Data Portal.

⁵⁸⁰ Quarterly reports.

⁵⁸¹ Source: Confidential Reporting to ComReg.

Sustainability⁵⁸² for the following reasons:

- a) Any price paid by Three would be no more than its valuation for that spectrum (potentially less) depending on competition from others. Three is highly unlikely to have a valuation for spectrum rights of use that would threaten its own sustainability⁵⁸³;
- b) There are options available to Three to remedy any concerns it may have in relation to pricing asymmetry namely the unconditional return a block of sub-1GHz spectrum to ComReg;
- c) As noted by DotEcon, spectrum costs are only a small part of the overall cost base⁵⁸⁴. For example:
 - i. any asymmetry would be small against Three's overall annual revenue/profits, including when considered over the lifetime of the rights of use to be awarded (i.e. 20 years); and
 - ii. the upfront SAF would be small when considered over the lifetime of the rights of use to be awarded (i.e. 20 years). The minimum prices have already been structured such that 60% is paid as a Spectrum Usage Fee over the duration of the licence. This proportion was set, among other things, to allow bidders to spread a considerable portion of the cost of licences over the licence duration. Three agreed with the proposed minimum price split.
- d) as noted in Section 5.7.3, fees for temporary rights have been set at a nominal fee of only €100, totalling only €200 if the licences run for the entire twelve months (two licences running consecutively for 6 months each) and this has already provided for the rollout of 700 MHz rights of use and LTE 2100.

Part III Stakeholder Preference

7.312 This Part set sets out the views of stakeholders in relation to the regulatory options listed above.

⁵⁸² "ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected."

⁵⁸³ In that regard, Three is part of Hutchison which also owns MNOs in five other Member States, namely Austria, Denmark, Italy, Sweden and the United Kingdom and would likely have significant experience in valuing spectrum rights of use.

⁵⁸⁴ Document 20/32, Annex 12, p7.

Three

7.313 The views of Three in relation to each of the options set out in this RIA are summarised below:

- a) Three supports the use of **Option 1 (b)(ii)** and is of the view that a Hybrid SMRA is a leading candidate format for this award. However, Three acknowledges that if implemented with Time Slicing, this format may increase aggregation risk for bidders;
- b) **Option 2 (c)** ('Enhanced SCA') is its preferred format of the options considered in this RIA;
- c) Three does not support **Option 3** because it is of the view that there are significant challenges to using the CMRA, including in its view, complexity and poor transparency;
- d) Three does not support the use of **Option 4** and contends that there are serious errors with the CCA that directly discriminates against Three which would be contrary to ComReg's statutory functions and objectives;
- e) However, if a CCA format is deemed necessary, Three would prefer **Option 5 (a) and Option 5 (b)** or for Option 5 (a) alone in that order. Three maintains that such options do not entirely remove the adverse discrimination it believes would occur under Option 4, but these modifications remove the most egregious aspects of them in its view; and
- f) Three does not support **Option 6** and submits that the modifications proposed by Eir do not address the concerns that Three has expressed in relation to the CCA but rather address a separate matter regarding budget-limited bidders. Three does not see merit in Option 6 and is of the view that the concern raised by Eir would already be addressed by ComReg's proposal to provide discount information in each round.

7.314 In summary, of the options assessed in this RIA, Three would prefer Option 2(c), Option 1 (b)(ii), or failing that Option 5(a) and 5(b). Three does not support the use of the other options.

Eir

7.315 The views of Eir in relation to each of the options set out in this RIA are summarised below:

- a) Eir has concerns about the use of an SMRA arguing that bidders may not be able to switch their demand cleanly between lot categories. However, Eir does support the use of **Option 1 (b)(i)** with unlimited withdrawals;
- b) Eir also supports the use of **Option 2 (a)** and **Option 2(b)** in the Proposed Award and maintains that the SCA format is the most appropriate format as, in its view, either option takes due account of the unique aspects of the Proposed Award. Eir believes that **Option 2 (c)**⁵⁸⁵ would be better than a Hybrid SMRA⁵⁸⁶;
- c) Eir does not support the use of **Option 3** and is concerned that there may still be a risk of significant price asymmetry favouring stronger bidders (potentially even greater than Option 4).⁵⁸⁷ The complexity and limited previous history of CMRA auctions is also of concern to Eir. However, Eir is of the view that several of the advantages of the CMRA, as compared with the standard CCA, could likewise be achieved through the use of an Iterative CCA (Option 6);
- d) In relation to **Option 4**, Eir strongly supports the provision of Exposure Pricing information and believes it essential, at a minimum⁵⁸⁸, that this information be provided if ComReg continues with its proposal to use a CCA format auction for this award. Eir however maintains that Exposure Pricing alone is insufficient to address its concerns with regard to the efficacy of the CCA for this specific award and consequently would prefer Option 6;
- e) Eir does not support **Option 5 (a)** or **Option 5 (b)** because, in its view, Three would in all likelihood be able to bid significantly above its true value for 700 MHz spectrum in order to win that first lot, in the knowledge that it almost certainly would not have to pay the true

⁵⁸⁵ In that regard, ComReg notes Eir's views that "*the Enhanced SCA proposed by Three seems to us to have merit in this regard, although we have not had sufficient time to fully assess the implications of every last detail of the proposed rules to confirm that they are entirely satisfactory*".

⁵⁸⁶ ComReg notes that Eir's view were expressed in relation to Time Slicing 2.1 GHz only. However, it may still consider Option 2 (c) with time slicing across all Performance Bands as a candidate for the Proposed Award.

⁵⁸⁷ The problem in this case being the risk that more financially constrained bidders will end up winning their final round headline bids at final round prices (which could be significantly higher than the opportunity cost of the spectrum), whereas a stronger bidder may be able to act to end the auction and win one of their additional bids at a (significantly) lower price.

⁵⁸⁸ In response to Document 20/32, Eir also notes that "*At the very least, further additional information could potentially be useful (but again, is unlikely to fully address eir's concerns). For example, after the end of the final primary round and before the start of the supplementary bids round, eir believes that the outcome of the auction could be enhanced if each bidder were provided with additional information, in addition to that already proposed by ComReg in the draft IM*" See paragraph 18 – Eir response to Document 20/32.

opportunity cost of its bid; and

- f) Eir supports the use of **Option 6**, noting that the key advantage of this approach would be that no bidder could come away from the auction with nothing, unless they had explicitly submitted a zero bid. As a result, Eir suggests that budget constrained bidders would be in a better position to compete.

7.316 In summary, Eir would prefer either Option 2 (a), Option 2 (b) or Option 6. Eir does not currently support Option 4 but may do so if additional information is provided to bidders (at a minimum).

Vodafone

7.317 The views of Vodafone in relation to each of the options set out in this RIA are summarised below:

- a) Vodafone does not support **Option 1** (in the presence of Time Slices⁵⁸⁹) and agrees with ComReg's observations that:
- i. bidders bidding on a combination of lots may be exposed to the risk of ending up being the standing high bidder for (and winning) some but not all of the lots it requires (i.e. aggregation risk);
 - ii. it exposes bidders to substitution risks as it is not possible to eliminate switching impediments under the traditional activity rules;
- b) Vodafone does not support **Option 2** or **Option 3** because this award will occur at the end a series of European auctions and probably be the last auction in Ireland for some time. Vodafone has a strong preference to use a well establish process in which reasonable expertise should be available to all parties;
- c) Further, in relation to **Option 3**, Vodafone is of the view that the issues relating to transparency are better dealt with by Exposure Pricing, as described by ComReg in Document 20/32;
- d) Vodafone supports the use of **Option 4** in the Proposed Award and strongly supports the addition of Exposure Pricing;

⁵⁸⁹ While Vodafone would support an SMRA without time slices, it opposes Three's two lot category approach. ComReg assesses other approaches for making rights of use available in the 2.1 GHz Band in Chapter 4 and provides reasons why such options are not suitable for the Proposed Award.

- e) Vodafone does not support **Option 5** because the amended price determination rules appear to have no purpose other than to reduce the price that Three would pay. In Vodafone's view, this does not align with ComReg's objectives in the award and discriminates against other bidders; and
- f) Vodafone did not provide any view on **Option 6** but seems unlikely to support such an approach given its views on Option 3 and 4 as outlined above.

7.318 In summary, Vodafone would prefer Option 4.

7.319 The views of Imagine in relation to each of the options set out in this RIA are summarised below:

- a) there are important advantages and disadvantages to **Option 1** and **Option 4** but, in its view, the final choice of auction format for any particular application should depend on an analysis of the circumstances;
- b) Imagine is of the view that the CCA (**Option 4**) is a suitable mechanism for the auction and assignment of this spectrum and stands by its previous position⁵⁹⁰;
- c) Imagine agrees with the arguments put forward by ComReg regarding **Option 2** and **Option 3**. Imagine does not believe that either of these would be more favourable than Option 1 or Option 4;
- d) In relation to **Option 5**, Imagine is of the view that there is an inherent risk that such departures from the relatively well understood and tested approach of the current preferred CCA format could undermine the benefits of its original design whilst also increasing the risk of unforeseen outcomes; and
- e) Imagine has not expressed any views in relation to Option 6 but given its views on Option 2 and 3 it seems unlikely to be supportive of **Option 6**.

7.320 In summary, Imagine would prefer Option 4 but may also prefer Option 1 depending on the circumstances of the Proposed Award.

⁵⁹⁰ Imagine also reiterate its statement made in response to ComReg 19/59R that "*In our view it is highly questionable to assume or infer substitutability between these bands [2.1GHz, 2.3GHz & 2.6GHz TDD] There appears to be no valid justification therefore for creating time slices for 2.3GHz and the TDD portion of the 2.6GHz bands as this is only needed for the 2.1GHz FDD bands...*"

7.6.2 Impact on competition and consumers

7.321 As outlined above, (see Policy Issues and Objectives) there are different elements to competition that are relevant in determining the impact of any of the preferred options. There is a natural overlap between the aims of the Auction Format RIA and an assessment of ComReg's compliance with some of its statutory obligations, and, in particular, one of its core statutory objectives under Section 12 of the 2002 Act of promoting competition by, amongst other things:

- a) Ensuring that there is no restriction or distortion of competition in the electronic communications sector⁵⁹¹;
- b) Safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition⁵⁹²; and
- c) Encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources⁵⁹³.

7.322 In that regard, ComReg notes that any preferred auction format would be based on objective, transparent, non-discriminatory and proportionate **selection criteria and selection procedures** as set out in the Authorisation Regulations and RSPD Decisions (See Policy issues and Objectives above).

7.323 ComReg notes that appropriate selection criterion in the case of an auction involves ensuring that spectrum rights of use are assigned to those users that value them the most⁵⁹⁴, subject to the selection procedure, providing bidders with the appropriate incentives to express its preferences and compete for all available spectrum.

7.324 In that regard, obtaining accurate information about the maximum willingness to pay is an important selection criteria for determining winners as this information allows the auction mechanism to make a better assessment of how to efficiently assign the lots amongst bidders, thereby maximising competition within the award and, in turn, downstream competition.

⁵⁹¹ Section 12(2)(a) of the 2002 Act.

⁵⁹² Regulation 16(2) of the Framework Regulations.

⁵⁹³ Ibid.

⁵⁹⁴ Notice that this criterion involves **both** spectrum and potential users. In this way, while the range of users may be relatively narrow, the different combinations of spectrum and values of same across those users are large. All auctions will assign rights to users that have some value for those rights of use. Some auctions may even assign rights of use to some of the most efficient users but assign those users the wrong combinations of spectrum. The auction format that assigns rights of use 'to those the values the spectrum the most' is the format that **best** assigns rights of use to the most efficient users and in the optimal amounts.

7.325 With that in mind, ComReg notes that the selection procedure should:

- a) be flexible enough to allow bidders to construct their preferred packages of lots without facing aggregation risk and winning unwanted subsets of their demand;
- b) allow bidders to express preferences for the full range of spectrum portfolios that are likely to be of interest to them without any impediments to switching or expressing their valuations during the award;
- c) be transparent to the greatest possible extent and allowing bidders to obtain information that is easily understood but without facilitating gaming opportunities; and
- d) set final prices paid at a level at which winners are willing to be assigned the spectrum while losers are not willing to be assigned the same spectrum at this price level (i.e. no unhappy losers).⁵⁹⁵

7.326 The remainder of this section provides ComReg's assessment on the impact on competition and consumers arising from each of the regulatory options. In doing so, ComReg notes that it previously set out its assessment of each of the Award Risks and Price Determination options earlier. This assessment is not repeated here and instead ComReg refers to the relevant aspects of same in completing its assessment.

7.327 Finally, ComReg concludes with an overall assessment on the impacts on downstream competitions and consumers.

Competition within the award

7.328 A spectrum auction should provide all bidders with the opportunity to obtain spectrum packages that suit their requirements at a given price in order to allow for the efficient assignment and use of the radio spectrum. The more intense the competition in the auction the higher the likelihood that rights of use will be assigned to those users that value it the most, and who are incentivised to use the spectrum most efficiently and compete most vigorously in the downstream retail market.

7.329 With that in mind, ComReg notes the following:

- a) competition within the award requires auction formats that provide good incentives to compete for additional spectrum:

⁵⁹⁵ This also assists in ensuring that spectrum fees reflect the need to ensure the optimal use of the radio spectrum and are also be objectively justified, transparent, non-discriminatory and proportionate.

- b) competition for spectrum within the award should be maximised by providing as much flexibility as reasonably possible for bidders to bid for spectrum of interest within valuation.

7.330 In relation to the remainder of this section, ComReg notes that:

- a) Options 1 and 2 are assessed together because both formats have similar Assignment and Pricing Impacts and use a uniform pricing approach;
- b) Option 3 is assessed on its own because it has features that resemble a CCA but is a pay-as-bid format; and
- c) Options 4, 5 and 6 are assessed together because all are based on the rules used in a CCA.

7.331 Each option (or categories of options) are assessed based on competition during the award, having regard to the appropriate selection criteria and selection procedures referred to above.

Options 1 and 2

7.332 In light of the Award Risks described above competition during the award is unlikely to be best promoted by Option 1 and 2 because:

- a) Option 1 suffers from serious **aggregation risks** which also reduces competition during the award because bidders may choose not to increase bids for lots beyond their standalone value (due to risk of being stranded with a subset of demand). However, this means that bidders would not express their synergy value for a combination of lots, thus leading to inefficiencies and reduced competition for lots during the award;
- b) Options 1 and 2 are both subject to **strategic demand reduction** as bidders have an incentive to strategically reduce demand, thereby preventing competition for additional lots out of fear of increasing prices. (i.e. absent that fear of increasing one's prices the bidder would have competed for additional lots);
- c) Options 1 and 2 both create a range of **gaming possibilities** which can allow bidders to reach collusive outcomes designed to reduce competition during the award;
- d) Options 1 and 2 suffer from **substitution risks** and the risk of **inefficiently**

unsold lots that can occur under both options⁵⁹⁶:

- i. these substitution risks (as described earlier) limit possibilities for bidders to switch to lots of interest, preventing competition during the award that would have occurred if impediments to switching did not exist; and
- ii. it may also result in inefficiently unsold lots and prevents competition for same, because some bidders who would be willing to acquire these lots at final prices may simply have been unable to express their willingness to do so through their bids

7.333 Finally, the uniform pricing rule associated with both options may result in lots **going unsold inefficiently** or being assigned inefficiently to a bidder who is **not the bidder that values them most**, because in some cases it is impossible to achieve an efficient outcome with uniform prices when there are complementarities between lots (see Box 1 above).

7.334 Therefore, ComReg is of the view that Option 1 (including the hybrid equivalents) and Option 2 are unlikely to sufficiently promote competition during the award.

Option 3

7.335 In light of the Award Risks described above, Option 3 is likely to better promote competition during the award compared to Option 1 and 2 for the following reasons:

- a) **Substitution risks** are removed by allowing bidders to make a list of mutually exclusive bids each round, and by allowing bidders to increase their demand in response to price movements;
- b) this allows for competition between bidders for different packages of spectrum and the auction (at the end of each round) determines whether, given the bids received, there is an assignment that includes all the bidders who are still bidding at clock prices; and
- c) it allows for asymmetric prices which can promote efficiency and competition for lots during the award by facilitating synergistic valuations (e.g. complementarities) and a reduced risk of **inefficiently unsold**

⁵⁹⁶ If one or more bidders view at least some alternative combination of lots as substitutes but cannot reflect this preference to switch its bidding from one package (or combination of lots) to another based on prices because of impediments to switching, such bidders may be assigned rights of use when it would have preferred an alternative spectrum package or combination of lots.

lots⁵⁹⁷.

7.336 There are two points worth noting however (both of which could reduce competition during the award:

- a) while the risks of **strategic demand reduction** are lower under Option 3 compared with Options 1 and 2 the format does have weaker incentives to compete for additional spectrum compared to Option 4 because it is still a pay-as bid format and prices are determined by the bids made by a bidder; and
- b) the CMRA is also subject to the problems associated with the pay-your-bid rule, where bidders may try to shade (i.e. bid below their true valuation) the bids they consider more likely to win, with a view to maximising their surplus (i.e. the difference between their valuation and the price paid).

7.337 Provided bidders have the correct incentives to make bids for packages of spectrum that are of interest to them at different prices there is a good opportunity for rights of use to be assigned to those users who value it the most under a CMRA as it is not exposed to the substitution and aggregation risks as referred to above under Option 1.

7.338 Overall, ComReg notes that the CMRA would facilitate competition during the award but there are residual concerns about the extent to which bidders would have the correct incentives to compete for all available rights of use during the award given the risks of strategic demand reduction and bid shading. Further, it is questionable whether bidders would be able to include all efficiency related bids at the end of each round compared to a supplementary bids round where such bids can be considered over a number of days (following information obtained over all the open rounds).

Options 4, 5 and 6

7.339 ComReg is of the view that Option 4 is likely to better promote competition during the award than Options 1, 2 or 3 for several reasons:

- a) **substitution risks** are removed compared to Options 1 and 2 and bidders can express their full range of demand and their relative value for many different packages of lots that are substitutes in competition with each other;
- b) the problem of **inefficiently** unsold lots is avoided compared to Option

⁵⁹⁷ Provided that bidders who reduce demand consider suitable alternatives and make relevant bids the CMRA should achieve broadly efficient outcomes.

1 and 2 through the use of a format that do not impose linear pricing promoting competition for all rights of use within the award;

- c) it does not provide incentives for **strategic demand reduction** compared to Option 1,2 and 3 and bidders have good reason to compete for larger packages of lots up to valuation, even if unsuccessful (although there is a bias towards smaller packages for budget constrained bidders in the supplementary bids round);
- d) it creates incentives for bidders to bid truthfully according to valuation with no incentives to shade bids (as arises under Option 1, 2 and 3). This ensures **information** revealed in the clock rounds is more meaningful to all bidders, thereby increasing competition and the likelihood of an efficient outcome. (See 'Bidding Incentives' above); and
- e) it better destabilises tacit collusion (i.e. **gaming**) by providing an opportunity for bidders to deviate from any tacit agreement in the supplementary bids round without the risk of retaliation by competitors (i.e. it is the only option with a mix of open and sealed bid stages).

7.340 Option 5 would proceed the same as Option 4 except for changes to price determination as described earlier. In that regard, ComReg notes and agrees with DotEcon that Three will have an incentive to overbid its true valuation for two blocks because of the inconsistency between the criterion for determining winning bids (where the joint cap is not applied) and that for determining the prices that winning bidders will pay (where it is).⁵⁹⁸

7.341 In effect the joint cap for price determination would operate specifically to give a discount for Three and would provide an incentive for Three to bid in excess of its valuation, because it knows it will not have to pay the full opportunity cost of its package. In that regard, the bidding incentives would be significantly altered and the incentives for Three to bid truthfully could be significantly compromised. Accordingly, there would be a strong risk of distortions to competition during the award. ComReg provides its assessment of this risk in relation to the 700 MHz Band, the Performance Bands and other residual impacts below.

700 MHz Band

7.342 In relation to the 700 MHz Band, ComReg notes the following.

- a) ComReg notes and agrees with DotEcon that the existence of this overbidding incentive for Three, but not Eir or Vodafone, leads to the possibility that Three could inefficiently win lots when Vodafone and

⁵⁹⁸ DotEcon Report, Document 20/122a, p65.

Three valued them more⁵⁹⁹. For example,

- i. Three could maintain demand for lots longer than would otherwise be the case, potentially forcing other bidders to reduce demand for additional 700 MHz lots that it might have won under normal price determination rules.
 - ii. Eir and Vodafone would have cause to complain that Three is being allocated two lots, but they had already offered more for these lots through their three block bids than Three was now paying.⁶⁰⁰
 - iii. if Eir or Vodafone wished to obtain a third lot, it increases the risks that it would come at the expense of the other also winning three lots (i.e. under normal price determination rules there was the possibility that Three may have dropped to **one lot first** in order to facilitate Vodafone and/or Eir winning 3 lots).
- b) ComReg notes and agrees with DotEcon that Vodafone and Eir do not enjoy similar opportunities to win two lots and pay less than others have bid for them. Therefore, the MNOs are not being treated equally.⁶⁰¹ For example, it artificially increases the prices other bidders must pay for 700 MHz lots because it imposes an opportunity cost based on bids that Three would be unlikely to have to pay and would not have been made under normal price determination rules.

7.343 In light of the above, ComReg notes that the change to determination rules and the factors outlined above would significantly reduce the incentives for Eir and Vodafone to win a third lot and consequently reduces the possibility for other bidders to reduce the sub-1 GHz cap asymmetry compared to normal price determination rules because Three is less likely to reduce demand to 1 or zero Lot lots (which could have facilitated one or more bidders winning three lots).

7.344 Further, the amended price rules and associated impacts would be common knowledge to other bidders, who may then settle for winning two lots each at reserve rather than competing for a third lot.

7.345 Option 5 (b) would additionally increase these risks by limiting the bids that other bidders could make for a third 700 MHz lots.

7.346 In that regard, DotEcon sets out in detail the difficulties associated with this

⁵⁹⁹ Ibid.

⁶⁰⁰ Ibid.

⁶⁰¹ Ibid.

option.⁶⁰² In summary, there is a restriction in the ability of a bidder to compete for a third 700 MHz lot which varies depending on whether or not it finishes the primary bid rounds on two or three lots.

- a) In relation to finishing the primary bid rounds with 2 lots and where there are significant numbers of unallocated lots in the final clock round the Three proposal has the effect of limiting the ability of bidders (other than Three) to compete for third blocks of 700 MHz spectrum. Under such circumstances, the largest incremental valuation that the bidder can express for its third lot is limited to the final clock price, which may be significantly less than value a third block.
- b) In relation to finishing the primary bid rounds with three lots, the main effect of Option 5 (b) is to oblige that bidder to make a corresponding supplementary bid for a package containing two 700 MHz (with the same number of lots in other categories), with a floor on this bid equal to the amount of its bid for its final clock package, less the final clock price of one 700 MHz. Therefore, Option 5 (b) requires a bidder finishing the clock round bidding for three 700 MHz lots to make the highest possible bid under the auction rules for two 700 MHz lots.

7.347 For a bidder who has valuation interactions between 700 MHz and other lot categories, it may not be able to express its true valuations for adding/removing a third 700 MHz lot to packages other than its final clock package.

7.348 Three's proposal unreasonably restricts this bidder from expressing its valuation for a third lot, potentially being forced to understate its value for a third lot by a very great deal.

Performance Bands

7.349 In relation to the Performance Bands, ComReg notes the following:

- a) Option 5 would contaminate bidding for other bands because Three may not have to pay the opportunity cost imposed on it for 700 MHz rights of use, thereby allowing it to compete more strongly in other bands. (i.e. the additional surplus provided by amended price determination would be used to compete in other bands);
- b) this cross contamination could have serious impacts on competition because it reduces the opportunities for smaller (potentially budget constrained bidders) to obtain rights of use in the Performance

⁶⁰² DotEcon Report, Document 20/122a.

Bands; and

- c) indeed, because these price determination rules would be common knowledge it is questionable whether such bidders (or potential New Entrants) would participate at all knowing that they would face this.

Other Impacts

7.350 Because of the impacts on bidding incentives in the 700 MHz Band and cross contamination of other bands, ComReg also notes that Option 5 would significantly undermine the price discovery process of the Proposed Award significantly limiting the usefulness of the demand information made available in the award (see Bidder Information Deficits above).

7.351 Further, as noted by DotEcon, if Three wins inefficiently because of the inconsistency between how winning bids are determined and how prices are determined, then Three could sell its two blocks – one to Vodafone and one to Three – at a profit in the secondary market.⁶⁰³

7.352 Option 6 includes provisions that would allow for two different set of auction rules to be used depending on the outcome of the Primary Bid Rounds One with similar rules as Option 4 and the other (i.e. ‘additional rounds’) which resembles a CMRA. ComReg notes that any assignment approach that may change rules depending on bids received up to a certain point is undesirable because bidders may make bids that reflect a desire to use one approach over the other rather than bidding truthfully in a straightforward fashion.

7.353 Under Option 6, if only one lot remained unassigned at the end of the Primary Bid Rounds, it would revert to an alternative mechanism for the remainder of the award rather than a normal supplementary bids round under Option 4. Such an approach introduces strong risks that a certain bidder who may prefer that approach would structure its bids in such a way to provide for unsold lots at the end of the Primary Bid Rounds (i.e. keeping demand artificially high by retaining a preference for lower surplus packages and dropping demand by an amount sufficient to ensure that supply exceeds demand by one lot).

7.354 More generally, replacing round prices with exposure prices would increase incentives for bid shading and expressing truthful valuations. For example, as noted by DotEcon, such an approach could complicate bidding decisions and is a departure from the favourable pricing rules of a CCA, which makes us less confident that bidders would bid truthfully.⁶⁰⁴

7.355 In light of the above, ComReg is of the view that Option 4 is likely to best promote

⁶⁰³ DotEcon Report, Document 20/122a, p66.

⁶⁰⁴ DotEcon Report, Document 20/122a, Section 6.3.8.

competition within the Proposed Award resulting in the efficient assignment of rights of use to those users who value it the most.

Downstream competition and consumers

- 7.356 At the outset, of this section ('Impact on competition and consumers') ComReg observed that appropriate selection criterion in the case of an auction involves ensuring that spectrum rights of use are assigned to those users that value them the most. In that regard, as noted above, Option 4 provides the greatest opportunity for rights of use to be assigned to those users that value them the most because that Option best mitigates the Award Risks providing bidders with the best opportunity to best express their valuation for spectrum rights of use.
- 7.357 ComReg additionally notes such criteria (i.e. assigning rights of use to those users that value the spectrum the most) should also result in the greatest benefits to downstream competition and consumers. If downstream competition is effective, the objective of achieving greatest social benefit can be achieved by assigning rights of use to whoever values the rights the most. This is because an auction will ensure that, subject to reasonable constraints inherent in the design of an auction (e.g. spectrum competition caps), those who value the spectrum the most will win it and, because of these financial incentives, are the most likely to use the spectrum efficiently⁶⁰⁵. Similarly, consumers will prefer the option which has the greatest potential to promote competition, thereby maximising the long-term benefits to consumers in terms of choice, price, and quality. They are also likely to favour options which avoids or minimises any significant disruption to existing services.
- 7.358** In the context of spectrum rights used for the provision of ECS, ComReg observes that the notion of what may constitute the "maximum benefits to users" in terms of choice, price and quality relates primarily to the economic dimension of spectrum efficiency and can be viewed in terms of ensuring that spectrum rights are used to (a) provide the services that are most highly valued by consumers (e.g. services which consumers would purchase, either directly or indirectly, and lead to the greatest consumer benefits (e.g. overall sales)) and (b) in a manner which would be valued by end-consumers (e.g. high quality/service levels at the lowest cost), over the lifetime of the rights of use.
- 7.359 Subject to a sufficiently competitive downstream market, a bidder's value for spectrum is the net present value of additional profits a bidder expects to earn from using it. This value may derive from the potential to use the spectrum to

⁶⁰⁵ Private valuations are likely to vary across operators as an individual operator's private valuation depends on its relative cost efficiency, including the use of existing spectrum holdings, network planning, etc. Where downstream competition is effective an operator is unable to extract monopoly revenues, therefore, provided that downstream competition is effective, how an operator's private valuation compares to that of rival bidders depends largely on its relative efficiency.

supply additional, improved or innovative services to consumers or through reductions in the cost of adding additional capacity (which may ultimately be passed on through lower prices). Therefore, spectrum delivers the maximum benefits (or value) for society, when held by the operator with the highest valuation for it, allowing for the best use of spectrum to unlock the full potential for spectrum to bring about benefits to society.

7.360 In that regard, Option 4 (which is more likely to assign rights of use to those who value it the most) should also best promote competition to the benefit of downstream competition.

7.361 For completeness, ComReg provides a further assessment of why auction formats that avoid certain award risks are likely to promote downstream competition to the benefit of consumers. At a high level, ComReg notes that this arises because bidders would prefer to avoid these risks because ultimately these risks impact on the ability of winning bidders to deliver services downstream and attract customers. With that in mind, ComReg notes the following.

7.362 Options that avoid **aggregation risks** are more likely to promote competition downstream to the benefit of consumers because:

- a) some bidders could be assigned rights of use below their minimum bandwidth requirement and may have to discontinue services or provide services below the intended QoS standard;
- b) the impacts on competition and consumers would be high if operators only obtained rights of use in one but not both Time Slices. In such cases, the rollout to services would be delayed if only Time Slice 2 was obtained and services might not be provided at all if only Time Slice 1 was obtained (vice versa). See Aggregation risks above;
- c) to the extent that existing LTE services have already been rolled out in the 2.1 GHz Band (using temporary rights of use) could create a potential cost to consumers arising from a disruption or continuity of those services; and
- d) if a potential New Entrant required rights of use across two different bands (i.e. coverage and capacity) aggregation risks could prevent new entry downstream.

7.363 In that regard, aggregation risks only arise in respect of Option 1 and Option 2 (c) and as a result these options would be unlikely to best promote competition in downstream markets to the benefit of consumers.

7.364 Options that avoid **inefficiently unsold lots and strategic demand reduction** are likely to see more rights of use assigned to the most efficient users and

consequentially more likely to promote competition downstream to the benefit of consumers because:

- a) auctions that are exposed to these risks could lead to less competitive downstream markets, as having less capacity may increase marginal costs and reduce incentives to compete for customers and offer new services that boost traffic;
- b) reductions in the marginal costs⁶⁰⁶ of capacity **through holding more spectrum** should promote competition downstream to the benefit consumers because additional spectrum rights of use should reduce network costs and allow operators to compete for and retain customers through changes in experienced quality of service and speeds; and
- c) there are stronger incentives to compete for customers and offer new and/or improved services if the incremental cost of doing so is reduced and also allows winning bidders to earn a return on the investment in spectrum⁶⁰⁷.

7.365 In that regard, ComReg notes that Option 4 best protects against strategic demand reduction and inefficiently unsold lots and this option would best promote competition in downstream markets to the benefit of consumers.

7.366 Options that avoid **substitution risks** are more likely to promote competition downstream to the benefit of consumers because:

- a) to the extent bidders would have won more spectrum the same benefits listed in Paragraph 7.364 apply; and
- b) to the extent bidders would be assigned different (and potentially) less right rights of use with a higher surplus, this surplus is a substitute to additional network expenditure or alternative spectrum in other bands.

7.367 In that regard, ComReg notes that Option 3 and 4 best protects against substitution risks and allows for price differences across packages to reflect complementarity between lots and opportunity costs, so both winners and losers should be happy if their bids reflect their valuations.⁶⁰⁸

⁶⁰⁶ Efficient operators incur a fixed cost of holding more spectrum that reduces the variable cost of adding more network infrastructure to serve incremental traffic.

⁶⁰⁷ Any such increase in competitive intensity is a social benefit and also reflects the valuation of bidders (as these may also reflect the benefit of winning spectrum rather than it going to a rival).

⁶⁰⁸ DotEcon notes that efficiency requires that the lots available are assigned in line with relative valuations, so that at final prices each bidder prefers the lots it has won to those won by others.

7.368 Options that reduce or remove **bidder information deficits and excessive complexity** are more likely to promote competition downstream because the reduction or removal of bidder information deficits and unnecessary complexity promotes efficient outcomes by providing more accurate information to bidders. In that regard (and in relation to all risks):

- a) if an auction fails to deliver an efficient outcome this would likely result in a negative impact on downstream competition and ultimately to consumers;
- b) the inefficient assignment of spectrum rights of use could lead to reduced competition and, consequently, lower quality services being offered by less efficient operators and higher prices from more efficient operators offering improved services; and
- c) there is a risk that applicants seeking to provide a differentiated range of services to consumers may be awarded less spectrum than would be efficient, or even none at all, while less efficient operators are awarded spectrum.

7.369 Options that reduce or remove **gaming risks** are more likely to promote competition downstream because these options:

- a) are likely to best prevent gaming strategies aim at precluding entry in downstream markets;
- b) reduces the risks of certain operators consolidating or strengthening existing positions at the expense of smaller operators (i.e. creation of an effective duopoly); and
- c) reduces the risk of sterilisation strategies resulting in rights of use that could be used to provide services, remaining fallow.

7.370 In light of above and ComReg's previous consideration of the extent to which each option is subject to each of the Award Risks, ComReg is of the view that Option 4 would best promote competition in downstream markets to the benefit of consumers.

7.371 In relation to smaller bidders and New Entrants, ComReg notes that these options all provide appropriate flexibility for smaller bidders to submit bids for packages of interest. However, Option 4 provides better incentives for bidders to compete for additional spectrum and is more likely to support outcomes that allow such bidders to be assigned rights of use. It better provides for a range of outcomes and differentiated services depending on the spectrum assigned to individual bidders, potentially increasing the choice for consumers while also

allowing for mobile operators to complement their existing spectrum holdings, while improving existing and future services to consumers.

- 7.372 In particular, ComReg notes DotEcon's view that the CCA is an '*entrant friendly*'⁶⁰⁹ award format, that helps to support entry and/or participation by smaller bidders providing scope for such players to fit in with the demands of the incumbents but also ensuring (through package bidding) that any spectrum portfolio acquired would be sufficient for its needs. In that regard, DotEcon observed that the Irish 3.6 GHz award (completed in 2017 using a CCA) has already demonstrated that bidders other than the MNOs (in that instance Imagine and Airspan) can be successful in spectrum awards in Ireland without any need for preferential treatment (e.g. spectrum reservations etc)⁶¹⁰. DotEcon observes that this can have positive consequences for the auction and/or the downstream market.⁶¹¹
- 7.373 Finally, a key objective is set out in Regulation 19 of the Authorisation Regulations that requires that spectrum fees must reflect the need to ensure the optimal use of the radio spectrum and must also be objectively justified, transparent, non-discriminatory and proportionate.
- 7.374 In that regard, ComReg notes that while prices set on the basis of the second price rule can help to establish the efficient assignment of spectrum amongst bidders, based on bidders' willingness to pay, they also establish the opportunity costs of the assignment. Setting suitable spectrum fees at this level that represents market value and encourages the winning bidder(s) to utilise the spectrum more efficiently.
- 7.375 The opportunity cost of assigning the spectrum to winning bidders reflects the need to ensure the optimal use of the radio frequency spectrum.(i.e. the value of the spectrum to the "losing" bidders who could have been assigned the spectrum instead.). In this way, minimum revenue core (MRC) pricing is the theoretical benchmark for the revenue that an efficient competitive process needs to raise, as this is the least amount that winners need to pay so that other bidders would not want to make a higher alternative bid and in this way reflects the need to ensure the optimal use of the radio spectrum.
- 7.376 Therefore, ComReg is of the view that Option 4 best promotes downstream competition to the benefit of consumers.

⁶⁰⁹ Document 19/124a, p22.

⁶¹⁰ Document 19/124, p22.

⁶¹¹ Document 19/124a, p39.

7.7 Preferred option – Assignment Process RIA (Step 5)

7.377 This assessment has considered the impact of the various options from the perspective of industry stakeholders, as well as the impact on competition and consumers, and should aid stakeholders' understanding of the relative merits of the alternative assignment formats.

7.378 ComReg notes that it does not *a priori* favour any specific approach for assigning spectrum rights of use and therefore considers each award on its merits. There are different auctions formats available and the most appropriate format for a particular award will, of course, be the one which best addresses the specific facts and circumstances that apply to the spectrum bands available for assignment.

7.379 In assigning rights of use, and where an auction is considered appropriate, ComReg determines which auction format would best meet its statutory objectives and duties and, in particular, ensures the efficient use and effective management of the radio spectrum.⁶¹² This necessarily involves a complex evaluative judgement of different options across different planes, using a range of different criteria.

7.380 All auction formats provide bidders with the opportunity to make bids for spectrum rights of use. However, the ability of bidders to make bids that accurately reflect the value they have for spectrum rights of use (at a given price) is central to providing an efficient assignment and ensuring that the winning assignment can be used efficiently to support downstream services. As noted above, there are many reasons why such bids may not be collected as part of the auction process. For example, bidders may:

- a) be unwilling to submit such bids where the incentives to do so are reduced (aggregation risk and/or strategic demand reduction) or distorted (gaming strategies);
- b) be unable to do so because the auction design restricts their ability to make such bids at a particular time or obtain lots that are inefficiently unsold (substitution risk and/or inefficiently unsold lots); and / or
- c) make incorrect/efficiency reducing bids because of bidder error or bids which were made based on poor information provided by the auction or lack of understanding (bidder information deficits/complexity).

7.381 All auction formats have various advantages and disadvantages associated with their use. Such auction formats would each be capable of providing for the

⁶¹² In that regard, since 2012 MBSA, ComReg has had four spectrum awards with three different preferred award formats.

efficient use and effective management of particular rights of use under a particular set of circumstances. In order to appropriately assess the extent to which each auction format can best provide for an efficient outcome, ComReg assessed in detail seven Award Risks that are likely to arise in the Proposed Award Process, each of which could compromise the delivery of an efficient award if not appropriately addressed.

7.382 ComReg acknowledges that no auction format fully removes each of these risks entirely. Further, the Award Risks do not exist independently of one another and design features which may mitigate or remove an Award Risk can increase or create other Award Risks. In that regard, the preferred auction format is necessarily the format that best balances these risks in line with the circumstances pertaining to a particular award.

7.383 In the current case, the efficient assignment of multiple substitutable and complementary bands is likely to be of interest to a variety of different users and the efficient assignment of those rights of use is not a straightforward matter. Importantly, how the bands are assigned will be critical to the development of wireless services in Ireland for the next 20 years, affecting, in general terms, not only the attainable levels of efficiency, innovation and quality in these services, but also the competitive position of operators as well as the interests of all end users. ComReg is therefore of the view that it should take a conservative approach in terms of assessing the extent to which Award Risks are likely to be relevant to the Proposed Award.

7.384 ComReg's approach has been to assess the impacts of these risks on stakeholders, competition and consumers and explore the extent to which these risks could materialise under various auction formats, noting that the intensity of these risks (such that they arise) can vary across formats.

7.385 In light of the above and its consideration of matters in Annex 7, ComReg is of the view that Option 4 is its preferred Options because it:

- a) avoids aggregation risks, by allowing bidders to bid for packages of lots, under the guarantee that bidders will only be assigned a combination of lots if they have specifically made a package bid for it;
- b) mitigates substitution risks, including across substitutable aggregations of lots, by allowing bidders:
 - i. to submit multiple, mutually exclusive bids for alternative packages, and selecting winning bids and prices in a way that ensures that bidders prefer their own winning outcome to that of any other bidder given the final prices; and
 - ii. to switch across lot categories in response to price changes

during the open stage, without creating an unacceptable risk of gaming or strategic behaviour that weakens competition or otherwise distorts outcomes;

- c) provides incentives for bidders to compete for additional spectrum and mitigates incentives for bidders to strategically reduce demand, which could result in an inefficient assignment and reduce service provision in downstream markets;
- d) allows for the possibility of non-uniform prices, which might be the only way of supporting an efficient outcome when valuations are based on being assigned complementary rights of use;
- e) is sufficiently transparent and provides opportunities for price discovery, where bidders to pool valuation-relevant information through the bidding process, thereby mitigating concerns about bidder information deficits;
- f) mitigates the risk of inefficiently unsold lots, by allowing bidders to offer, through supplementary bids, to take those lots that would remain unsold at clock prices and to do so fully expressing any complementarity or substitutability those unsold lots might have with other lots; and
- g) mitigates the risk of and destabilises tacit collusion.

7.386 In relation to other award formats, the likely presence of complementarities limits the extent to which uniform price auctions (Option 1 and 2) would result in the efficient assignment and use of the radio spectrum.

7.387 In relation to a CMRA, ComReg notes that this format also allows for package bidding (eliminating aggregation risk) and for bidders to submit multiple mutually exclusive bids for alternative options (mitigating substitution risks). It is also suitable for accounting for the presence of complementarities and the risks of inefficiently unsold lots far more effectively than a SCA or SMRA and are more likely to result in an efficient assignment. For similar reasons, DotEcon shortlisted the CMRA as one of two candidate auction formats.

7.388 However, ComReg notes that there are concerns in relation to incentives for strategic demand reduction and bid shading (incentives that do not exist under a CCA). Further, it is a relatively new format and subject to some complexity concerns. The CMRA may also be challenging for bidders who may want to bid for many alternative packages, as such bidders may need to update a large number of bids in each round. Alternatively, the CCA provides bidders at least three days (Document 20/32) to consider what supplementary bids it would like to make in a single supplementary bids round, but otherwise only requires bidders to identify a single package bid in each clock round.

7.389 As outlined above, Option 5 provides clear distortions to the award process that would favour Three. In particular, it would represent a departure from opportunity cost pricing that would reduce Eir and Vodafone's incentives to compete for third lots and more likely result in Three winning 700 MHz rights of use regardless of whether this is the efficient outcome or not.

7.390 While Option 6 has many of the advantages of Option 4, it creates significant additional complexity and is largely untested. In particular, this additional complexity (two sets of auction rules) could be wholly unnecessary and could proceed in similar way to Option 4 depending on progress during the award.

7.391 In selecting a CCA as its preferred option, ComReg notes the views of DotEcon that the CCA is not a perfect auction format, and that there are some downsides⁶¹³. In that regard, ComReg recognises that there are some disadvantages associated with the format that could compromise an efficient outcome under certain circumstances:

- i. the second-price rule means there can potentially be a large difference between what bidders need to bid for a package and what they will end up paying in cases where there are few bidders, resulting in each bidder facing different intensity of competition from rivals for the lots it wins;
- ii. it may create some bidding complexity for budget constrained bidders in the supplementary bids round; and/or
- iii. it is potentially susceptible to price driving strategies due the second price rule reducing winners prices as far as possible subject to the requirement for winners, and groups of winners, to pay at least opportunity cost.

7.392 **In relation (i)**, concerns had been expressed by some Interested Parties that the CCA lacks transparency and creates a governance challenge for some bidders. ComReg commissioned DotEcon to consider and advise on whether additional information could be provided to bidders in the course of a CCA in terms of the final price a bidder would have to actually pay arising from bids made in the clock rounds ("Exposure Pricing"). Having completed this detailed study, ComReg proposes to introduce this enhancement in order to address and significantly reduce this concern. See Section 1.3 Document 20/32. We note respondent's general agreement that this mechanism should be included as part of this CCA award.

7.393 **In relation to (ii)** the issues regarding bidding complexity in the supplementary

⁶¹³ DotEcon Report Document 20/122a.

bids round only arises for certain bidders, typically those that are budget constrained, and only under certain circumstances, that is when there are unassigned lots of a certain value at end of primary bids round. Even if such circumstances arise, such bidders can still bid up to their budget for larger packages. Both the Exposure Pricing mechanism and relaxed activity rules will assist in identifying relevant packages. Most importantly, the issue of budget constraints could also occur in other formats such as a SMRA or a SCA. In all these formats, a budget constrained bidder will need to assess what it can reasonably expect to win within its available budget and tailor its bidding strategy accordingly.

- 7.394 Only a CMRA (Option 4) and Option 6 (Iterative CCA) would remove these risks sufficiently for budget constrained bidders. However, this would come at the not inconsiderable cost of increasing the risks of strategic demand reduction, bid shading and complexity which would be more likely to arise and affects **all bidders** (including budget constrained bidders). Such an approach would unlikely be proportionate or consistent with ComReg's objectives.
- 7.395 **In relation to (iii)**, ComReg is of the view that price driving is a risky approach for bidders to take particularly in an important spectrum award were such an approach could compromise their ability to be assigned their preferred rights of use over the duration of the licence and instead being assigned other rights of use at a higher price. Further, price driving that may be viewed as low risk for bidders would only result in prices that would be no higher than would normally occur under a SMRA or Simple Clock Auction.
- 7.396 Therefore, ComReg is satisfied that even if these concerns arose during the Proposed Award, the impact on the development of wireless services in Ireland would be relatively marginal and below (significantly in some cases) the impacts arising from alternatives Options assessed in this RIA.
- 7.397 For the reasons set out above and outlined across this RIA more generally (and including ComReg's assessment of various issues in Annex 7), ComReg's preferred option under the Auction Format RIA is to assign the relevant spectrum rights using a CCA (in accordance with Option 4).

7.8 Auction Format – assessment of Preferred Option against ComReg's other relevant statutory functions, objectives and duties

7.8.1 Introduction and context

- 7.398 The preceding Auction Format RIA considered a number of auction options potentially available to ComReg within the context of the RIA analytical

framework as set out in the ComReg's RIA Guidelines (i.e. impact on industry stakeholders, impact on competition and impact on consumers). It necessarily also involved a complex evaluative analysis of the extent to which various auction options would serve to facilitate ComReg in achieving certain statutory objectives in the exercise of its functions. In particular, it involved an analysis of the extent to which the various auction options would serve to promote competition and ensure that there would be no distortion or restriction of competition in the electronic communications sector, whilst at the same time promoting innovation and encouraging the efficient use and ensuring the effective management of the radio frequency spectrum. This would in turn enable ComReg to ensure that users would derive maximum benefit in terms of choice, price and quality. The Auction Format RIA concluded that Option 4 is, on balance, the Preferred Option in terms of its impact on stakeholders, competition and consumers.

7.399 In this section, ComReg now assesses whether the Preferred Option also complies with the other statutory functions, objectives and duties of particular relevance to its management of Ireland's radio frequency spectrum (as summarised in Annex 2 of this document). In doing so, ComReg also sets out its consideration of any responses received from interested parties of relevance to the above assessment.

7.400 By way of context and of relevance to the scope of the assessment set out below, ComReg would also first highlight the following points:

- this section will focus upon the combination of the Proposed Spectrum Competition Caps (the Proposed Sub-1 GHz Cap in particular) and proposed CCA Auction Format with opportunity cost pricing, noting Three's concerns regarding the pricing effects of this combination (and in particular with respect to the principles of non-discrimination and proportionality) as outlined below;
- this section does not re-assess each constituent aspect of the Preferred Option (e.g. Proposed Spectrum Competition Caps, Auction Format) given the extensive analysis of each aspect set out in the relevant sections of this document. However, ComReg draws from or refers to these considerations as may be relevant to the present discussion on the Preferred Option; and
- this section does not reiterate detailed considerations from the Auction Format RIA, noting however, that ComReg may draw from or refer to these considerations as may be relevant to the present discussion on the Preferred Option.

7.8.2 Structure of this section

7.401 In its responses to various consultations, Three has raised a number of issues suggesting that the design of the Proposed Award does not comply with ComReg's statutory functions, objectives and duties. Accordingly, the remainder of this section is structured as follows:

- Summary of views of respondents;
- ComReg's assessment of Three's views which, for ease of reference, are grouped under the following headings:
 - Competition;
 - Efficiency;
 - Impact on Eir / smaller bidders;
 - RIA, objective justification and consultation;
 - Principle of non-discrimination;
 - Principle of proportionality; and
 - Article 106(1) TFEU, State aid and similar matters.
- ComReg's assessment of those other relevant statutory functions, objectives and duties not already addressed above, as follows:
 - contributing to the development of the internal market;
 - to promote the interest of users within the Community;
 - efficient use and effective management of spectrum;
 - regulatory principles; and
 - relevant Policy Directions and Policy Statements.

7.8.3 Summary of Three's views since the publication of Document 19/124 relating to the Preferred Option⁶¹⁴

7.402 In a number of its submissions, Three has argued that the Preferred Option⁶¹⁵

⁶¹⁴ Noting that prior submissions were already addressed in Document 19/124 and so it is unnecessary to address them again here unless they were raised again since Document 19/124.

⁶¹⁵ i.e. the CCA auction format with opportunity cost pricing, together with the Proposed Sub-1 GHz Cap (of 2 x 35 MHz of sub-1GHz spectrum, taking into account existing holdings in the 800 MHz and 900 MHz band).

breaches ComReg's statutory obligations concerning the principles of non-discrimination and proportionality (and in the context of ComReg's obligations in relation to spectrum fees in particular).

Summary of Three's claims in relation to non-discrimination

7.403 Three uses the terms discrimination / bias / unfairness interchangeably in its various submissions. However, it is clear that ultimately Three's concerns centre on ComReg's statutory obligations around the principle of non-discrimination. It is not, for example seriously suggested that, as a public authority, ComReg has a specific animus, or bias, against, Three. Three's arguments in this respect have moved over time but its current position appears to broadly be that:

- a) it no longer objects to the sub-1 GHz cap⁶¹⁶ or the obligation for it to pay an opportunity cost determined by other bidder valuations⁶¹⁷;
- b) rather, it is the combination of a CCA with the proposed sub-1 GHz spectrum cap "*directly discriminates*" against Three because, in its view, Three could end up paying significantly more – up to [✕ ██████████ ✕] than its two competitors for the same thing⁶¹⁸;
- c) this difference is caused not by any difference in the positions of the three MNOs before the auction or due to valuation differences but because of the structure of the award itself. This is because Three will be restricted in its ability to express opportunity cost relative to its competitor MNOs.⁶¹⁹

⁶¹⁶ Page 2 of Three's response to Document 20/78 where Three states:

"We also reiterate that Three has not objected to ComReg's Proposed Spectrum Competition Caps on their own, it is the combination of the caps and the CCA auction mechanism which is our main objection."

⁶¹⁷ For example, at pages 2 and 7 of its submission to Document 20/56, Three states: *"It should be noted that it is not specifically the use of a CCA auction on its own or the use of spectrum caps on their own that causes the price discrimination, but the specific combination that ComReg has proposed to use"....."It is this price difference caused by the auction format and rules that Three objects to, and not those derived from different bidder valuations"*.

⁶¹⁸ For example, at page 20 of its response to Document 19/124 Three states:

"1. Uniform prices. Three does not call for uniform prices as an absolute requirement. Even if a CCA was used for this award (which Three regards as incorrect), Three understands that each of the existing MNOs will have different valuations for 1, 2, or 3 lots of sub-1GHz spectrum (and also for different quantities of super-1GHz spectrum). These valuations are derived from current market position, growth plans, network load, and also existing spectrum holdings. The fact that Three currently holds one sub1GHz lot more than Vodafone and Eir might well mean that they each have a higher valuation for an incremental lot driven by a desire to correct or reverse that difference, and this could be expected to be reflected in the opportunity costs. This could be the case with symmetrical caps and (notwithstanding our comments in Section 4 it is not this difference in pricing that is of most concern to Three, but one that is derived from the fact that Three has been restricted in its ability to express opportunity cost relative to its competitor MNOs."

⁶¹⁹ For example, at page 7 of its response to Document 20/56, Three states:

The true opportunity cost will therefore not be determined for the other bidders.⁶²⁰ In its view, this means that there will be a *de facto* reservation of one block of 700 MHz for Vodafone and Eir at reserve price assuming no competition for 700 MHz lots other than from the MNOs. The price difference does not create any assignment efficiency;

- d) it is incorrect to say⁶²¹ that Three is bidding for something different than the other MNOs in the auction because:
- i. the reason Three is currently licensed to use one lot of sub-1 GHz spectrum more than the other two MNOs is as a result of a merger in which spectrum acquired at auction by two entities, O2 and Three, was consolidated. Those parties paid the full auction price for this spectrum at the time. Furthermore, when Three acquired O2, it implicitly had to pay O2's parent company Telefonica full market value for all its spectrum holdings as part of the transaction price. It would therefore be 'double-counting' to apply an additional price premium on Three in this auction over-and-above what Eir and Vodafone pay for any 700 MHz spectrum that they may win⁶²²; and
 - ii. Three is not bidding for something different than the other bidders. ComReg is to award generic lots by way of an auction. Three's valuation for different quantities of those lots might well be different than other bidders for various reasons (including

"In the auction as proposed by ComReg in document 19/124, Three would be limited in its bidding when compared to the two other mobile network operators. This means that Three could not express a value for spectrum it would be willing to buy in the same way as other bidders – in effect some of Three's value which determines pricing for other bidders would be ignored. It is this price difference caused by the auction format and rules that Three objects to, and not those derived from different bidder valuations."

⁶²⁰ For example, at page 20 of its response to Document 19/124 Three states:

Paying opportunity cost. Three is not seeking to have other bidders pay "above their respective opportunity costs", as is claimed by DotEcon. ComReg understands full well that its caps would restrict Three from expressing a value for a third lot of sub1GHz spectrum, while that restriction does not apply to the two other MNOs. This means that the true opportunity cost will not be determined for the other bidders as Three has not been given the opportunity to express its full value." (emphasis added).

⁶²¹ Three references paragraph 108 of Document 19/124a in this regard where DotEcon states:

"In this regard, we reiterate that Three is not starting from the same position as the other bidders. Before the award Three already has access to more spectrum than the other operators; in effect, Three is not bidding for the same thing as the other MNOs (when viewed in the context of overall post-award spectrum holdings) and may also face a different level of competition from its rivals due to differing requirements for incremental spectrum across bidders. Therefore valuations (and prices) are likely to vary across bidders, and there is no particular reason to expect or require that any award process should lead to uniform pricing."

See also paragraph 6.196 of Document 19/124 in which ComReg references this paragraph and paragraph 109 from Document 19/124a.

⁶²² Pages 19 – 20 of Three's response to Document 19/124.

Three's current spectrum licences) and this could well lead to different price outcomes under a CCA. This is not the most significant problem with ComReg's proposed rules. It is not varying competition derived from the varying demand of different bidders that drives the most concerning disadvantage for Three, but the relative restriction on Three that prevents this from being expressed in the bidding. The requirement to provide a non-discriminatory and fair process cannot be side-stepped by stating that Three is somehow in a different position to the other bidders⁶²³;

- e) Three has also suggested that ComReg's proposal has "*built-in...a pricing bias against Eir, albeit less significant than the one against Three*"; and
- f) Three is also of the view that ComReg has not provided any evidence based objective reason for its proposal.

Summary of Three's claims in relation to proportionality

7.404 Three's arguments around proportionality contain relatively limited detail. However, ComReg would summarise the claims made by Three in that regard as follows:

- a) There must be an adequate analysis to demonstrate that ComReg's proposal is proportionate – this, Three claims, has not been done so far;
- b) ComReg's proposals to use a CCA and to set caps which count existing spectrum holdings are likely to have to have a disproportionate and significant negative impact on Three and also in a different way on Eir;
- c) based on its analysis as set out in Annex A to its response to Document 19/124, ComReg's proposal "*..builds-in:*
 - i. *the possibility for Three to win no sub-1GHz spectrum in this award;*
 - ii. *a pricing bias against Three that would see Three exposed to paying significantly higher prices for buying the same thing as its main rivals where this is not created by valuation differences and does not create any assignment efficiency as shown in Annex A, ComReg's current award proposal could leave Three exposed to paying a premium of up to [X ██████████ X] under plausible circumstances;*
 - iii. *the possibility for Eir to win less spectrum than both*

⁶²³ Page 21 of Three's response to Document 19/124.

Vodafone and Three, thereby increasing the asymmetry in sub-1GHz spectrum holdings from that which exists today; and

- iv. *the proposal is also disproportionate because there are other options available (including modifications to ComReg's proposal) that meet ComReg's objectives without causing such harm.*

7.405 ComReg sets out its assessment below of whether the Preferred Option complies with the principles of non-discrimination and proportionality. However, before doing so, it is appropriate to first address a number of matters that Three has raised in connection with these two issues, as ComReg's position on many of these matters necessarily informs its assessment of the Preferred Option against the principles of non-discrimination and proportionality. In that regard, ComReg observes that it has addressed several of these points earlier in this document (e.g. Auction Format RIA, Spectrum Caps) and, where this is the case, ComReg cross-refers to its considerations in the relevant section of this document.

7.406 The issues raised by Three's claims can be grouped under the following broad headings and each matter is addressed in turn below:

Competition (including Three / O2 merger)

- i. ComReg must identify which particular outcomes it has deemed will cause harm;
- ii. The European Commission found that the merger was not harmful to competition and ComReg is of the same view with respect to the current asymmetry in spectrum holdings;
- iii. Under the Commitments, Virgin Media has the option to acquire spectrum rights of use from Three and ComReg has not taken this into account;
- iv. Competition cap - there is no impediment to Three obtaining more spectrum immediately after the award;
- v. There are higher sub-1 GHz caps of 2 × 40 MHz in other Member States;
- vi. There has been no assessment of the effect of the proposal on competition;
- vii. ComReg's proposal (which, Three says, would require Three to pay more) distorts competition;
- viii. ComReg's position contradicts 'equivalent in economic terms' principle;

- ix. ComReg's proposals violate Article 106(1) TFEU⁶²⁴ and the State aid rules;
- x. ComReg must achieve a 'fair market related price' (Code of Practice for Government of State Bodies);

Efficiency

- xi. The combination of CCA and the spectrum cap exposes the award to inefficient allocation outcome;
- xii. The design of the Proposed Award conflicts with the following statement made by ComReg - "This means that each winner (and group of winners) needs to pay at least its opportunity cost, otherwise there would be alternative higher value users and an efficient assignment would not have been achieved";

Impact on Eir / smaller bidders

- xiii. The rules are biased against smaller bidders;
- xiv. There is a chance of Eir winning less than the other MNOs;
- xv. There is a pricing bias against Eir;
- xvi. Caps are unlikely to meet the apparent objective of protecting Eir;
- xvii. It does not appear that ComReg has carefully considered the downsides for Eir and new-entrant bidders;

RIA, objective justification and consultation

- xviii. ComReg has carried out no RIA on its auction format;
- xix. ComReg has not considered the impact of its proposals on Three;
- xx. ComReg is required to take due account of comments from stakeholders; and
- xxi. ComReg has provided no objective justification for its proposals.

7.407 ComReg assesses Three's submissions by reference to the number of each of

⁶²⁴ In particular, Three states:

"By creating an award structure (in such a disproportionate and discriminatory manner despite evidence being supplied) to deliver State assets that clearly benefit one or two operators above another operator (Three) and have the effect of distorting competition in the market, Three believes ComReg is in violation of Article 106(1) TFEU."

the bullet point summaries above.

7.8.4 ComReg's assessment of Three's views – competition, Three/O2 Merger)

Background - General provisions on competition

7.408 There is a certain natural overlap between the aims of the Auction Format RIA and an assessment of ComReg's compliance with some of its statutory obligations. In particular, one of ComReg's core statutory objectives under Section 12 of the 2002 Act is the promotion of competition by, among other things:

- ensuring that users derive maximum benefit in terms of choice, price and quality;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector; and
- encouraging efficient use and ensuring effective management of radio frequencies.

7.409 There are also other various statutory provisions requiring ComReg generally to promote and safeguard competition in the electronic communications sector including:

- Regulation 16(2) of the Framework Regulations which requires ComReg to apply objective, transparent, non-discriminatory and proportionate regulatory principles by safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition;
- Regulation 9(11) of the Authorisation Regulations which requires ComReg to ensure that competition is not distorted by any transfer or accumulation of rights of use for radio frequencies;
- Article 4 of Directive 2002/77/EC (Competition Directive) which requires ComReg to refrain from granting exclusive or special rights of use of radio frequencies for the provision of electronic communications services; and
- General Policy Direction No. 1 on Competition (2 April 2004) which requires ComReg to focus on the promotion of competition as a key objective, including removing barriers to market entry and supporting new entry (both by new players and entry to new sectors by existing players).

ComReg's assessment of Three's views relating to competition

7.410 Bearing in mind the above context, ComReg now assesses Three's submissions relating to competition by reference to the number of each of the bullet point summaries above.

Three's points (i) – (vi) relating to competition

7.411 In relation to **points (i) - (v)** (regarding (i) identifying which particular outcomes will cause harm, (ii) EC merger decision/current spectrum asymmetry, (iii) Spectrum Option under Commitments, (iv) no impediment to acquiring spectrum following proposed award, and (v) higher sub-1 GHz caps in other Member States)), ComReg has already addressed each of these points in the relevant sections of Chapter 6 (Spectrum Competition Caps), and does not therefore propose to consider them further here.

Three's point (vi) regarding no assessment of the effects of ComReg's proposal on competition

7.412 In relation to **point (vi)** (regarding Three's claim that ComReg has not conducted an assessment of the effect of the proposal on competition), this is simply incorrect. ComReg has clearly discussed in detail the impact of (what is now) the Preferred Option on competition in previous consultation documents (for example, Section 6.5 of Document 19/124). Furthermore, in relation to the current document, ComReg would refer to the detailed discussion on the need for spectrum competition caps in Chapter 6, the detailed discussions around the impact of the Preferred Option on competition in various RIAs and, in particular, the Auction Format RIA above, and its consideration of the views expressed by its expert economic advisors, DotEcon, throughout this document. Accordingly, ComReg does not consider that this is a valid concern that ComReg has not addressed its mind to this issue.

Three's point (vii) regarding it paying more than Vodafone and Eir would distort competition

7.413 In relation to **point (vii)**, ComReg does not accept that the Preferred Option (which, in Three's view, would require Three to pay more than Vodafone and Eir) would result in a distortion to competition for the reasons outlined below. Indeed, ComReg's position is that, in the absence of the Preferred Option and Proposed Spectrum Competition Caps, competition could potentially be distorted. In other words, Preferred Option and Proposed Spectrum Competition Caps are necessary and proportionate to avoid potential distortions of competition.

7.414 First, as Three recognises, it is not necessary for an auction result to deliver uniform prices in all cases and, accordingly, a mere difference in treatment – which ComReg does not accept is the case – would not suffice for a distortion in

competition to arise.

7.415 Second, there is no relevant difference in treatment, since the Preferred Option would apply to all participants in the award without distinction, including that Three would be required to pay market-based opportunity cost, nothing more, as would other bidders. In that regard, ComReg notes and agrees with DotEcon's observation that⁶²⁵:

“Three’s main complaint is not about the design of the competition caps, or the use of a CCA (although it asserts the need to facilitate switching, the complementarities across bands, and the need for time slicing have been overstated), but the interaction of the two. Specifically, Three suggests that use of the MRC pricing rule in the context of the competition caps, means that Vodafone and Eir will pay too little as Three would not be able to express a value for a third lot of 700 MHz spectrum in its bids which would therefore not be reflected in the opportunity cost that determines the prices paid by Eir and/or Vodafone. In our view it is not reasonable to describe this as Three overpaying for spectrum, as its price will be set by the same method and will reflect the opportunity cost of its own winning bid.” (emphasis added).

7.416 Third, the *de facto* reservation of one block of 700 MHz Duplex at reserve price that Three claims would be afforded to Vodafone and Eir under the Proposed Sub-1 GHz Cap (but not Three because of its additional 900 MHz block) would only arise if there are no other bidders for 700 MHz Duplex lots, which is obviously unknown in advance of the Proposed Award. Moreover, and as DotEcon observed in its report accompanying Document 19/124⁶²⁶, and which ComReg agrees with:

- a) if there is no interest for the 700 MHz lots other than from the MNOs, then all three MNOs would be faced with the prospect of ending the auction with five, six or seven sub-1 GHz lots; and
- b) If there is interest from at least one additional bidder, then Three is arguably in a more favourable position than Vodafone and Eir due to its greater existing holdings, i.e. its additional block of 900 MHz spectrum⁶²⁷; in that case it would be guaranteed five sub-1 GHz lots at the end of the auction, while the other two would only be guaranteed four.

7.417 Fourth, ComReg recognises that Three may wish to acquire a third block of 700

⁶²⁵ DotEcon report (Document 20/122a) at page 98-99.

⁶²⁶ See page 26 of Document 19/124a and paragraph 6.196 of Document 19/124.

⁶²⁷ Noting Three’s proposal to contingently return a 2 × 5 MHz block of 900 MHz spectrum as considered earlier in this chapter.

MHz Duplex. However, for the reasons set out in Chapter 6, ComReg has settled on a Sub-1 GHz Cap of 70 MHz in order to prevent potentially extreme asymmetric sub-1 GHz spectrum outcomes arising from the Proposed Award that may distort downstream retail competition for mobile telecommunications services and, in this regard, Three acquiring a third block of 700 MHz would result in it exceeding the sub-1 GHz Cap of 70 MHz⁶²⁸.

7.418 Fifth, ComReg further recognises that Three nevertheless wishes for its valuation for a third block of 700 MHz Duplex to be reflected in the opportunity cost that determines the prices that may be paid by Vodafone and/or Eir for 700 MHz Duplex lots (so as to minimise any relative price differences between Three and Vodafone/Eir). However, any valuation Three may have for a third block of 700 MHz Duplex is not a “relevant” or otherwise valid opportunity cost in the price determination process for the Preferred Option because it is premised on Three being able to acquire a third block of 700 MHz Duplex – which, again, would not be permitted under the Proposed Sub-1 GHz Cap.⁶²⁹ In that regard, ComReg also notes and agrees with DotEcon’s observation that:⁶³⁰

“Absent this cap, Three’s bids might reflect expected anticompetitive gains in addition to its genuine value for the spectrum, so ComReg would not be able to ensure Three was expressing only legitimate opportunity cost. On the other hand, Eir and Vodafone may wish to level up with Three by winning a third 700 MHz lot, and an outcome in which they do so may well be consistent with an efficient outcome.”

7.419 Accordingly, it cannot be said that the Preferred Option would distort competition by simply comparing it to what would be a non-viable and therefore non-existent counterfactual (i.e. being able to express a valuation for a bid that would not be permitted under the Proposed Spectrum Competition Caps). ComReg revisits this issue in the context of the principle of non-discrimination.

7.420 Sixth, any price difference that might result arises from Three’s additional block of 900 MHz under the Proposed Sub-1 GHz Cap, the latter of which ComReg considers an appropriate and justified measure to address its identified competition concerns. ComReg also notes Vodafone’s submission that any asymmetric pricing in this planned award would arise because of the different starting points of the bidders, and outcomes with asymmetric prices have been a feature of previous auctions in Ireland and internationally⁶³¹.

⁶²⁸ i.e. 50 MHz of existing sub-1 GHz rights (compared to 40 MHz of existing sub-1 GHz rights for Vodafone/Eir) and an additional 30 MHz of 700 MHz Duplex if Three acquired 3 blocks of same.

⁶²⁹ See also the section entitled “Asymmetric pricing and competition caps” in Annex 7 of this document.

⁶³⁰ DotEcon report (Document 20/122a) at page 100.

⁶³¹ Page 4 of Vodafone’s response to Document 20/56.

7.421 Finally, ComReg finds Three's arguments difficult to reconcile in the context of its competition objectives where:

- a) Three has the largest existing spectrum holdings among all the MNOs (and particularly its additional block of sub-1 GHz spectrum compared to Vodafone and Eir);
- b) Three is expressing concerns about not being able to reduce its own prices relative to undertakings with smaller existing sub-1 GHz spectrum holdings (or increase the prices paid by undertakings with smaller existing sub-1 GHz spectrum holdings); and
- c) Three's concerns are premised on its belief that it should be permitted to impose its "opportunity cost" for a third block of 700 MHz Duplex notwithstanding that it acquiring same could result in a potentially extreme asymmetric sub-1 GHz spectrum outcome which would be precluded under an appropriate and proportionate measure to address competition concerns (i.e. the sub-1 GHz Cap of 70 MHz)⁶³².

Three's point (vii) – (x) regarding Article 106(1) TFEU and State aid, Code of Practice for Government etc

7.422 **In relation to points (viii) – (x)** (regarding Article 106(1) TFEU and State aid, Code of Practice for Government of State Bodies, and 'equivalent in economic terms' principle), ComReg considers these matters further below following its consideration of the principles of non-discrimination and proportionality.

ComReg's assessment of Three's views relating to competition - conclusions

7.423 In light of ComReg's considerations regarding its Proposed Spectrum Competition Caps, the Auction Format RIA, and its assessment of the views of interested parties above (and elsewhere in this section as may be relevant to competition), ComReg is satisfied that the Preferred Option complies with its statutory obligations in relation to competition.

⁶³² And recalling again that, under the Proposed Sub-1 GHz Cap:

- If there is no interest for the 700 MHz Duplex lots other than from the MNOs, then all three MNOs would be faced with the prospect of ending the auction with five, six or seven sub-1 GHz lots; and
- If there is interest from at least one additional bidder for 700 MHz Duplex lots, then Three is arguably in a more favourable position than Vodafone and Eir due to its greater existing holdings, i.e. its additional block of 900 MHz spectrum; in that case it would be guaranteed five sub-1 GHz lots at the end of the auction, while Vodafone and Eir would only be guaranteed four

7.8.5 ComReg's assessment of Three's views - efficiency

7.424 In relation to **point (xi)** raised (regarding Three's claim of an inefficient allocation outcome), ComReg refers to the detailed considerations in the Auction Format RIA above where, having considered Three's claims and all other information before it, it identified the Preferred Option as being, on balance, the best option for addressing the identified Award Risks and, thereby, promoting an efficient outcome to the Award.

7.425 In addition, ComReg notes and agrees with DotEcon's view that⁶³³:

"When bidding for three blocks, Three might expect some anti-competitive gains arising from gaining some potential downstream market power, as the current three-player market would fragment, with a higher-quality/lower-cost duopoly and a differentiated weaker player limited by its much smaller holding of spectrum. If Three was allowed to bid for three blocks of 700 MHz, then its valuation may contain some anticipation of gaining excess profits through weaker downstream competition. Allocating spectrum to Three based on a valuation inflated by anti-competitive rents would not be efficient." (emphasis added).

7.426 In relation to **point (xii)** (regarding the text cited by Three regarding opportunity cost), ComReg is satisfied that there is no contradiction between the ComReg statement quoted by Three and the design of the Proposed Award. Under the Preferred Option, the Award is designed to ensure that all participants are required to pay at least their opportunity cost. This point is discussed further below in the context of the principle of non-discrimination.

7.8.6 ComReg's assessment of Three's views - impact on Eir / smaller bidders

7.427 In relation to points **(xiii) – (xvii)**, ComReg refers to the detailed considerations in the Auction Format RIA, including those highlighted above in the context of competition.⁶³⁴ ComReg addresses these points further in Annex 7 ('Assessment of Submissions'). ComReg does not find Three's arguments to be persuasive in this regard. Accordingly, ComReg does not consider these issues further.

⁶³³ DotEcon Report, Document 20/122a, p53.

⁶³⁴ In addition, and as ComReg noted in Chapter 6, Eir submits:

- "[it] has considered the arguments and has no objections to the proposed 70MHz sub 1GHz cap" (page 11 of Eir's response to Document 19/124); and
- "Irrespective of the merits of Three's case there is no justification whatsoever for prohibiting two bidders from winning all of the available 700 MHz spectrum (subject to the already proposed sub-1 GHz cap)." (page 13 of Eir's response to Document 20/56).

7.8.7 ComReg's assessment of Three's views – RIA, consideration of impact upon Three, taking due account of views of interested parties and objective justification

7.428 In relation to **point (xviii) – (xx)**, ComReg refers to the Auction Format RIA above. Furthermore, it is readily apparent that ComReg and its expert advisers have carefully considered the views of interested parties throughout this consultation process, including as detailed in this document.

7.429 In relation to **point (xxi)** (regarding objective justification), ComReg does not agree and refers to the extensive consultation process conducted to-date, the extensive analysis conducted by ComReg and its expert advisers, including the views of interested parties and ComReg's (and its expert advisers') consideration of this and other material.

7.8.8 ComReg's assessment – principle of non-discrimination

7.430 When granting rights of use for radio frequencies, ComReg must do so on the basis of selection criteria, selection procedures and spectrum fees which comply with, amongst other things, the principle of non-discrimination.

Principle of non-discrimination - Three's claim that it is incorrect [for ComReg] to say that Three is bidding for something different than the other MNOs in the auction

7.431 By way of background, at paragraph 6.198 of Document 19/124, ComReg stated that it considered DotEcon's assessment of Three's (and NERA's) concerns of asymmetric pricing arising from the combination of the Proposed Spectrum Competition Caps and proposed CCA format (as raised in Three's response to Document 19/59R) particularly convincing, including⁶³⁵:

'105. Three and NERA (on behalf of Three) are also incorrect to suggest that the asymmetric prices arising from the combination of the caps and the CCA are discriminatory. Three's argument for equal prices is in effect a claim that other bidders with smaller existing spectrum holdings should pay more - above their respective opportunity costs - simply because Three's greater existing holdings of spectrum limit the extent to which Three can compete for additional spectrum. If two bidders within a CCA are in the same situation, winning the same packages and facing the same competition from rival bidders, they will pay the same winning prices. However, if bidders win different packages, or face different levels of competition from rivals, they may have different winning prices.'

⁶³⁵ See section entitled 'Asymmetric Prices are not discriminatory', at pages 25-26 of Document 19/124a.

This is not discriminatory as they are in objectively different situations.

...

108. In this regard, we reiterate that Three is not starting from the same position as the other bidders. Before the award Three already has access to more spectrum than the other operators; in effect, Three is not bidding for the same thing as the other MNOs (when viewed in the context of overall post-award spectrum holdings) and may also face a different level of competition from its rivals due to differing requirements for incremental spectrum across bidders. Therefore valuations (and prices) are likely to vary across bidders, and there is no particular reason to expect or require that any award process should lead to uniform pricing.

109. Regarding the sub-1 GHz cap, if we take the total sub-1 GHz holdings of the MNOs into account (using Three's terminology where one block is 2x5 MHz), Three would start the award with 5 blocks, and Vodafone and Eir would have 4 blocks each. In effect, Three bidding for two 700 MHz lots in the award is equivalent in result to one of the other MNOs bidding for three lots (as in both cases it would take the bidder to seven sub-1 GHz blocks in total). Three winning a second 700 MHz lot (and a seventh sub-1 GHz block) can be essentially viewed as similar in effect to Vodafone/Eir winning a third 700 MHz lot; given this, it is not unreasonable that Three should pay the opportunity cost associated with denying another MNO a seventh sub-1 GHz block. Conversely, if Vodafone were to win a third 700 MHz lot, the opportunity cost it would be required to pay (absent other bidders) would be set by the implied value of a seventh sub-1 GHz block to Three or Eir (i.e. based on Three's bid for two 700 MHz lots or Eir's bid for three 700 MHz lots). When taken in the context of overall sub-1 GHz holdings, any asymmetry in pricing which results is not a result of discriminatory treatment of Three. Because Three is clearly not in a comparable position with other MNOs in terms of sub-1 GHz holdings, other MNOs with less spectrum than Three to start with might have a greater appetite for spectrum in order to catch up with Three and/or to simply meet a growing need for spectrum; in this case Three will naturally face more competitive pressure and higher prices if it wants to increase its own holdings." (emphasis added)

7.432 In its response to Document 19/124, Three submits that it does not agree with DotEcon's view because:

- i. The reason Three is currently licensed to use one lot of sub-1GHz spectrum more than the other two MNOs is as a result of a merger in which spectrum acquired at auction by two entities, O2 and Three, was

consolidated. Those parties paid the full auction price for this spectrum at the time. Furthermore, when Three acquired O2, it implicitly had to pay O2's parent company Telefonica full market value for all its spectrum holdings as part of the transaction price. It would therefore be double-counting to apply an additional price premium on Three in this auction over-and-above what Eir and Vodafone pay for any 700 MHz spectrum that they may win⁶³⁶; and

- ii. Three is not bidding for something different than the other bidders. ComReg is to award generic lots by way of an auction. Three's valuation for different quantities of those lots might well be different than other bidders for various reasons (including Three's current spectrum licences) and this could well lead to different price outcomes under a CCA. This is not the most significant problem with ComReg's proposed rules. It is not varying competition derived from the varying demand of different bidders that drives the most concerning disadvantage for Three, but the relative restriction on Three that prevents this from being expressed in the bidding. The requirement to provide a non-discriminatory and fair process cannot be side-stepped by stating that Three is somehow in a different position to the other bidders⁶³⁷.

7.433 In relation to the first point raised by Three, ComReg does not consider this to be a valid concern. The price paid by Three in 2014 to Telefonica Ireland's parent company, and whether or not that price constituted full market value, reflects a voluntary decision of the merging parties in that case, and is therefore a matter for Three. That said, ComReg observes that the price concerned a deal which the European Commission found raised risks of a substantial lessening of competition and so the price may not be a valid one for this reason as well. Moreover, ComReg does not have a statutory obligation to take into consideration the historic price paid by Three in that merger in 2014 when determining appropriate fees for rights of use to radio frequency spectrum in an upcoming award in 2020/2021. However, ComReg can confirm that the Preferred Option will not in any way impact upon the fees paid by MNOs for existing rights of use in the sub-1 GHz bands. Furthermore, ComReg would reject the suggestion that it is somehow applying "*an additional price premium*" on Three in this auction over-and-above what Eir and Vodafone pay for any 700 MHz spectrum that they may win. Under the Preferred Option, Three is simply being required to pay market-based opportunity cost for any new rights of use it wishes to acquire, nothing more, as are other participants in the award. Accordingly, ComReg does not view this as a valid concern and does not therefore consider it further.

⁶³⁶ Pages 19 – 20 of Three's response to Document 19/124.

⁶³⁷ Page 21 of Three's response to Document 19/124.

7.434 In relation to second point raised by Three, ComReg does not consider the fact that 700 MHz Duplex lots would be awarded on a frequency-generic basis diminishes DotEcon's reasoning as outlined above. For example, that:

- a) Three would not be starting the award in the same position as other bidders because of its greater existing spectrum holdings (including its additional block of 900 MHz spectrum for the purposes of the Proposed Sub-1 GHz Cap);
- b) in the context of the Proposed Sub-1 GHz Cap, Three bidding for two 700 MHz Duplex lots is equivalent in result to one of the other MNOs bidding for three such lots (as in both cases it would take the bidder to seven sub-1 GHz blocks in total);
- c) Three winning a second 700 MHz Duplex lot (and a seventh sub-1 GHz block) can be essentially viewed as similar in effect to Vodafone/Eir winning a third 700 MHz lot; and
- d) given this, it is not unreasonable that Three should pay the opportunity cost associated with denying another MNO a seventh sub-1 GHz block.

7.435 ComReg addresses the remaining point regarding the “*relative restriction on Three*” (which arises because of its additional block of 900 MHz and the effect of same under the Proposed Sub-1 GHz cap) below.

Principle of non-discrimination - no adverse effect

7.436 ComReg refers to Three's claims in this regard as summarised earlier in this section.

7.437 ComReg does not accept that there is any adverse effect on Three within the meaning of this principle.

7.438 First, Three would be required to pay market-based opportunity cost, nothing more, as are other operators.⁶³⁸ Any price difference that might result, arises from Three's greater existing spectrum holdings, and its additional block of 900 MHz in particular⁶³⁹ or differential conditions of competition arising due to bidders

⁶³⁸ ComReg also notes DotEcon's similar observation at page 100 of its report (Document 20/122a) that:

“Both the same competition caps and the same pricing rule apply to all bidders. Any asymmetric effects of this cap are a result of Three's larger existing holdings, and it would be inappropriate to intervene to protect Three from competition and thereby reinforce its existing advantage.”

⁶³⁹ Three recognises this as the basis for any pricing difference. For example, at page 10 of its response to Document 20/56, it states:

“Vodafone and Eir's advantage relative to Three under Option 1 arises because, going into the auction, Three has 2x25MHz of sub-1 GHz spectrum, including 2x15 MHz in the 900 MHz band, whereas Vodafone and Eir each have 2x20 MHz, including 2x10 MHz at 900 MHz.”

facing differing levels of competition from rival bidders (which may arise when there are few bidders).

- 7.439 Second, the *de facto* reservation of one block of 700 MHz Duplex at reserve price that Three claims would be afforded to Vodafone and Eir under the Proposed Sub-1 GHz (but not Three because of its additional 900 MHz block) assumes there are no other bidders for 700 MHz Duplex lots, which is obviously unknown in advance of the Proposed Award.
- 7.440 Furthermore, Three's suggestion that other operators are not paying "true" opportunity cost is not well-founded.
- 7.441 First, for the reasons outlined by ComReg above in the context of point (vii) (i.e. Three's claim that paying more than Vodafone and Eir would distort competition), any valuation Three may have for a third block of 700 MHz Duplex is not a "relevant" or otherwise valid opportunity cost *in the context of Preferred Option* because it is premised on Three being able to acquire a third block of 700 MHz Duplex – which, again, would not be permitted under the Proposed Sub-1 GHz Cap.
- 7.442 Second, and looking at it another way, the upshot of Three's arguments is that if Vodafone and Eir won 700 MHz Duplex rights on the basis of their respective permissible⁶⁴⁰ bids under the Proposed Sub-1 GHz Cap, they would each be required to pay an additional amount (i.e. based on Three's valuation for a third block of 700 MHz Duplex spectrum) to deny Three a third block which it was not entitled to obtain in the first place (again as a consequence of it having an additional 900 MHz block under the Proposed Sub-1 GHz Cap). Furthermore, it is difficult to conceive how the imposition of any such additional costs on Vodafone and Eir (or any other bidder) in these circumstances would be reasonable or objectively justified (including as to how any such additional costs would better ensure the optimal use of the radio frequencies won by those bidders).
- 7.443 Furthermore, and as considered elsewhere in this document (e.g. in Chapter 6, the above Auction Format RIA and Annex 7) and in the DotEcon Report (see, in particular, Section 5.3.4), various proposals put forward by Three to address its stated concerns of "discriminatory pricing" would likely discriminate against other

⁶⁴⁰ ComReg again notes DotEcon's observation at page 99 of its report that:

"Absent this cap, Three's bids might reflect expected anticompetitive gains in addition to its genuine value for the spectrum, so ComReg would not be able to ensure Three was expressing only legitimate opportunity cost. On the other hand, Eir and Vodafone may wish to level up with Three by winning a third 700 MHz lot, and an outcome in which they do so may well be consistent with an efficient outcome."

potential bidders, and Vodafone and Eir in particular.⁶⁴¹

Option 5(a) (i.e. CCA with joint cap of 2 × 25 MHz in 700 MHz Duplex on any two winners for both winner and price determination)

7.444 First, and as discussed in detail in Chapter 6, this proposal would, *inter alia*, treat different situations the same by providing Three “an equivalent concession” (in Three’s words) of a reservation of one block of 700 MHz Duplex - as Three claims would be afforded Vodafone and Eir under the Preferred Option - but where Three is clearly in a different factual situation to Vodafone and Eir because of its additional block of sub-1 GHz spectrum. ComReg also notes Eir’s and Vodafone’s submissions in this regard (see Chapter 6). Furthermore, ComReg notes and agrees with DotEcon’s observations in relation to this proposal by Three that⁶⁴²:

- a) *“...a joint cap is unfair to bidders other than Three, as it gives Three a guarantee about its relative spectrum holding position post award that other bidders do not have. It rules out the case in which Vodafone and Eir each win three blocks of 700 MHz and Three wins nothing. However, this means that Three has a guarantee that it ends up no more than one block behind the MNO with the most sub-1 GHz spectrum (assuming 700 MHz is shared by the existing MNOs).”*
- b) *“Vodafone and Eir do not have this guarantee, as they can finish with 5 blocks in total, two behind.”*
- c) *“...there is no reason why just one outcome out of the three potential outcomes with an asymmetry of two blocks should be excluded. This treats the three MNOs unequally and cannot be justified on grounds of protecting downstream competition. Outcomes with a given level of asymmetry should be either all included or else all excluded; it is logically inconsistent to exclude just some of them.”*

Option 5(b) (i.e. CCA with joint cap of 2 × 25 MHz in 700 MHz Duplex on any two winners but for price determination only)

7.445 Second, and in addition to ComReg’s consideration of this option in the Award Format RIA above, ComReg observes that this option would treat different

⁶⁴¹ For example, at page 61 of its report, DotEcon states:

“Three proposes a number of amendments to the auction rules to reduce this perceived problem with relative prices. These are two versions of a joint cap and a limitation on what Vodafone and Eir can bid for a third 700 MHz lot. All of these proposals reduce the ability of Vodafone and Eir to compete for a third lot of 700 MHz and bias towards outcomes in which Three retains a greater amount of sub-1 GHz spectrum than the other MNOs.”

⁶⁴² Pages 62 - 64 of the DotEcon Report.

situations the same by seeking to provide Three a price discount⁶⁴³ - as Three reiterates would be afforded Eir and Vodafone under ComReg's proposals – but where Three, again, is clearly in a different factual situation to these operators because of its additional block of sub-1 GHz spectrum.

7.446 In that regard, ComReg notes and agrees with DotEcon's analysis that this option, which creates the possibility of a situation in which Three wins two lots of 700 MHz Duplex spectrum - but the price it pays is *less* than the amount that Eir and Vodafone are in total prepared to pay for third lots of 700 MHz Duplex spectrum - may lead to “*various perverse incentives*” including⁶⁴⁴:

- a) *“First, Eir and Vodafone would have cause to complain that Three is being allocated two lots, but they had already offered more for these lots through their three block bids than Three was now paying. It is very difficult to see how such a counterintuitive outcome could be justified.*
- b) *Second, Vodafone and Eir do not enjoy similar opportunities to win two lots and pay less than others have bid for them. Therefore, the MNOs are not being treated equally.*
- c) *Third, and potentially of greatest significance, Three will have an incentive to overbid its true valuation for two blocks. This is because of the inconsistency between the criterion for determining winning bids (where the joint cap is not applied) and that for determining the prices that winning bidders will pay (where it is).*
- d) *Fourth, the existence of this overbidding incentive for Three, but not Eir or Vodafone, leads to the possibility that Three could inefficiently win lots when Vodafone and Three in fact value them more. This is clearly contrary to ComReg's objective of efficient allocation. This also tends to handicap Vodafone and Eir in attempting to win more lots. It also unreasonably favours Three if there is any competition from any entrant for 700 MHz lots.*
- e) *Fifth, if Three wins inefficiently because of the inconsistency between how winning bids are determined and how prices are determined, then Three could sell its two blocks – one to Vodafone and one to Three – at*

⁶⁴³ For example, at page 21 of its response to Document 20/56, Three states:

“It is already the case that, under ComReg's rules, Eir's price and Vodafone's prices may not be reflective of true opportunity costs as the cap excludes Three from expressing an opportunity cost reflecting our intrinsic value for a third lot. Under the minimalist intervention, the same concession is afforded to Three. This may mean that Three's price does not fully reflect opportunity cost based on all bids received, but it is fair because any discount available to Three would be consistent to that already available to Eir and Vodafone.” (emphasis added).

⁶⁴⁴ Pages 66-68 of the DotEcon Report.

a profit in the secondary market. Again, this possibly does not arise for Vodafone or Eir.”

7.447 ComReg also notes Eir’s and Vodafone’s concerns in relation to this option.⁶⁴⁵

Option 5(c) (i.e. CCA with a third 700 MHz Duplex lot value cap of no higher than the final clock price for 700 MHz Duplex spectrum)

7.448 Third, and in addition to ComReg’s consideration of this option in the Award Format RIA above, ComReg observes that this option could have significant adverse effects on bidders (other than Three) who could bid for 3 lots of 700 MHz Duplex under the Proposed Sub-1 GHz Cap⁶⁴⁶. In particular, ComReg notes and agrees with DotEcon observations, including⁶⁴⁷:

- a) *“Adding Three’s proposed cap on third block bids would be a remarkably detailed and specific intervention into the auction process and may well be consequential for the outcome of the auction in terms of whether Vodafone and Eir win third blocks.”⁶⁴⁸*
- b) *“The analysis above shows that there are significant adverse effects from Three’s proposed cap on the expressed value for a third 700 MHz lot set by the final clock price for 700 MHz lots:*
 - *If a bidder reaches the end of the clock rounds bidding on three 700 MHz lots because it has a value for a third 700 MHz lot much higher than the final clock price, it would be forced to make a bid for a corresponding package with only two 700 MHz lots at an amount lower by the final clock price for one 700 MHz lot. Therefore, such a bidder would be entirely unable to express its value for retaining a third lot.*
 - *If a bidder reaches the end of the clock rounds bidding on two 700*

⁶⁴⁵ For example, Eir states, at page 13 of its response to Document 20/56 (in relation to Option 5(b)):

“Whilst this option would at first glance appear only to affect the prices to be paid by winning bidders and not the allocation of spectrum, this is incorrect. This proposed change to the pricing rule would mean that Three would not have to pay the full opportunity cost of its winning bid if it were to win 700MHz spectrum in competition with Eir and Vodafone. Three would only have to pay what any fourth bidder for 700MHz spectrum was willing to pay, or the reserve price, for its first lot of 700MHz spectrum. As such, Three would in all likelihood be able to bid significantly above its true value for 700MHz spectrum in order to win that first lot, in the knowledge that it almost certainly would not have to pay the true opportunity cost of its bid. It is easy to see therefore how this could lead to an inefficient outcome in which Three won 700MHz spectrum that should have been won by either Eir or Vodafone.”

⁶⁴⁶ But again, where Three winning a second 700 MHz lot (and a seventh sub-1 GHz block) can be essentially viewed as similar in effect to Vodafone/Eir winning a third 700 MHz lot as identified earlier in this section.

⁶⁴⁷ See pages 67-73 of the DotEcon Report.

⁶⁴⁸ Page 67 of the DotEcon Report.

MHz lots, Three's cap has no effect on adding back a third 700 MHz lot to its final clock package. However, for a bidder who has valuation interactions between 700 MHz and other lot categories, it may not be able to express its true valuations for adding/removing a third 700 MHz lot to packages other than its final clock package. In practice, the most significant problem is likely to be that an entrant with complementarities across lot categories might not be able to express its full value for adding a third 700 MHz to larger packages.”⁶⁴⁹

7.449 ComReg also notes Eir's and Vodafone's concerns in this regard.

7.8.9 Compliance with principle of non-discrimination

7.450 Notwithstanding, to the extent that one accepts that the proposals have an adverse effect on Three (which ComReg does not accept), ComReg reiterates that the proposals clearly apply to all participants in the award without distinction and it is therefore erroneous for Three to suggest (as it has done on a number of occasions) that the proposals 'directly' discriminate against Three.

7.451 In any event, a difference in treatment (were one to exist) does not breach the principle of non-discrimination where it is objectively justified.⁶⁵⁰ In that regard, the Common Regulatory Framework expressly allows the adoption of measures in pursuit of objectives in the general interest when allocating radio frequencies⁶⁵¹.

7.452 Among the fundamental objectives of the Common Regulatory Framework are the promotion of competition (see in particular Article 7(1)(a) of the Authorisation Directive⁶⁵² and Article 8(2) of the Framework Directive⁶⁵³) and the avoidance of distortion of competition in the area of electronic communications networks and services (see in particular Article 5(6) of the Authorisation Directive⁶⁵⁴ and Article 8(2)(b) of the Framework Directive⁶⁵⁵). In this regard, ComReg is expressly required to ensure that competition is not distorted by any accumulation of rights of use of radio frequencies (Article 5(6), second sentence, of the Authorisation

⁶⁴⁹ Page 73 of the DotEcon Report.

⁶⁵⁰ This is a trite principle. See, for example, *Wolzenburg*, C-123/08, EU:C:2009:616.

⁶⁵¹ See in particular Article 9(1), second subparagraph, and Article 4(2) of Directive 2002/21 and Article 5(1), second sentence, last indent, and (2), second subparagraph, of Directive 2002/20).

⁶⁵² See also Regulation 11(1)(a) of the Authorisation Regulations.

⁶⁵³ See also Section 12(2) of the 2002 Act and Regulation 16(1) of the Framework Regulations.

⁶⁵⁴ See also Regulation 9(11) of the Authorisation Regulations.

⁶⁵⁵ See also Section 12(2)(a)(ii) of the 2002 Act and Regulation 16(1)(b)(ii) of the Framework Regulations.

Directive⁶⁵⁶).

7.453 In the current document and, indeed, in previous consultation documents, ComReg has clearly articulated the above objectives, i.e. in particular the promotion of competition and ensuring that competition is not distorted by any accumulation of rights of use, as the bases for its proposals and ultimately its identification of Option 4 as the Preferred Option. Accordingly, ComReg is satisfied that the Preferred Option is clearly justified on the bases of fundamental objectives of common interest.

7.8.10 ComReg's assessment – principle of proportionality

7.454 ComReg refers to Three's claims as summarised earlier in this section.

7.455 When granting rights of use for radio frequencies, ComReg must do so on the basis of selection criteria, selection procedures and spectrum fees which comply with, amongst other things, the principle of proportionality.

7.456 Under the principle of proportionality, ComReg must not adopt any measure which goes beyond what is necessary to achieve its objectives. In essence, this involves three tests:

- Is the measure suitable for the realisation of a legitimate objective;
- Is the measure necessary to attain the objective or is there a plausible, less restrictive, alternative measure;
- Does the measure impose a burden on the person affected that is excessive in relation to the objective sought to be achieved.

7.8.11 ComReg's assessment

7.457 As discussed previously, ComReg does not accept that there is any adverse effect on Three within the meaning of this principle.

7.458 First, and in terms of the individual aspects of ComReg's overall proposal which Three is concerned with, ComReg notes the following:

- a) the application of spectrum caps in a spectrum award to prevent excessive accumulations of spectrum rights and distortions to competition from such accumulations is well established as a general matter in Ireland (e.g. in the 2012 MBSA and 2017 3.6 GHz Band award) and internationally;

⁶⁵⁶ See also Regulation 9(11) of the Authorisation Regulations.

- b) in addition, the application of spectrum caps which take into account relevant existing spectrum rights is also generally well established, including for the award of 700 MHz Duplex rights. For example, in Austria, Denmark, Netherlands, Switzerland, UK;
- c) furthermore, in light of its considerations in Chapter 6 (including detailed consideration of Three's alternative spectrum cap proposals), ComReg is satisfied that its Proposed Spectrum Competition Caps, and the Proposed Sub-1 GHz Cap which Three's pricing concerns centre around in particular, are proportionate in the present case; and
- d) similarly, the CCA auction format using opportunity cost pricing is also well established in Ireland (e.g., in the 2012 MBSA and 2017 3.6 GHz Award) and internationally.

7.459 Second, and in terms of its overall proposal, ComReg has:

- a) examined a broad range of alternative auction formats (i.e. SMRA, SCA, CMRA) and various potential modifications to its own proposal (i.e. Options 5 and 6), to determine which of these options would be the most suitable measure by which to achieve its objectives for this award⁶⁵⁷; and
- b) for the reasons outlined in the above Auction Format RIA, come to the conclusion that the Preferred Option would be the most suitable means by which to achieve its objectives for this award and, further, that no other option would be as equally effective.

7.460 Third, ComReg does not consider that there would be an excessive effect upon Three from its proposal for the reasons outlined below.

7.461 First, ComReg refers to DotEcon's assessment of each of the examples laid out in the NERA report, including as discussed in the Auction Format RIA above.

7.462 Second, ComReg refers to its considerations in respect of industry sustainability in the Auction Format RIA.

7.463 Third, the *de facto* reservation of one block of 700 MHz Duplex at reserve price that Three claims would be afforded to Vodafone and Eir under the Proposed Sub-1 GHz (but not Three because of its additional 900 MHz block) would only arise if there are no other bidders for 700 MHz Duplex lots, which is obviously unknown in advance of the Proposed Award.

7.464 Fourth, ComReg also notes and agrees with DotEcon's observation that the issue is not that Three would overpay but that, because Three would be limited

⁶⁵⁷ As described in Section 7.4 – 7.7 above.

to bidding for two 700 MHz Duplex blocks under the Proposed Sub-1 GHz Cap (because of its additional block of 900 MHz spectrum), the opportunity cost for Vodafone and Eir may be less than Three.⁶⁵⁸

7.465 Fifth, any lower price paid by Vodafone and Eir relative to Three in these circumstances would not be excessive because:

- a) the price for any 700 MHz Duplex rights acquired by Three would be based on market-based opportunity cost determined by legitimate bids under the Proposed Sub-1 GHz Cap from other bidders and, therefore, the minimum required by Three to obtain those rights. This is also the case for other bidders;
- b) whereas Three's claims are premised on it expressing a valuation for a third block of 700 MHz; which, again, is not a plausible counterfactual because it would be precluded from bidding for or acquiring same because of its additional 900 MHz block and the effect of this existing holding under the Proposed Sub-1 GHz Cap.

7.466 Sixth, ComReg does not accept Three's point that the price discount it claims would be afforded to Vodafone and Eir "*applies in scenarios where there are no competition concerns, and the purpose of the cap is anyway precautionary in nature, lacking supporting arguments that could justify price discrimination against one MNO*" because:

- a) ComReg's competition concerns relate to future, potential spectrum accumulations that could arise from the Proposed Award that could distort competition, rather than to current holdings (though the risk of such accumulations will, of course, be affected by undertakings' respective existing spectrum holdings); and
- b) any price difference that might result, arises from Three's additional block of 900 MHz and how it interacts with the Proposed Sub-1 GHz Cap, which ComReg considers to be an objectively justified and proportionate measure to address its identified competition concerns (see discussion on proportionality of the competition caps in Chapter 6).

7.467 Finally, and to the extent that Three nevertheless continues to consider that any potential relative pricing difference may be material (an argument with which ComReg does not agree), it remains open to Three to address its own concerns by unconditionally returning its additional block of 900 MHz spectrum so that, under the intended auction rules in the Preferred Option, Three would be eligible

⁶⁵⁸ DotEcon Report, Document 20/122a, p98.

to bid for a third block of 700 MHz Duplex under the Proposed Sub-1 GHz Cap.⁶⁵⁹

Conclusion on non-discrimination and proportionality

7.468 ComReg is of the view, having regard to submissions from interested parties, the applicable legislation and legal principles, its Auction Format RIA and other analyses, its expert advice and reports, and the other material to which it has had regard, that the Preferred Option is objectively justified, transparent, non-discriminatory and proportionate, both in general terms and in the context of its specific obligations regarding selection criteria and procedures and spectrum fees.

7.8.12 ComReg's assessment – Article 106(1) TFEU, State Aid and related matters

7.469 First, ComReg notes that the assertions made by Three around non-compliance with **Article 106(1) TFEU** and the **State aid** rules are very high level and do not go into any detail as to how these complex provisions have been breached in the present case. Notwithstanding, and for the avoidance of doubt, ComReg rejects the suggestion that the Preferred Option would breach these EU law provisions. Furthermore, ComReg notes that Three's arguments in that regard are in practice predicated upon the assumption that ComReg's proposals are discriminatory and disproportionate. However, as discussed above, ComReg is satisfied that the selection criteria, selection procedures and spectrum fees under the Preferred Option comply with the principles of non-discrimination and proportionality.

7.470 Second, in relation to Article 106(1) TFEU specifically, Article 106(1) TFEU has no independent application but operates in conjunction with other provisions of the TFEU, and in particular Articles 101 and 102 TFEU. Three does not identify in this context what is the "exclusive right" granted for purposes of Article 106(1) TFEU, and how the granting of that exclusive right would itself enable a public undertaking or undertaking to infringe Articles 101 and 102 TFEU.

7.471 Third, in relation to Three's claim concerning the **Code of Practice** for Government of State Bodies and that "*the method used should be both transparent and likely to achieve a fair market-related price*", ComReg would simply note that the Preferred Option would clearly comply with its obligations in this regard. In particular:

- a) as discussed elsewhere in this chapter, the Preferred Option complies with the principles of non-discrimination and proportionality;

⁶⁵⁹ In light of ComReg's concerns with any contingent return of sub-1 GHz spectrum as discussed earlier in this chapter.

- b) under the Preferred Option, all operators, including Three, would be required to pay market-based opportunity cost; and
- c) for the reasons outlined previously, Three's suggestion that other operators would not be paying "true" opportunity cost has no sound evidential basis.

7.472 Fourth, regarding the **'equivalent in economic terms'** principle, ComReg notes that this principle concerns situations where a regulator is administratively determining licence fees (as opposed to licence fees determined by auction). Indeed, the Annex 7 referenced by Three concerns the administrative setting of fees for interim rights of use *"by reference to the fees being paid by the other existing unliberalised 2.1 GHz licensees (i.e. Vodafone and Eir) during same time period"*. Accordingly, this is clearly not comparing like with like and ComReg is not persuaded by the argument raised by Three.

7.473 Accordingly, ComReg does not propose to consider these points further.

7.8.13 ComReg's assessment of other objectives, principles and duties not already addressed above

Contributing to the development of the Internal Market

7.474 In achieving the objective of contributing to the development of the Internal Market, which is one of ComReg's core statutory objectives under section 12 of the 2002 Act, ComReg considers that the following factors are of particular relevance in the context of this award process:

- a) the extent to which the Preferred Option would enable ComReg to ensure that harmonisation of the use of radio frequency spectrum across the EU is promoted, consistent with the need to ensure its effective and efficient use and in pursuit of benefits for the consumer such as economies of scale and interoperability of services, having regard to all decisions and measures adopted by the European Commission in accordance with the Radio Spectrum Decision⁶⁶⁰ (Regulation 17 of the Framework Regulations);
- b) the extent to which the Preferred Option would encourage the establishment and development of trans-European networks and the interoperability of pan-European services, in particular by facilitating, or not distorting or restricting, entry to the Irish market by electronic communication services providers based or operating in other Member

⁶⁶⁰Decision No. 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the EU.

States; and

- c) the extent to which ComReg has had due regard to the views of the European Commission, BEREC and other Member States in relevant matters, in selecting an option and considering any regulatory action required by ComReg in respect of such an option in order to ensure the development of consistent regulatory practice and the consistent application of EU law.

Promoting harmonised use of radio frequency spectrum across the EU

7.475 In relation to the first factor identified above, for the reasons set out in 'Spectrum for Award' RIA, it is ComReg's view that the Preferred Option would result in the award of harmonised spectrum rights of use in the selected bands which are suitable for the provision of advanced WBB services. In this regard, the Preferred Option is consistent with and promotes (i) the objectives of the relevant harmonisation decisions of the European Commission which emphasise the suitability of this band for WBB services and (ii) the objectives of the 700 MHz EU Decision, noting recital 7, which provides: *"The assignment of the 700 MHz frequency band should be structured in a way that facilitates competition and should be carried out in a manner that does not undermine existing competition."*

Encouraging the establishment and development of trans-European networks and the interoperability of pan-European Services

7.476 ComReg notes the overlap between this objective and the objective of promoting competition in the provision of ECN/ECS. Encouraging the establishment and development of trans-European networks requires that operators from other Member States seeking to develop such networks are given a fair and reasonable opportunity to obtain spectrum rights of use required for such networks and, particularly, access to critical spectrum rights of use. Accordingly, options which would restrict or distort competition or otherwise unfairly discriminate against potential entrants (such as through administrative assignment of rights of use to critical spectrum to incumbent operators) would not, in ComReg's view, satisfy the requirements of this objective.

7.477 In this regard, ComReg refers to the Auction Format RIA and its finding that the Preferred Option is likely to be more supportive of new entry than other options, including that:

- a) it better provides for a range of outcomes and differentiated services depending on the spectrum assigned to individual bidders, potentially increasing the choice for consumers, while also allowing for mobile operators to complement their existing spectrum holdings, while improving existing and future services to consumers; and

- b) it is an “entrant friendly” format that helps to support entry and/or participation by smaller bidders providing scope for such players to fit in with the demands of the incumbents but also ensuring (through package bidding) that any spectrum portfolio acquired would be sufficient for its needs; and
- c) the use of the CCA format in the 3.6 GHz award facilitated new entry (i.e. Airspan and Imagine).

Promoting the development of consistent regulatory practice and the consistent application of EU law

7.478 In relation to this aspect of contributing to the development of the internal market, ComReg continues to cooperate with other National Regulatory Authorities (“NRAs”), including closely monitoring developments in other Member States to ensure the development of consistent regulatory practice and consistent implementation of the relevant EC harmonisation measures and relevant aspects of the Common Regulatory Framework.

7.479 For instance, ComReg has had regard to international developments in the context of:

- a) promoting the provision of WBB services;
- b) considering whether to include other potential bands in the award process;
- c) harmonisation developments and equipment availability in relation to the selected bands;
- d) spectrum caps, including those relating to the award of the 700 MHz Band;
- e) licence durations for spectrum rights in the selected bands; and
- f) licence fees (and benchmarking in particular).

Promote the interest of users within the Community

7.480 The impact of the Preferred Option and other options on users from a more general perspective and in the context of ComReg’s objective to promote competition has been considered in the context of the Auction Format RIA and it is not proposed to consider this matter further here.

7.481 ComReg also observes that the majority of measures set out in section 12(2)(c)(i) to (vii) of the 2002 Act, aimed at achieving this statutory objective, are more relevant to consumer protection, rather than to the management of the radio frequency spectrum.

Efficient Use and Effective Management of Spectrum

- 7.482 Under section 10 of the 2002 Act, it is one of ComReg's functions to manage the radio frequency spectrum in accordance with a Policy Direction under section 13 of the 2002 Act. Policy Direction No. 11 of 21 February 2003 requires ComReg to ensure that, in managing spectrum, it takes account of the interests of all users of the radio frequency spectrum (including both commercial and non-commercial users) (see discussion on this policy direction below). Importantly, in pursuing its objective to promote competition under section 12(2)(a), ComReg must also take all reasonable measures to encourage efficient use and ensure effective management of radio frequencies. Section 12(3) of the 2002 Act also requires that measures taken with regard to encouraging the efficient use and ensuring the effective management of radio frequencies must be proportionate.
- 7.483 Regulation 9(11) of the Authorisation Regulations also provides that ComReg must ensure that radio frequencies are efficiently and effectively used having regard to section 12(2)(a) of the 2002 Act and Regulations 16(1) and 17(1) of the Framework Regulations.
- 7.484 In relation to Policy Direction No. 11, the Auction Format RIA (and the other related RIAs) takes into account the interests of all users of the radio frequency spectrum (and assesses the extent to which such interests are consistent with ComReg's own statutory obligations), both commercial and non-commercial.
- 7.485 In addition, the Preferred Option should facilitate efficient new entry, and encourage an efficient use of spectrum by those successful in the award. This is because it would ensure that, subject to reasonable constraints inherent in the design of an auction e.g. spectrum competition caps, those who value the spectrum rights the most will win same and, because of these financial incentives, are the most likely to use the spectrum efficiently.
- 7.486 In that light, ComReg is of the view that the Preferred Option complies with the obligations contained in the above statutory provisions.

Regulatory Principles

- 7.487 Under Regulation 16(2) of the Framework Regulations, ComReg must, in pursuit of its objectives under Regulation 16(1) and section 12 of the 2002 Act, apply objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things:⁶⁶¹
- promoting regulatory predictability by ensuring a consistent regulatory

⁶⁶¹ Some of those principles listed in 16(2) are not listed here because they are either dealt with elsewhere in this chapter or were considered by ComReg as not being relevant to the Proposed Award.

approach over appropriate review periods; and

- promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors and parties seeking access to diversify the risk of investment, whilst ensuring that competition in the market and the principle of non-discrimination are preserved.

Regulatory Predictability

7.488 ComReg notes that it places importance generally on promoting regulatory predictability and, as illustrated below, has complied with this principle in carrying out the current process.

7.489 In the present context, ComReg considers the following objectives to be of particular importance to achieving the aims of this regulatory principle:

- promoting regulatory predictability in relation to availability of spectrum rights to other users of spectrum by applying an open, transparent, and non-discriminatory approach to spectrum release; and
- promoting regulatory predictability by, to the extent appropriate, taking a consistent approach to the award of spectrum in the Proposed Award as that taken in other recent spectrum awards.

7.490 In relation to the first objective, ComReg notes that the Preferred Option ensures that the rights of use to the proposed harmonised bands are made available as soon as possible. This would give the market the utmost transparency and predictability in terms of the availability of those rights.

7.491 In relation to the second objective, ComReg considers that the Preferred Option would promote regulatory predictability by appropriately employing an auction format that is familiar to likely potential participants in circumstances where there are strong similarities between the awards in which the auction format has been and would be employed (e.g. complementarities between lot categories, such as across bands, within bands and across bandwidth, and across time slices).

7.492 In light of the above, ComReg considers that the Preferred Option complies with the regulatory principle of promoting regulatory predictability.

Promoting Efficient Investment and Innovation in New and Enhanced Infrastructures

7.493 ComReg considers that the Preferred Option is consistent with the aims of this

regulatory principle because it:

- a) provides for a range of outcomes and differentiated services depending on the spectrum assigned to individual bidders, potentially increasing the choice for consumers while also allowing for mobile operators to complement their existing spectrum holdings, while improving existing and future services to consumers;
- b) supports entry and/or participation by smaller bidders providing scope for such players to fit in with the demands of the incumbents but also ensuring (through package bidding) that any spectrum portfolio acquired would be sufficient for its needs⁶⁶²;
- c) is the one likely to best promote competition in the Proposed Award, including by allowing bidders to express their potential demand for the spectrum rights being made available in circumstances where such demand would not result in an accumulation/s of spectrum rights that would distort competition; and
- d) produces an efficient outcome by assigning the spectrum to bidders who would attach the highest value to it⁶⁶³ and, because of these financial incentives, thereby generate the greatest benefits to society from the use of the spectrum.

Relevant Policy Directions and Policy Statements

7.494 ComReg has taken due account of the Spectrum Policy Statement issued by the then DCENR in September 2010 and its Consultation on Spectrum Policy Priorities issued in July 2014. ComReg notes that the core policy objectives, principles and priorities set out therein are broadly in line with those set out in the 2002 Act and in the Common Regulatory Framework and, in turn, with those followed by ComReg in identifying the Overall Preferred Option.

7.495 Section 12(4) of the 2002 Act requires ComReg, in carrying out its functions, to have regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to it, in relation to the economic and social development of the State. Section 13 of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister as he or she

⁶⁶²In particular, when large bidders submit bids for a range of different packages with different valuations, the value of a smaller bidder's discrete package of lots may be such that the value of the winning combination of lots used to determine winners may include or 'fit in' a smaller bidder's package. This arises because the smaller bidder's value for a small number of lots may be higher than a larger bidder's incremental value for those same lots within a larger package or because the larger bidder reduces demand later in the award.

⁶⁶³ And excluding valuations which may contain some anticipation of gaining excess profits through weaker downstream competition.

considers appropriate to be followed by ComReg in the exercise of its functions.

7.496 ComReg considers below those Policy Directions which are most relevant in this regard (and which have not been referred to elsewhere in this chapter).

Policy Direction No.3 of 21 February 2003 on Broadband Electronic Communication Networks

7.497 This Policy Direction provides that:

“ComReg shall, in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.”

7.498 The purpose of this Policy Direction was to ensure that the regulatory framework for electronic communications plays its part in contributing to the achievement of the then Government’s objectives regarding the rollout of broadband networks.

7.499 ComReg is cognisant of the fact that the three year objective described in this policy direction has now long expired. In any case, ComReg is of the view that the Preferred Option is aligned with the objectives of the current Programme for Government. For example, it would promote the introduction of advanced WBB services in the selected bands at the earliest possible date (including through the appropriate use of a familiar auction format) and it complements other schemes such as the National Broadband Plan and the Mobile Broadband Taskforce aimed at improving broadband infrastructure and services for businesses and citizens across the State.

Policy Direction No.4 of 21 February 2003 on Industry Sustainability

7.500 This Policy Direction provides that:

“ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry’s position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.”

7.501 The purpose of this policy direction is to ensure that any regulatory decisions take due account of the potential impact on the sustainability of industry players, in particular in light of the business cycle at the time such decisions are taken.

7.502 ComReg observes that this policy direction concerns the sustainability of the industry as a whole rather than the position of individual players.

7.503 Notwithstanding, in its Auction Format RIA above, ComReg has considered the impact of its Preferred Option in the context of all industry stakeholders, including different types of industry stakeholders, and refers to its assessment in the Auction Format RIA with respect to this policy direction (including the finding that alleged pricing asymmetry in the Proposed Award is highly unlikely to threaten industry sustainability and the reasons for same). ComReg also refers to its considerations in the context of the principle of proportionality above.

7.504 This Policy Direction is clearly relevant in terms of those costs that industry must bear which are, to some extent, within the control of ComReg, for example, the nature and extent of any minimum prices in the Proposed Award and the related issue of the duration of spectrum rights of use. ComReg has had regard to this policy direction in devising its proposals in relation to licence duration and minimum prices.

Policy Direction No.11 of 21 February 2003 on the Management of the Radio Frequency Spectrum

7.505 This Policy Direction provides that:

“ComReg shall ensure that, in its management of the radio frequency spectrum, it takes account of the interests of all users of the radio frequency spectrum.”

7.506 The purpose of this policy direction is to ensure that ComReg achieves an appropriate balance between the interests of various users of the radio frequency spectrum, in particular, the respective interests of commercial and non-commercial users.

7.507 In carrying out the Auction Format RIA, ComReg has considered the Preferred Option in light of the interests of various categories of industry stakeholders and consumers.

7.508 ComReg is of the view, therefore, that it has complied with this requirement in carrying out the Auction Format RIA and that the Preferred Option is the one that best serves the interests of all users of the radio frequency spectrum and strikes an appropriate balance where those interests may conflict.

Conclusion

7.509 In light of the above, ComReg is satisfied that the Preferred Option complies with those statutory functions, objectives and duties relevant to its management of the radio frequency spectrum.

Chapter 8

8 Licence conditions

Introductory remarks

What are the issues? Considering the appropriate licence conditions that will apply to the spectrum rights of use awarded on foot of the Proposed Award

What did ComReg propose?⁶⁶⁴

ComReg proposed:

1. that the Proposed Bands be licensed on a **service and technology neutral basis**;
2. that it would be appropriate to attach a **non-exclusivity condition to spectrum rights issued in the Proposed Award**, which would permit other uses of spectrum in the Proposed Bands on a non-interference and non-protected basis;
3. to apply coverage obligations to rights of use in the 700 MHz Duplex
 - (A) a 3 Mbit/s service to 99% of the population and 92% of the geographic area of Ireland (Note 1) and a 30 Mbit/s service to 95% of the population, 90% of motorways, and 80% of primary roads. An RSRP signal strength of -95 dBm was proposed as a proxy for 30 Mbit/s.(Note 2);
 - (B) to deploy outdoor 30 Mbit/s SUTP coverage to 345 Specific Locations
4. to apply base station rollout obligations to rights of use in the Performance Bands as follows:

Service	New Entrant Obligation				Existing Operator Obligation			
	2.1 GHz	2.3 GHz	2.6 GHz FDD	2.6 GHz TDD	2.1 GHz	2.3 GHz	2.6 GHz FDD	2.6 GHz TDD
Time	5 Years				4 Years			
Mobile	290	290	290	290	1,200	525	525	525
Other	80	80	80	80	290	290	290	290

⁶⁶⁴ As outlined by ComReg in its draft Decision Document 19/124.

5. to apply minimum quality of service obligations to rights of use in respect of network availability and voice call standards including as appropriate relating to VoLTE;
6. to attach a licence condition to spectrum rights in the Proposed Bands **requiring prior notification⁶⁶⁵ from Licensees of their termination of a technology**, given the potential for consumer disruption, and considering that the cessation of a technology is not currently within the scope of the consumer protection provisions of Condition 18 of the General Authorisation;
7. that it is **not appropriate at this time to attach MVNO access obligations to some or all of the 700 MHz rights of use**;
8. that **spectrum transfers and spectrum leases will be permitted** in the Proposed Bands and that winners of liberalised spectrum rights in the Proposed Bands will be obliged to comply with any rules to **prevent spectrum hoarding** as may be laid down by ComReg under Regulation 17(10) of the Framework Regulations; and
9. to establish **technical conditions** in the Proposed Bands in accordance with the relevant EC/ECC Decisions along with additional conditions to ensure coexistence with specific national users of the radio spectrum (i.e. Eir's Rurtel network and IAA primary aeronautical radars).

What Respondents said?

Respondents were in general agreement or did not submit a view in relation to ComReg's proposals for items 1, 2, 6, 8 and 9.

In relation to 3 (A):

- Eir and Three were in general agreement with the levels proposed, Vodafone submitted the 30 Mbit/s level should be lower - 90%;
- Three and Vodafone submitted that the timelines should be adjusted to make the obligations more achievable;
- Eir, Three and Vodafone submitted that the proxy of -95 dBm for measuring 30 Mbit/s coverage is unsuitable with Three and Vodafone suggesting an alternate proxy.

In relation to 3 (B)

- All respondents considered that this requirement could be used in negotiating the price of securing access to these sites, with some alternate timescales and differing levels of coverage suggested.

In relation to 4:

- Imagine proposed a higher rollout obligation;
- Vodafone submitted that the proposals are too stringent; and

⁶⁶⁵ Not less than six months.

- Eir stated that it could see no justification for new entrants to have a lower rollout obligation.

In relation to 5:

- Three sought variation during periods of extreme weather;
- Three submitted that the proposed VOLTE obligations were not appropriate.

In relation to 7:

- Eir and Vodafone agreed with ComReg's proposal, whereas Tesco Mobile identified 4 options to enable MVNOs secure better wholesale access.

What has ComReg finally decided, and why?

Having carefully considered the submissions of the respondents and the potential impact on consumers, ComReg adjusted the proxy RSRP levels for item 3(A) as detailed in Section 8.4.5, and is maintaining its position on remaining items 1, 2, 3(A), 4, 5 6, 7, 8.

Note 1: The 3 Mbit/s and 30 Mbit/s services identified in these coverage obligation proposals refer to single user throughput services at the cell edge.

Note 2: A 30 Mbit/s service obligation applies where an existing licensee obtains 2×10 MHz or more of in the 700 MHz Duplex in the award. A lower throughput obligation (20 Mbit/s) applies where it obtains 2×5 MHz of the 700 MHz band.

8.1 Introduction

8.1 This chapter sets out ComReg's final position on the licence conditions that should be attached to the rights of use that are intended to be awarded on foot of the Proposed Award. These licence conditions are guided and informed by, among other things:

- ComReg's statutory functions, objectives and duties, including in particular its obligations under the Authorisation Regulations;
- the relevant European legislation related to the Award Bands;
- the rationale and licence conditions used previously by ComReg for bands used for similar purposes (e.g. the licence conditions used in the 2012 MBSA and 3.6 GHz Award);
- the rationale and licence conditions proposed in Document 14/101 and the submissions received to that consultation;
- the "Connectivity Studies" - comprising of the Frontier Connectivity Report (18/103a and 18/103b), Oxera / Real Wireless Connectivity Report (18/103c) and the DotEcon Connectivity Report (Document 18/103d) along with ComReg's Information Notice (Document 18/103);
- the Plum 2.6 GHz and 2.3 GHz Co-existence Reports published as Documents 19/59c, 19/59d, 19/124c, 19/124d and Document 20/122b;
- the licence conditions, and rationale for same, proposed in Documents 19/59R, 19/124 and set out in Document 20/32 and the submissions received to these consultations; and
- other relevant information including international practice.

8.2 The following licence condition proposals are discussed in this chapter:

- service and technology-neutrality;
- non-exclusive assignment of spectrum;
- coverage and rollout;
- quality of service;
- notification of the termination of a technology;
- potential wholesale access (MVNO) conditions;

- spectrum transfer, spectrum leasing, spectrum hoarding; and
- technical conditions.

8.2 Service and technology neutrality

8.2.1 Summary of ComReg's view in Document 19/124

8.3 In Section 7.2 of Document 19/124, ComReg considered that a service and technology neutral⁶⁶⁶ approach should be applied to the licensing of the Proposed Bands. In particular, ComReg noted that this would permit the deployment of all technologies and services that comply with the relevant EC/ECC harmonisation decisions for those bands.

8.4 ComReg also noted the view of the GSMA⁶⁶⁷ that this approach is widely recognised as best practice when assigning spectrum to MNOs and results in improved mobile broadband coverage and data speeds and lower mobile data prices for users than would otherwise be the case, as it:

- a) enables MNOs to re-farm spectrum from 2G/3G to 4G/5G use at a pace driven by market demand; and
- b) maximises spectral efficiency as well as efficient use of spectrum.

8.5 ComReg subsequently reflected this proposed condition in the Draft Regulations published in Annex 2 of Document 20/32⁶⁶⁸.

8.2.2 Summary of respondents' views to Document 19/124, 20/32 and 20/56

8.6 ComReg received one response on this issue, from Vodafone, in its submission to Document 19/124.⁶⁶⁹ Vodafone supports the granting of service and technology neutral licences, which, it notes, is well established practice in Ireland and Europe-wide.

8.7 ComReg welcomes Vodafone's support for this proposal and is not aware of any

⁶⁶⁶ Service and technology neutrality is the principle that spectrum rights of use, and the conditions applied thereto, should not preclude the provision of any specific service and/or the use of any technology.

⁶⁶⁷ As set out in "The Benefits of Technology Neutral Spectrum Licences", GSMA, June 2019, <https://www.gsma.com/spectrum/wp-content/uploads/2019/06/Benefits-of-Technology-Neutral-Spectrum-Licences.pdf>

⁶⁶⁸ See Regulation 6(1)(b) and section 2(2) ("Technical Conditions") of Part 4 ("Licence Conditions") to Schedule 1 ("MBSA2 Liberalised Use Licence") of the Draft Regulations.

⁶⁶⁹ Eir also agreed with this proposal in its response to Document 19/59R.

other information which would warrant reconsideration of this proposal.

8.2.3 ComReg's final position

8.8 Accordingly, ComReg's final position is that the Award Bands will be licensed on a service and technology neutral basis, such that the deployment and provision of all technologies and services that comply with the relevant EC/ECC harmonisation decisions for those bands will be permitted.

8.3 Non-exclusive assignment of spectrum rights

8.3.1 Summary of ComReg's view in Document 19/124

8.9 In Section 7.3 of Document 19/124, ComReg remained of the view that it would be appropriate to attach a non-exclusivity condition to spectrum rights issued in the Proposed Award, which would permit other uses of spectrum in the Proposed Bands on a non-interference and non-protected basis. In the interests of regulatory consistency, this condition would be substantively the same as the non-exclusive provision in the licences issued for the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz bands.

8.10 ComReg subsequently reflected this proposed condition in the Draft Regulations published in Annex 2 of Document 20/32⁶⁷⁰.

8.3.2 Summary of respondents' views to Document 19/124, 20/32 and 20/56

8.11 ComReg did not receive any submissions from respondents in relation to this proposal, nor is ComReg aware of any other information which would warrant reconsideration of this proposal.

8.3.3 ComReg's final position

8.12 Accordingly, ComReg's final position is that rights of use issued on foot of the Proposed Award will be granted on a non-exclusive basis where the relevant provisions⁶⁷¹ are set out in draft form in the Draft Regulations.

⁶⁷⁰ See definitions of "Non-Interference and Non-Protected Basis", "Non-exclusive" and "Licence" in Regulation 2 of the Draft Regulations.

⁶⁷¹ "Non-exclusive", in relation to a Licence, means that the Commission is not precluded from authorising the keeping and having possession by persons other than the Licensee, on a Non-Interference and Non-Protected Basis, of apparatus for wireless telegraphy for the radio frequency spectrum specified in the Licence;

"Non-Interference and Non-Protected Basis" means that the use of apparatus for wireless telegraphy is subject to no Harmful Interference being caused to any Radiocommunication Service, and that no claim may be made for the protection of apparatus for wireless telegraphy used on this basis against Harmful Interference originating from Radiocommunication Services.

8.4 Coverage and rollout obligations

8.4.1 Introduction and background

8.13 In Section 8.4 of Document 19/59R, ComReg set out a detailed discussion and analysis of the background and context to establishing appropriate coverage and rollout obligations in the Proposed Bands, as well as its preliminary views and proposals in relation to same.

8.14 In the light of new information and the views of respondents on its proposals in Document 19/59R, ComReg updated its preliminary views and proposals for coverage and rollout obligations where appropriate in Section 7.4 of Document 19/124.

8.15 Importantly, ComReg identified in Section 8.4 of Document 19/59R that the 700 MHz Duplex would be considered separately to the other Proposed Bands for reasons including that:

- a) it is widely accepted that when targeting the provision of a good quality of service over wide areas, sub-1 GHz bands, which have more favourable propagation characteristics, enable coverage to be obtained more economically⁶⁷²;
- b) of the Proposed Bands, the 700 MHz Duplex is best suited for this purpose, which is acknowledged in EU Decision (EU) 2017/899⁶⁷³ and the 700 MHz EC Decision⁶⁷⁴; and
- c) by comparison, the other Proposed Bands have propagation characteristics such that they are typically more suited to (i) support additional capacity to mobile devices over relatively short distances and (ii) provide connections to rooftop locations over wider areas where near line of sight can be obtained.

8.16 Accordingly, ComReg considered that coverage obligations would be appropriate for the 700 MHz Duplex while rollout obligations would be appropriate for the Performance Bands.

⁶⁷² Many respondents (including Three, ESNB and Viatel) to Document 14/101 acknowledged the differences in propagation characteristics between sub 1 GHz bands (i.e. the 700 MHz) and higher frequency bands (including the 2.3 and 2.6 GHz Bands proposed at that time) that are used for capacity.

⁶⁷³ See, for example, recitals 2, 4 and 9.

⁶⁷⁴ See, for example, recitals 2 and 3.

8.4.2 700 MHz Duplex - Summary of ComReg's view in Document 19/124

8.17 In Chapter 7 of Document 19/124, ComReg set out its preliminary positions on coverage obligations for the 700 MHz Duplex. In that connection, ComReg considered several key questions in relation to such an obligation in Section 7.4.4 of Document 19/124, which were as follows:

- a) whether the obligation should focus on population or geographic coverage (**“Proposals to focus on population coverage”**);
- b) how best to address outdoor and indoor coverage (“Proposals that the obligation should focus on outdoor coverage and that a Native Wi-Fi obligation should apply to address indoor coverage (and quality of service)”);
- c) whether the obligation should include a requirement to provide a minimum data rate of 30 Mbit/s single user throughput at cell edge (SUTP) (**“Proposal to target 30 Mbit/s SUTP for outdoor population coverage”**);
- d) what appropriate coverage percentages and associated timings to include in the obligation (**“Proposed coverage percentages and associated timings”**);
- e) what targets should be included in a proposed requirement to provide coverage at specific locations (**“Proposed obligations at specific locations”**); and
- f) how ComReg would measure and monitor compliance with the obligations (**“Proposals in relation to measuring and monitoring the coverage obligations”**).

8.18 ComReg's consideration of these key questions was informed by the matters and materials set out above (Section 8.1) and, in particular, amongst other things:

- a) The Connectivity Studies as published in November 2018:
 - i. *“Meeting Consumers' Connectivity Needs”* – a report (Document [18/103b](#)) and accompanying infographic (Document [18/103a](#)) from Frontier Economics Ltd (Frontier);
 - ii. *“Future Mobile Connectivity in Ireland”* - a report (Document [18/103c](#)) from Oxera Consulting LLP (Oxera), with Real Wireless Ltd; and

iii. “Coverage obligations and spectrum awards” – a report (Document [18/103d](#)) from DotEcon.

- b) ComReg’s previous detailed discussion and analysis in Section 8.4 of Document 19/59R of the background and context to establishing appropriate coverage obligations as well as options for coverage obligations;
- c) the views of respondents on ComReg’s proposals in Document 19/59R for coverage obligations in the 700 MHz Duplex;
- d) ComReg’s analysis of the options for coverage obligations in the 700 MHz Duplex in the “Draft Coverage RIA” in Annex 7 of Document 19/59R and updated in Annex 9 of Document 19/124; and
- e) ComReg’s analysis of the options for indoor coverage obligations in the 700 MHz Duplex in the “Draft Indoor mobile voice and text coverage RIA” in Annex 13 of Document 19/124.

8.19 ComReg’s preliminary positions in relation to these key questions for a 700 MHz Duplex coverage obligation are set out in Section 7.4.4 of Document 19/124 and are summarised later in this chapter.

8.20 ComReg also set out the details of its proposed conditions for outdoor coverage and indoor Native Wi-Fi coverage obligations in Section 7.4.5 of Document 19/124, which are also summarised below.

8.21 In Chapter 9 of Document 19/124, ComReg set out its draft decision on attaching rights of use to the Award Spectrum, based on its preliminary positions on such rights of use, including 700 MHz Duplex coverage obligations (see paragraph 3.10 thereof).

8.22 In Section 2.3.4 (“Licence Conditions Applicable to MBSA2 Liberalised Use Licences”) of Document 20/32, ComReg set out the draft rules and procedures to implement the above preliminary positions and draft decisions on 700 MHz Duplex coverage obligations.

ComReg’s preliminary positions in Document 19/124 on key questions for a coverage obligation

Proposal to focus on population coverage

8.23 ComReg proposed to adopt proposals as set out in Section 8.4.4 A of Document 19/59R that a coverage obligation should primarily focus on targeting population coverage.

Proposal that the obligation should focus on outdoor coverage and that a

Native Wi-Fi obligation should apply to address indoor coverage (and quality of service)

- 8.24 ComReg proposed that the 700 MHz Duplex coverage obligation should focus on targeting outdoor coverage and that indoor connectivity be achieved via an obligation to be applied to any rights of use obtained via the award process where, if a mobile voice service is provided to a licensee's customers (which would include any provided to third party customers by a licensee, for example in the case of MVNO arrangements) then it must also provide Native Wi-Fi within 2 years of licence commencement.

Proposal to target 30 Mbit/s SUTP for outdoor population coverage

- 8.25 ComReg proposed to adopt the proposals as set out in Section 8.4.4 C of Document 19/59R that the proposed outdoor obligation should primarily focus on a minimum data rate of 30 Mbit/s for a single user at cell edge⁶⁷⁵. Notably, in Section 7.4.4 of Document 19/124, ComReg confirmed that licensees could make use of all the frequencies resources that they have available, and carrier aggregation where useful, to achieve the minimum data rate.

Proposed coverage percentages and associated timings

- 8.26 ComReg proposed to adopt the proposals as set out in Section 7.4.5 of Document 19/124 for coverage obligations with appropriate coverage levels and associated timings.

Proposed obligations at specific locations

- 8.27 ComReg proposed to adopt the proposals as set out in Section 7.4.5 and Annex 10 of Document 19/124 for an obligation for licensees that are existing MNOs to provide outdoor coverage at 345 specific locations⁶⁷⁶.
- 8.28 ComReg set out further detail on defining the specific locations in Annex 10 of Document 19/124⁶⁷⁷ and that it proposed to use the geographic boundaries for each of the locations, as defined in the shapefiles made available on ComReg's webpage⁶⁷⁸ to assist with assessing compliance with the obligation.

⁶⁷⁵ Notwithstanding, ComReg observed that there may be situations where a 30 Mbit/s obligation would not be appropriate. For example, in the case of a New Entrant only winning rights in the 700 MHz Duplex, or an existing MNO only winning 2 x 5 MHz in the 700 MHz Duplex, therefore not being able to take full advantage of sub 1-GHz carrier aggregation. In such instances, ComReg proposed that lower data rates would apply.

⁶⁷⁶ Including, 65 hospitals, 24 higher education campuses, 40 industrial areas, 14 air and sea ports, 160 train and bus stations and 42 top visitor attractions information points.

⁶⁷⁷ Annex 10 of Document 19/124, "*Outdoor coverage obligations at specific locations*".

⁶⁷⁸ <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/proposed-multi-band-spectrum-award/>

8.29 ComReg also clarified the obligation relating to the specific locations for the Business and Technology parks. In Document 19/59R , ComReg noted that absent other official sources on other business and technology parks in the State, the IDA locations would be used to identify the locations. ComReg proposed, and as further detailed in Annex 10 of Document 19/124, to include adjacent business and technology parks to those of the IDA, while aiming to exclude large green areas that have no development.

Proposals in relation to measuring and monitoring the coverage obligations

8.30 ComReg proposed to measure and monitor the coverage obligation based on a set of principles which it developed from its initial proposals in Section 8.4.7 of Document 19/59R and in light of the views of respondents on those initial proposals.

8.31 In summary, ComReg proposed to measure and monitor the coverage obligation based on the following principles:

- a) the ComReg network planning tools, supported by field measurements which may include drive tests where appropriate, would be the key component in assessing compliance with the coverage obligations;
- b) that all rights of use available to the licensee can be used to contribute to meeting the coverage obligations;
- c) while acknowledging that newer technologies will be rolled out over time, LTE technology is expected to continue to be used by operators in delivering data to consumers for some time and in this regard ComReg proposes to use a RSRP metric for determining the coverage levels;
- d) the obligations are set to incentivise operators to rollout new sites as appropriate, upgrade sites with additional spectrum and make use of improvements in technology such as new standards including carrier aggregation and carrier sharing or extension techniques;
- e) depending how the above techniques are deployed on a network, this will yield varying benefits in terms of increasing the range of a cell for a given throughput;
- f) where carrier aggregation is deployed using carriers with similar propagation characteristics (e.g. 700, 800 and 900 MHz) that the additional bandwidth and resultant throughput gains will be available, to a large extent, for the whole of the cell range;
- g) where bands with different propagation characteristics are carrier

aggregated, the throughput enhancements will be considered over the range of the highest of the frequency bands;

- h) a RSRP base level of -95 dBm would be used as a proxy for a 30 Mbit/s SUTP⁶⁷⁹ level for a 10 MHz downlink carrier. Where capacity increasing techniques are used such as carrier aggregation and or deploying additional bandwidth, a lower RSRP value can be used;
 - i. where two or three band carrier aggregation is deployed across bands with similar propagation characteristics (e.g. 700 MHz, 800 MHz and 900 MHz carriers) an RSRP level of -100 dBm and -105 dBm would apply respectively.
- i) a RSRP base level of -110 dBm would be used as a proxy for a 3 Mbit/s SUTP level for a 10 MHz downlink carrier. Where capacity increasing techniques are used such as carrier aggregation and or deploying additional bandwidth, a lower RSRP value can be used;
 - i. where two or three band carrier aggregation is deployed across bands with similar propagation characteristics (e.g. 700 MHz, 800 MHz and 900 MHz carriers) an RSRP level of -112 dBm and -114 dBm would apply respectively.
- j) noting that there may be many different potential combinations of spectrum and deployment techniques that could be used by a New Entrant, ComReg would apply the same principles as identified above in determining the appropriate approach to measuring and monitoring the coverage obligations; and
- k) as new technologies or coverage enhancing techniques are rolled out, ComReg would consider proposals from licensees as to how this could influence meeting the coverage obligations.

8.32 Additionally, in Section 7.4.4 of Document 19/124, ComReg set out how it intended to identify population coverage for the purposes of measuring and monitoring the population obligation. In that connection, ComReg proposed to:

- a) use the most up to date and appropriate datasets available at the time of conducting the measurement;
- b) generate the population dataset by combining information from the CSO

⁶⁷⁹ ComReg notes that for the purpose of assessing compliance with the obligation where an existing MNO was to obtain 2 x 5 MHz in the 700 MHz Duplex (i.e. where the obligation is to provide 20 Mbit/s SUTP), ComReg would deploy the same methodology for the 30 Mbit/s case, (i.e. assume a 2 x 10 MHz carrier is deployed).

and the Eircode datasets⁶⁸⁰; and

- c) use the residential addresses in the Eircode database to determine the geographic coordinates of the residential locations and the population statistics for the small areas dataset as provided by the CSO, for the time being.

8.33 ComReg further proposed to share with licensees the methodology it would use for developing the population file for assessing compliance. However, in the event of any divergence of opinions, the file used by ComReg would be definitive in assessing compliance with the obligation.

ComReg's proposals in Document 19/124 for specific licence conditions for 700 MHz Duplex Coverage

Existing MNOs

8.34 An existing MNO who wins at least 2 × 10 MHz of spectrum in the 700 MHz Duplex would need to meet:

- coverage levels as set out in Table 12 below; and
- coverage at specific locations as set out in Table 13 below.

Table 12. Obligations on an existing MNO winning at least 2 × 10 MHz in the 700 MHz Duplex

Outdoor Coverage Service (Single User Throughput Cell Edge)	Coverage dimension	Coverage level to be met in:		
		3 Years	5 Years	7 years
30 Mbit/s	Population	85%	92%	95%
30 Mbit/s	Motorways	75%	85%	90%
30 Mbit/s	Primary Roads	60%	75%	80%
3 Mbit/s	Population	99%	99%	99%
3 Mbit/s	Geographic area	90%	91%	92%

⁶⁸⁰ ComReg noted that, while there may be a variety of sources that could provide approximations on a population dataset, it intended for the time being to use the CSO and Eircode datasets.

Table 13. Coverage obligations at specific locations

What	Where	When
Outdoors: 30 Mbit/s (Single User Throughput Cell Edge)	<p>Specific locations as set out in Annex 10 of Document 19/124 which include:</p> <ul style="list-style-type: none"> • Business and technology Parks (including strategic sites): The IDA identifies a list of 31 business and technology Parks and 9 Strategic Sites • Hospitals: the Health Service Executive (HSE) identifies a list of the 48 public and 17 private hospitals • Higher Education Campuses: The Higher Education Authority (HEA) identifies a list of 8 Universities, 11 Institutes of Technology and 5 other colleges • Air and Sea Ports: the Department of transport tourism and Sport (DTTAS) identifies a list of the 7 main airports and the Irish Maritime Development Office (IMDO) identify a list of the 7 passenger sea ports. • Train and bus stations: the National transport Authority identifies the busiest 144 train stations and Bus Eireann identifies a list of the main 16 bus stations • Top visitor attraction information points: Failte Ireland identifies a list of the top (21) fee charging and (21) free entry visitor attractions. 	<p>For each category</p> <p>70 % in 3 years</p> <p>90 % in 5 years</p> <p>100 % in 7 years</p>

8.35 An existing MNO, that wins less than 2×10 MHz of spectrum in the 700 MHz Duplex would need to meet the above obligations, except the minimum single user throughput cell edge level would be 20 Mbit/s.

New Entrants

8.36 A New Entrant who wins spectrum of at least 2×10 MHz in the 700 MHz Duplex and 2×20 MHz of capacity spectrum or equivalent⁶⁸¹ would need to meet the obligations as set out in Table 14 below.⁶⁸²

⁶⁸¹ This could also be 40 MHz of TDD spectrum.

⁶⁸² This obligation is informed by amongst other things, Oxera / Real Wireless' Scenario 8, which models a New Entrant obtaining rights of use for 2×10 MHz in the 700 MHz Band along with 2×20 MHz in the 2.6 GHz Band.

Table 14. Obligations on New Entrant winning 2 × 10 MHz in the 700 MHz Duplex and 2 × 20 MHz of capacity spectrum⁶⁸³

Outdoor Coverage Service (Single User Throughput Cell Edge)	Coverage dimension	Coverage level to be met		
		4 Years	6 Years	10 years
30 Mbit/s	Population	75%	80%	90%

8.37 A New Entrant who only wins 2 × 10 MHz or 2 × 5 MHz in the 700 MHz Duplex would need to meet the above obligation, except the single user throughput cell edge level would be reduced to 20 Mbit/s and 10 Mbit/s respectively. ComReg noted in Document 19/59R that these levels are of course minima and it would be open for any New Entrant to advance these levels further as appropriate.

ComReg's proposal in Document 19/124 for a Native Wi-Fi condition

8.38 If a mobile voice service is provided to a licensee's customers (which would include any provided to third party customers by a licensee, for example in the case of MVNO arrangements) then it must also provide Native Wi-Fi within 2 years of licence commencement.

8.4.3 700 MHz Duplex – Summary of respondents' views to Document 19/124 and 20/32

8.39 Four respondents (Eir, Imagine, Three and Vodafone) provided comments on ComReg's 700 MHz Duplex coverage obligation proposals in their submissions to Documents 19/124 and 20/32.

8.40 To aid the presentation of this material, the submissions are presented where comments were received on the key questions and on the specific proposals.

Proposal to focus on a minimum data rate of 30 Mbit/s for a single user at cell edge

8.41 In its response to Document 19/124, Vodafone supports a 30 Mbit/s SUTP at cell edge coverage target for the 700 MHz Duplex but has provided further material as to how this should be measured and monitored which is presented in the sections below.

⁶⁸³ Or equivalent: i.e. 40 MHz of TDD spectrum.

Proposed coverage percentages and associated timings

- 8.42 Three respondents (Imagine, Three and Vodafone) provided submissions on these proposals. At a high level, Vodafone and Three disagree with aspects of the timescales proposed, Vodafone contends that the target level for Existing MNOs is too high.
- 8.43 In its response to Document 20/32, Imagine agrees with ComReg's proposals to apply higher obligations to a New Entrant that wins spectrum in both the 700 MHz Duplex and other bands than if a New Entrant only wins spectrum in the 700 MHz Duplex⁶⁸⁴.
- 8.44 In its response to Document 19/124, Three contends that ComReg's coverage obligation proposals are too ambitious in terms of rollout and that the Existing MNO obligations, considering the investment capabilities for 5G technologies, are interventionist rather than precautionary in nature and would be a deterrent to acquisition of 700 MHz Duplex rights of use.
- 8.45 In that regard, while Three does not disagree with the ultimate percentage targets for outdoor coverage proposed by ComReg, Three proposes longer timescales for meeting the obligations for an existing MNO winning at least 2 x 10 MHz in the 700 MHz Duplex. Three has provided these in a table which is extracted below in Figure 14:

Figure 14. Three's alternative proposals for obligations on an existing MNO winning at least 2 x 10 MHz in the 700 MHz Duplex

Outdoor coverage service (SUTP Cell edge)	Coverage dimension	Coverage level to be met in:	
		5 years	10 years
30 Mbit/s	Population	85%	95%
30 Mbit/s	Motorways	75%	90%
30 Mbit/s	Primary Roads	60%	80%
3 Mbit/s	Population	99%	99%
3 Mbit/s	Geographic area	90%	92%

- 8.46 In its response to Document 19/124, Vodafone asks ComReg to amend the timescales to give it time to complete a RAN refresh project to deploy any new

⁶⁸⁴ The relevant obligations proposed in Section 2.3.4 of Document 20/32 are as follows:

- 30 Mbit/s SUTP at cell edge for New Entrant licensees that win at least 2 x 10 MHz in the 700 MHz Duplex and 2 x 20 MHz across the remaining Award Spectrum; and
- 20 Mbit/s and 10 Mbit/s SUTP at cell edge respectively for New Entrant licensees that win only 2 x 10 MHz or 2 x 5 MHz in the 700 MHz Duplex.

spectrum it might obtain in the Proposed Award. Vodafone indicates that the project would require more time, as it would:

- proceed on a sequential cluster-by-cluster basis focused on limited geographic areas in order to minimise customer service impacts which might arise if a large number of sites were changed at once; and
- require more significant upgrades to tower infrastructure than previous RAN refresh projects, including more antennas for additional bands and a move from ground-based to tower-based Remote Radio Head BTS deployments.

8.47 Vodafone submits that the time required for it to complete a RAN refresh on such a basis would not be enough for it to achieve ComReg's proposed intermediate target of 85% population coverage within three years. Accordingly, Vodafone suggests that the three-year element of the proposed coverage targets for existing MNOs be removed or reduced to 75% population (from 85%). Vodafone states that a reduction to 75% would fit in with an efficient RAN refresh program and still allow it to reach the proposed 5 year and 7 year coverage targets.

8.48 In its response to Document 20/32, Vodafone repeats its proposal to remove the three year element of the proposed coverage targets for existing MNOs for the same reasons it put forward in its response to Document 19/124 and additionally it contends that the COVID-19 Emergency would drive additional network capacity requirements in areas with more than adequate existing coverage.

8.49 Separately in its response to Document 19/124 Vodafone submits that the proposed obligations to be too high where it:

- maintains that there is no commercial incentive to roll-out coverage beyond the lower 90% range of population;
- contends that ComReg's proposed coverage targets are not precautionary; and
- believes that the proposed targets will exceed the level that a competitive market would produce.

8.50 Further, Vodafone disagrees with ComReg's view in paragraph 7.25 of Document 19/124 that existing MNOs would prefer population coverage targets to serve between 90% and 95% of the population⁶⁸⁵ and considers targets of between 70% and 90%⁶⁸⁶ to be more appropriate. In that regard, Vodafone states that ComReg quoted public statements of several operators, including

⁶⁸⁵ Option 3 in paragraph 7.23 of Document 19/124.

⁶⁸⁶ Option 2 in paragraph 7.23 of Document 19/124.

Vodafone, indicating current coverage levels in excess of 90%, in support of a 95% target. However, Vodafone maintains that these levels do not refer to 30 Mbit/s at cell edge and are not relevant to the proposed higher standard coverage targets. Vodafone also maintains that Oxera's analysis identifies current coverage at the required specification at much lower percentage figures.

Proposals in relation to the measuring and monitoring the obligations

- 8.51 Eir, Three and Vodafone submitted comments on this matter, where the submissions focused on informing the appropriate RSRP level to be used as a proxy to determine compliance with a coverage obligation.
- 8.52 Eir questions whether a RSRP base level of -95 dBm would be a suitable proxy for a 30 Mbit/s SUTP level for a 10 MHz downlink carrier, while Three and Vodafone consider it to be too high and therefore propose alternatives.
- 8.53 In its response to Document 19/124, Eir cites feedback from its RAN vendor which suggests that the reduction in inter-site distance due to smaller cell sizes for -95 dBm at cell edge would increase the noise floor. Further, Eir suggests that the current inter-site distance for MNOs might not be based on a 30 Mbit/s throughput and that moving to -95 dBm at cell edge would require additional infill sites. Further, Eir contends that with the proposed RSRP that the search ring for sites to serve the Specific locations obligation is reduced.
- 8.54 In its response to Document 19/124, Three proposes RSRP levels of -109 dBm (Dense Urban) and -113 dBm (Rural) for 5G NR and -108 dBm (Dense Urban) and -113 dBm (Rural) for LTE, based on its own calculations⁶⁸⁷. Further, Three submits that the RSRP levels for the lower speeds are also inappropriate and that they should be as follows:
- a) For a 5G-NR 20 Mbit/s service at 700 MHz it should be between -101 dBm (Dense Urban) and -107 dBm (Rural) for a single user throughput using a 5MHz downlink carrier; and
 - b) For a 5G-NR 3 Mbit/s service at 700 MHz it should be between -118 dBm (Dense Urban) and -122 dBm (Rural) for a single user throughput using a 10 MHz downlink carrier.
- 8.55 Vodafone submits that in setting a target RSRP level and based on its technical analysis⁶⁸⁸ of various 5G NR configurations, which it presented in an annex to its submission to Document 19/124, that the 30 Mbit/s SUTP should be a "nominal"

⁶⁸⁷ Three indicates that its supplier Ericsson independently reviewed and agreed with its calculations.

⁶⁸⁸ Using data on 5G NR spectral efficiency and user experience data rates from a 3GPP technical specification.

30 Mbit/s service. In its analysis Vodafone submits that:

- in a realistic multi-cell environment, there would be areas of very low SNR due to overlap between the cells where the spectral efficiency would be reduced to a level such that a bit rate of 30 Mbit/s could not be ensured in those areas; and
- a 30 Mbit/s coverage target for the 700 MHz band can only be considered in a single-user and single-cell scenario without intra and inter-system interference and assuming nominal power for the BS (no power reduction due to EMF or external causes).

8.56 Considering this and based on a link budget calculation which it presented in an Annex to its submission to Document 19/124, Vodafone proposes that an RSRP level of -105 dBm would be an appropriate proxy for a nominal 30 Mbit/s SUTP. Vodafone further proposes that this level could be lowered by 5 dB for each additional 2 × 10 MHz deployed in bands with similar propagation characteristics to the 700 MHz Duplex.

Availability of three band sub 1-GHz carrier aggregation

8.57 In its response to Document 19/124, Three contends that ComReg was incorrect in assuming that carrier aggregation could be used to achieve a minimum data rate of 30 Mbit/s SUTP at cell edge. Instead, Three contends that the use of an RSRP as a proxy for same should only take into account the 700 MHz Duplex. In that connection, Three submits that:

- such use of carrier aggregation is not possible in non-standalone mode due to technical limitations on the uplink for handsets, such that handsets cannot use a sub-1 GHz band (e.g. 800 MHz) as an anchor signal supporting the control plane if they need to aggregate with another sub-1 GHz band (e.g. 700 MHz) supporting the user plane; and
- it is incorrect to assume that current handsets or devices using the 800 MHz or 900 MHz bands can be migrated quickly enough so that a licensee can re-farm its low band spectrum and aggregate it with 700 MHz while using all 5G NR technology.

Proposed obligations at specific locations

8.58 Both Eir and Three consider the proposed obligations for coverage at specific locations might affect a licensee's negotiation position when seeking access to sites at or around those locations.

8.59 In its response to Document 19/124, Eir argues that site owners at the specific locations would be aware of this requirement and might charge high rents to

operators. Eir also argues that along with the proposed RSRP level that the search ring for suitable sites would be reduced.

- 8.60 In its response to Document 20/32, Three submits that ComReg's proposed requirement for eventual coverage at 100% of the Specific Locations listed within seven years would weaken licensees' negotiation positions for access to suitable sites and in general considers that the obligations are too ambitious and go beyond the principle of precautionary and are interventionist by nature.
- 8.61 Eir, Three and Vodafone all variously propose reducing the list or quota of specific locations to be covered on the basis that, in some cases, licensees might be impeded from providing coverage by external factors such as planning issues and lack of cooperation from site owners.
- 8.62 In its response to Document 20/32, Eir submits that a location should be removed from the list of Specific Locations if a licensee is impeded by factors outside its control such as planning issues or lack of cooperation from the person responsible for the location.
- 8.63 In its response to Document 20/32, Three argues that, in the interests of balanced negotiations, ComReg must allow for the possibility that some of the Specific Locations might not be covered if it proves too difficult or too expensive to do so and instead recommends that ComReg incentivise licensees and site owners to cover these locations by setting a 70% quota of Specific Locations from the list that must be covered.
- 8.64 In its response to Document 19/124, Vodafone suggests that the percentage of the Specific Locations to be covered within seven years be reduced from 100% to 95%. In that regard, Vodafone considers that:
- there could be impediments to access at some locations, such as planning issues and owners refusing access or setting unreasonable conditions;
 - in some such cases, in particular top visitor attractions, it might not be possible to find an alternative site where the surrounding area is a Special Protected Area under Irish & EU legislation; and
 - proposals to encourage access for MNOs to publicly owned property under consideration by the Mobile and Broadband Taskforce might take longer than seven years to realise.
- 8.65 As noted above in relation to proposed coverage percentages and associated timings, Three contends that ComReg's coverage obligation proposals are too ambitious and go beyond the principle of precautionary and are interventionist by nature. As a result, it also contends that the proposals would be a deterrent to acquisition of 700 MHz spectrum rights of use, in its view.

8.66 In that regard, Three proposes alternative timescales for meeting ComReg's proposed coverage obligations at specific locations and these are extracted below in Figure 15.

Figure 15. Three's alternative proposals for coverage obligations at specific locations

What	Where	When
Outdoor: 700MHz band 2x10MHz BW 30Mbit/s SUTP (Cell edge)	<ul style="list-style-type: none"> • Business and Technology Parks (including strategic sites): The IDA identifies a list of 31 businesses and technology parks and 9 strategic sites • Hospitals: The Health Service Executives (HSE) identifies a list of 48 public and 17 private hospitals • Higher Education Campuses: The Higher Education Authority (HEA) identifies a list of 8 Universities, 11 Institutes of Technologies, and 5 other colleges • Air and Sea Ports: The Department of transports tourism and sport (DTTAS) identifies a list of the 7 main airports and Irish Maritimes Development Offices (IMDO) identify a list of the 7 passenger sea ports • Train and Bus Stations: The National Transport Authority identifies the busiest 144 train stations and Bus Eireann identifies a list of the main 16 bus stations • Top visitor attraction information points: Failte Ireland identifies a list of the top (21) fee charging and (21) free entry visitor attractions 	<p>For each category:</p> <ul style="list-style-type: none"> • 70% in 5 years • 100% in 10 years

8.67 Only Eir commented on the Specific Location Boundary files. In its response to Document 20/32, Eir agrees with the criteria proposed by ComReg⁶⁸⁹ to identify the areas encompassed by the outdoor coverage obligations for the Specific Locations⁶⁹⁰ and to derive the Specific Location Boundary files for each Specific Location⁶⁹¹.

Proposal that a Native Wi-Fi obligation should apply to address indoor coverage (and quality of service)

8.68 In its response to Document 19/124, Vodafone agrees that including a Native Wi-Fi obligation in the licence conditions is appropriate. Other respondents did not

⁶⁸⁹ In Table A4.8 of ComReg Document 20/32.

⁶⁹⁰ e.g. for Specific Locations in the Business and Technology Parks category, the outdoor coverage obligation would encompass buildings, the adjacent carparks and thoroughfares within, as well as those adjacent to IDA Business and Technology Parks and Strategic Sites.

⁶⁹¹ The Specific Location Boundary Files are available on ComReg's Multi Band Spectrum Award webpage at: <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/proposed-multi-band-spectrum-award/>

comment on this proposal.

8.4.4 700 MHz Duplex - ComReg's assessment of respondent's views on the proposed coverage obligations

8.69 ComReg's consideration of the key questions, the proposed coverage obligations and the submission of respondent's views in relation to same, are grouped as follows:

- Proposal to focus on population coverage;
- Proposals that the obligation should focus on outdoor coverage and that a Native Wi-Fi obligation should apply to address indoor coverage (and quality of service);
- Proposal to set target throughput obligation of 30 Mbit/s SUTP;
- Proposals regarding the percentage levels and timings;
- Proposals as to how the obligation will be measured and monitored;
- Proposed obligations at specific locations; and
- Proposals to establish precautionary rather than interventionist coverage obligations.

Proposal to focus on population coverage

8.70 In Document 19/124, ComReg was of the preliminary view to adopt proposals as set out in Section 8.4.4 A of Document 19/59R that a coverage obligation should primarily focus on targeting population coverage.

8.71 ComReg notes that only Vodafone directly responded to this proposal supporting same and ComReg is not aware of any reason to reconsider this approach.

Proposals that the obligation should focus on outdoor coverage and that a Native Wi-Fi obligation should apply to address indoor coverage (and quality of service)

8.72 ComReg notes that only Vodafone directly responded to the proposal to include a Native Wi-Fi obligation.

8.73 Considering this and other relevant information, ComReg has updated its Indoor mobile voice and text coverage RIA in Annex 8. For the reasons contained in Annex 8 and as set out in Document 19/124, ComReg is of the view that the Native Wi-Fi obligation is the most appropriate mechanism to address indoor voice and text coverage and quality of service.

Proposal to set target throughput obligation of 30 Mbit/s SUTP

8.74 ComReg observes that Vodafone was the only respondent that directly responded⁶⁹² to this proposal where it indicated support for this target. Vodafone also provided some further material in relation to how this target would be measured, and this is considered below.

Proposals regarding the percentage levels and timings

8.75 Four respondents commented on the above proposals (Eir, Imagine, Three and Vodafone).

8.76 In relation to those that provided support, ComReg notes Imagine's concurrence that ComReg should apply higher obligations to a New Entrant that wins spectrum in both the sub-1 GHz band and Performance Bands.

8.77 Eir and Three, in general, provide support for the target obligation of 95% population coverage (30 Mbit/s SUTP) while Vodafone contends in one part of its response that the lower 90% range is what an operator will likely deliver in a competitive market⁶⁹³ and in another part of its response appear to agree with achieving a 95% target⁶⁹⁴.

8.78 In relation to where Vodafone contends that the lower 90% is the level likely to be achieved, ComReg notes that it has addressed this previously in Section 7.4.4 of Document 19/124. ComReg notes that Vodafone has not provided additional material in support of this. As noted above, Vodafone appears to identify that it is feasible to meet the obligation should the milestones be adjusted. Therefore, ComReg does not find Vodafone's contention convincing and does not intend to address this point again.

8.79 Separately, Vodafone and Three are seeking both to (i) extend the time required for some of the targets and (ii) adjust the method of measuring the obligation to a level that would mean the obligation would largely be met already. For example Three proposes that the time to meet the (95%) obligation is met over 10 years rather than 7 years, but puts forward a number of different RSRP levels that would mean, using existing rights of use (i.e. absent any 700 MHz rights of use) a 95% coverage level would be already met.

⁶⁹² In response to the Documents 19/124, 20/32 or 20/56. Earlier submissions in relation to the throughput targets are considered in Documents 19/59R and 19/124.

⁶⁹³ Vodafone's response to Document 19/124, p 11. "Our position remains that there is no commercial incentive to roll-out coverage beyond a figure in the lower 90% range of population"

⁶⁹⁴ Vodafone Response to Document 19/124, p.12 – "We suggest therefore reducing or removing the 3 year element of the coverage targets listed in Table 4. A reduction to 75% pop would fit in with an efficient program and, we believe, still allow us to reach the proposed numbers at the 5 year and 7 year points".

- 8.80 The rationale provided by Vodafone for advocating a change of the percentage level at the 3-year milestone from 85% to 75% but where it can achieve the 5 year and 7 year milestones is based on a nominal rollout plan using just the 700 MHz Duplex. However, Vodafone's assumption with regard to ComReg assessment of compliance with the coverage obligation is not correct. As set out in Section 7.4.4, paragraph 7.106 of Document 19/124 and as summarised earlier, the coverage obligation can be met by any spectrum rights of use available to the licensee. For example, the 800 MHz Band can be used to meet the obligation where there are already well established levels of coverage. Consequently⁶⁹⁵, it would not be appropriate to amend the 3-year milestone as the LTE coverage layer in 800 MHz can be used to contribute to meeting all the milestones.
- 8.81 Considering the above and ComReg's updated 700 MHz Coverage RIA, ComReg remains of the view that the proposed percentages and timings are appropriate.
- 8.82 ComReg considers the views of respondents on the proposed approach to measuring and monitoring the coverage obligation below.

Proposed approach to measuring and monitoring the coverage obligations

- 8.83 ComReg received three submissions (Eir, Three and Vodafone) relating to the appropriate RSRP level for the different coverage obligations attached to rights of use in the 700 MHz Duplex. All three consider that the proposed RSRP level of -95 dBm as a proxy for a 30 Mbit/s cell edge service to be inappropriate for the purposes of the obligation.
- 8.84 Eir, in its response to Document 19/124, suggests that an RSRP level of -95 dBm at cell edge would have the effect of increasing the noise floor and may lead to a requirement for additional infill sites in order to achieve this signal level at cell edge. Eir does not provide any further information to support its view nor any alternative RSRP levels.
- 8.85 ComReg notes that its proposed coverage obligations have been informed by, amongst other things, the Oxera / Real Wireless Report (which modelled the expansion of networks by building additional sites and upgrading sites) and this approach is intended by ComReg, as set out in paragraph 7.109 of Document 19/124:

"..ComReg intends to establish an obligation that aims to incentivise operators to deploy new sites where appropriate, upgrade sites with additional spectrum, make use of improvements in technology such as new standards including

⁶⁹⁵ As noted below, Vodafone's existing coverage levels are approximately [%< ██████████ %>].

carrier aggregation and carrier sharing or extension techniques”.

- 8.86 ComReg notes that Oxera/Real Wireless utilised both new sites and upgrades to existing sites in its modelling. Therefore the concept, at least, of creating additional sites to expand cell edge coverage was envisaged by Oxera/Real Wireless.
- 8.87 Also, Oxera/Real Wireless modelled the increase in throughput at sites taking advantage of the benefits of carrier aggregation of three sub-1 GHz carriers, therefore not, in the main, focusing on the reduction of site distances or increasing the noise floor⁶⁹⁶. Therefore, while building new sites to meet the coverage obligation is envisaged, the use of carrier aggregation was also a key mechanism envisaged by Oxera/Real Wireless in increasing the coverage of higher throughput services.
- 8.88 ComReg notes Three’s submission regarding the current limitations with respect to sub-1 GHz carrier aggregation, including those related to handsets. However, these capabilities, if not available now, will likely become available over time as three band sub-1 GHz carrier aggregation is envisaged in 3GPP Release 15. This is particularly relevant noting that the 95% population obligation is to be met in 7 years from licence commencement or by 1 December 2028 as currently proposed.
- 8.89 Further, ComReg notes that the view of Oxera / Real Wireless was informed by, amongst other things, the stakeholder interviews with MNOs where they identified that they would target coverage expansion by using the 700 MHz Band, possibly aggregating other sub-1 GHz bands and harnessing the efficiencies of 5G for improving the cell edge performance.⁶⁹⁷
- 8.90 However, ComReg is not mandating the use of three band sub-1 GHz carrier aggregation but rather identifies it as a way of achieving the obligation. A licensee will be free to meet the obligation using whatever means it deems appropriate, including but not limited to the deployment of additional sites in any of the bands where the licensee has rights of use or deploying carrier aggregation or carrier extension techniques.
- 8.91 Three, in its response to Document 19/124 contends that the RSRP levels proposed by ComReg would move the coverage obligation from precautionary to interventionist. Three then proposes alternative proxy levels of -109 dBm (Dense Urban) and -113 dBm (Rural) for 5G NR and -108 dBm (Dense Urban) and -113 dBm (Rural) for LTE. While ComReg could speculate as to how these levels were obtained, Three did not provide any supporting information as to how

⁶⁹⁶ In this regard, ComReg recalls paragraph 8.164 of Document 19/59R.

⁶⁹⁷ Section 5.5.3 of Document 18/103c.

these proposals were derived.

- 8.92 ComReg notes however that if it were to adopt the levels as proposed by Three it would in effect remove the obligation altogether as the target of 95% would be already achieved using existing infrastructure.⁶⁹⁸
- 8.93 Vodafone, in its response to Document 19/124, proposes that an RSRP level of -105 dBm would be an appropriate proxy for 30 Mbit/s. Vodafone further proposes that this level could be lowered by 5 dB for each additional 2 × 10 MHz deployed in bands with similar propagation characteristics to the 700 MHz Duplex. Vodafone also provided a link budget in an annex to its submission to Document 19/124 illustrating how it determined this RSRP.
- 8.94 In light of the submissions received regarding the RSRP and the availability or otherwise of carrier aggregation at this time in sub-1 GHz bands, ComReg has revisited the appropriate RSRP level to use as a proxy for a 30 Mbit/s SUTP.
- 8.95 In establishing the appropriate RSRP, ComReg has considered, amongst other things⁶⁹⁹:
- a) the material and approach as set out in Document 19/59R and Document 19/124;
 - b) the existing network infrastructure of the MNOs and existing levels of coverage as determined by the Outdoor Coverage Map⁷⁰⁰;
 - c) the submissions received in relation to the different RSRP levels presented by respondents including the link budget calculation presented by Vodafone;
 - d) relevant material from ETSI/3GPP⁷⁰¹;
 - e) ComReg's mobile handset performance testing⁷⁰² where the Total Isotropic Sensitivity (TIS)⁷⁰³ measurements indicated significant

⁶⁹⁸ [REDACTED]
[REDACTED] %].

⁶⁹⁹ Also noting, that it can be observed through practical experience that RSRP levels and corresponding throughputs do not follow a linear set of assumptions.

⁷⁰⁰ For example the existing coverage levels for the proposed RSRP of -103 dBm for each of the operators is [REDACTED] %].

⁷⁰¹ ETSI TR 136 942, ETSI TS 136 213 and 3GPP TS 37.910.

⁷⁰² ComReg Documents 18/82, 19/67 and 20/121.

⁷⁰³ TIS is a measure of the receive performance for data and the antenna sensitivity patterns of mobile handsets.

variances⁷⁰⁴ in the receiver sensitivity across the different handsets tested; and

- f) the potential for variability in interference and noise at the user handset receiver.

- 8.96 In light of the above, ComReg is now of the view that an RSRP base level of -103 dBm would be used as a proxy for a 30 Mbit/s SUTP level for a 10 MHz downlink carrier. Should sub-1 GHz carrier aggregation be used, that for every 2 × 10 MHz carrier aggregated the RSRP can be reduced by 5 dB.
- 8.97 Three also requested that the RSRP levels be amended⁷⁰⁵ in the event that an existing operator only wins 2 × 5 MHz in the 700 MHz Duplex (where this obligation is identified as a 20 Mbit/s target). In Document 19/124, ComReg proposed that the same RSRP level for the 30 Mbit/s target would also apply for assessing compliance with the 20 Mbit/s obligation noting that the throughput would be reduced as the bandwidth available would be less.
- 8.98 Given the modifications to the 30 Mbit/s RSRP level, ComReg is of the view that the level of -103 dBm is appropriate as a proxy for assessing compliance with the obligation. In addition to the considerations above, ComReg notes that while a higher RSRP would likely be required should an operator only have a 2 × 5 MHz carrier, the obligation can be met using all other rights of use including those in other sub-1 GHz bands where Existing MNOs have access to 2 × 10 MHz carriers.
- 8.99 Further, setting the RSRP level to be the same, whether 2 × 10 MHz or 2 × 5 MHz is obtained in the 700 MHz Duplex, aims to remain consistent with the approach used by Oxera/Real Wireless modelling the expansion of networks which informed the obligations.
- 8.100 Specifically, Oxera/ Real Wireless modelled the expansion of the networks where operators would take advantage of three band sub-1 GHz carrier aggregation (utilising three 2 × 10 MHz carriers) when targeting 30 Mbit/s. In this scenario an operator, if it wished to do so, would not be able to fully utilise the three 2 × 10 MHz carriers as modelled by Oxera/Real Wireless. Therefore, while an Existing Operator may decide to carrier aggregate the 2 × 5 MHz carrier with its other 2 × 10 MHz sub 1 GHz carriers the throughput capable of being achieved would be reduced compared to an operator having three 2 × 10 MHz carriers. As such the headline throughput obligation is reduced to take account of this (i.e. from 30

⁷⁰⁴ Where for LTE data, receiver sensitivity performance for all phones tested thus far varies between 6-15 dB. With the recent sample varying by approximately 6-7 dB.

⁷⁰⁵ Three suggests a level of -101 dBm (dense urban) and 107 dBm (rural) using 5G NR.

Mbit/s to 20 Mbit/s)⁷⁰⁶.

- 8.101 In relation to the appropriate RSRP level for assessing compliance with the 3 Mbit/s SUTP target, ComReg notes that Three's proposals identify very low RSRP levels where the levels would be well below the "fringe" level as illustrated on the Outdoor Coverage Map. However, ComReg has taken into account the additional considerations outlined above and has revised the base RSRP level to -112 dBm and where sub-1 GHz carrier aggregation be used, that for every 2 x 10 MHz carrier aggregated the RSRP can be reduced by 2 dB.
- 8.102 In light of the above, ComReg sets out below the revised summary set of principles that it will use in measuring and monitoring compliance with the coverage obligations:
- a) ComReg's radio network planning tools, supported by field measurements which may include drive tests where appropriate, would be the key component in assessing compliance with the coverage obligations.
 - b) That all rights of use available to the licensee can be used to contribute to meeting the coverage obligations.
 - c) ComReg proposes to use an RSRP metric as a proxy for determining licensees compliance with the coverage levels.
 - d) While acknowledging that newer technologies will be rolled out over time, LTE technology is expected to continue to be used by operators in delivering data to consumers for some time.
 - e) The obligations are set to incentivise operators to rollout new sites as appropriate, upgrade sites with additional spectrum and make use of improvements in technology such as new standards including carrier aggregation and carrier sharing or extension techniques.
 - f) Depending how the above techniques are deployed on a network, this will yield varying benefits in terms of increasing the range of a cell for a given throughput.
 - g) Where carrier aggregation is deployed using carriers with similar propagation characteristics (e.g. 700, 800 and 900 MHz) that the additional bandwidth and resultant throughput gains will be available, to a large extent, for the whole of the cell range.
 - h) Where bands with different propagation characteristics are carrier aggregated, the throughput enhancements will be considered over the

⁷⁰⁶ In this regard, ComReg recalls paragraph's 8.123 – 8.125 of Document 19/59R.

range of the highest of the frequency bands.

- i) For the purpose of assessing compliance with the coverage obligation an RSRP base level of -103 dBm be used as a proxy for 30 Mbit/s SUTP using a 10 MHz downlink carrier. Where capacity increasing techniques are used such as carrier aggregation and or deploying additional bandwidth, a lower RSRP value can be used as follows:
 - i. Where additional 10 MHz downlink carriers are added using two or three band carrier aggregation across bands with similar propagation characteristics (e.g. 700 MHz, 800 MHz and 900 MHz carriers) an RSRP level of -108 dBm and -113 dBm will apply respectively.
- j) For the purpose of assessing compliance with the coverage obligation a RSRP base level of -112 dBm be used as a proxy for 3 Mbit/s SUTP using a 10 MHz downlink carrier. Where capacity increasing techniques are used such as carrier aggregation and or deploying additional bandwidth, a lower RSRP value can be used:
 - i. Where additional 10 MHz downlink carriers are added using two or three band carrier aggregation across bands with similar propagation characteristics (e.g. 700 MHz, 800 MHz and 900 MHz carriers) an RSRP level of -114 dBm and -116 dBm will apply respectively.
- k) Noting that there may be many different potential combinations of spectrum and deployment techniques that could be used by a New Entrant, ComReg would apply the same principles as identified above in determining the appropriate approach to measuring and monitoring the coverage obligations; and
- l) As new technologies or coverage enhancing techniques are rolled out, ComReg will consider proposals from licensees as to how this could influence meeting the coverage obligations.

Proposed obligations at specific locations

8.103 ComReg notes the views of respondents regarding the proposed coverage obligations at specific locations, observing that some of the submissions raised were identified previously and considered in Document 19/124.

8.104 ComReg recaps that concerns over high rents, planning issues and access to sites is to a large extent being considered as part of the Governments Mobile Phone and Broadband Taskforce ("MPBT"), where the latest recorded measures include:

- a) Action 7 (OPW, Supported by DRCD⁷⁰⁷, DCCAE⁷⁰⁸, CCMA⁷⁰⁹ and the LDA⁷¹⁰): Commercial and non-commercial state and public bodies to increase the number of records listed on the Intra-State Property Register. (Carried forward, with amendments, from 2018 - Actions 18,19 and 20);
- b) Action 11 (CCMA): Increase the number of local authorities providing reasonable access to their facilities to telecommunication companies for the installation of essential infrastructure⁷¹¹;
- c) Action 13 (CCMA): The LUTs⁷¹² committee, with the engagement of the Irish Public Bodies (IPB), to explore the feasibility of agreeing a prescribed indemnity clause for the use of local authority land and assets by telecoms companies⁷¹³;
- d) Action 14: (Ibec supported by Telcos) Telecommunication operators to appoint a senior person to take responsibility for engagement with local authorities as a designated first point of contact for problematic applications⁷¹⁴;
- e) Action 15: In the context of existing statutory obligations, telecommunication operators to agree on a voluntary Code of Practice for granting/sharing access to mobile telecommunication infrastructure⁷¹⁵; and
- f) Action 16 (Ibec supported by Telco/CCMA): Telecommunication sector to work with local authorities to agree a standardised procedure for seeking planning permission for new mast sites including: taking account of County Development Plan, preplanning meetings and standardised

⁷⁰⁷ The Department of Rural and Community Development.

⁷⁰⁸ The Department of Communications, Climate Action and the Environment (now Department of the Environment, Climate and Communications).

⁷⁰⁹ The County and City Management Association.

⁷¹⁰ The Land Development Agency.

⁷¹¹ ComReg notes that this was a Q4 2019 deliverable, but no further update has been provided at this time.

⁷¹² The Land Use and Transportation committee.

⁷¹³ ComReg notes that this was a Q4 2019 deliverable, but no further update has been provided at this time.

⁷¹⁴ ComReg notes that Action 14 above was completed in Q2 2019 according to the Mobile Phone & Broadband Taskforce quarterly reports. <https://www.gov.ie/en/collection/c1f0b-mobile-phone-and-broadband-taskforce-progress-reports/>

⁷¹⁵ Latest available extract of MPBT update (Q3 2019) “A Code of Practice committing operators to support site sharing is already in place, signed by the existing operators. This was completed as part of the 3G licensing process. The existing code has been successful in that a high proportion of existing sites are shared. This code will be reviewed before the end 2019.

Application Pack⁷¹⁶.

- 8.105 In this regard, operators are encouraged to continue to engage with the MPBT and the appropriate bodies identified above in facilitating reasonable access to sites and infrastructure.
- 8.106 As identified in paragraph 7.100 of Document 19/124, the obligation is to provide coverage at the location and not provide a site at the location and therefore some flexibility is afforded to operators in determining other site locations. Regarding Eir's concerns over the reduced search ring due to the RSRP level, ComReg notes that this has largely been addressed with the reduction of the RSRP level identified above.
- 8.107 In relation to Vodafone's concern that it may not be possible to find alternative site locations to serve visitor attractions that may for example be in a Special Protected Area under Irish & EU legislation, ComReg encourages early engagement in relation to these limited number of sites so that, should issues arise, they can be addressed through the MPBT as appropriate.
- 8.108 In relation to Three's concerns that the obligation may be deemed to be interventionist rather than precautionary, ComReg notes that it considered in Section 8.4.6 of Document 19/59R the outputs and recommendations from the MPBT, in particular the list and ranking of the categories of locations. ComReg considered all the proposed location categories and identified at that time that some of the location categories listed by the taskforce would be beyond what an operator would deliver in a competitive market and only focused on the location categories that would likely be delivered by operators in a competitive market.
- 8.109 In relation to the categories of locations and the specific locations proposed in Document 19/59R and Document 19/124, ComReg notes paragraph 8.140 of Document 19/59R:

"From analysing the current mobile coverage of the existing MNOs, ComReg observes that some level of coverage (either 2G, 3G or 4G) is available at the majority of the locations identified above. Noting the findings of the Oxera Report which suggest that MNO's will likely target upgrading their networks to provide a better quality of service (30 Mbit/s) and noting that some of the locations are remote, ComReg observes that it will take time for an existing MNO to deploy 30 Mbit/s coverage at some of these locations. Therefore in establishing a rollout time period for the

⁷¹⁶ Latest available extract of MPBT update (Q3 2019) "Operators will explore with LAs options for a standardised procedure for seeking planning permission for new masts. Operators believe a series of workshops will be required with the key stakeholders and will work with LAs to arrange these".

provision of a 30 Mbit/s service at these locations, ComReg proposes that for each of the above categories as follows:

- *“75% of the specific locations would have coverage within 3 years*
- *90% of the specific locations would have coverage within 5 years*
- *100% of the specific locations would have coverage within 7 years.”*

8.110 Further, ComReg notes that the more remote locations identified are primarily those visitor attractions on Fáilte Ireland’s list of Top Visitor Attractions by visitor numbers and are therefore likely to be met by operators. Thus, considering the above, ComReg is of the view that the list of Specific Locations obligations to be met in 7 years from licence commencement (currently estimated to be by 1 December 2028) is at the appropriate level and consistent with ComReg’s precautionary principle.

8.111 Notwithstanding the above in monitoring and supervising compliance with ComReg obligations, ComReg will act in accordance with its statutory functions, objectives and duties⁷¹⁷ and take into account all relevant material at the relevant time including any representations by licensees.

Proposals to establish precautionary rather than interventionist coverage obligations

8.112 Finally, having considered above the views of all respondents in relation to the 700 MHz Duplex Coverage obligations incorporating the revisions and clarifications as presented above, ComReg is of the view that (i) the proposed coverage obligations are precautionary by nature and likely to be achieved by operators in a competitive market and (ii) they are achievable within the timelines set out by ComReg.

8.4.5 700 MHz Duplex - ComReg’s final position

8.113 In light of the above, ComReg’s final position is to apply the following licence conditions to rights of use in the 700 MHz Duplex:

Existing MNOs

8.114 An existing MNO who wins at least 2 × 10 MHz of spectrum in the 700 MHz Duplex must meet:

- a) Coverage levels as set out in Table 15 below; and
- b) Coverage at specific locations as set out in Table 16 below.

⁷¹⁷ e.g. Regulation 16 of the Authorisation Regulations 2011

Table 15. Obligations on an Existing MNO winning at least 2 × 10 MHz in the 700 MHz Duplex

Outdoor Coverage Service (Single User Throughput Cell Edge)	Coverage dimension	Coverage level to be met in:		
		3 Years	5 Years	7 years
30 Mbit/s	Population	85%	92%	95%
30 Mbit/s	Motorways	75%	85%	90%
30 Mbit/s	Primary Roads	60%	75%	80%
3 Mbit/s	Population	99%	99%	99%
3 Mbit/s	Geographic area	90%	91%	92%

Table 16. Coverage obligations at specific locations

What	Where	When
Outdoors: 30 Mbit/s (Single User Throughput Cell Edge)	<p>Specific locations as set out in Annex 10 which include</p> <ul style="list-style-type: none"> • Business and technology Parks (including strategic sites): the IDA provides a list of 31 Business and Technology Parks and 9 Strategic Sites. The obligation also includes adjacent business and technology parks to those of the IDA. • Hospitals: the Health Service Executive (HSE) identifies a list of the 48 public and 17 private hospitals • Higher Education Campuses: The Higher Education Authority (HEA) identifies a list of 8 Universities, 11 Institutes of Technology and 5 other colleges • Air and Sea Ports: the Department of transport identifies a list of the 7 main airports and the Irish Maritime Development Office (IMDO) identify a list of the 7 passenger sea ports. • Train and bus stations: the National transport Authority identifies the busiest 144 train stations and Bus Eireann identifies a list of the main 16 bus stations • Top visitor attraction information points: Failte Ireland identifies a list of the top (21) fee charging and (21) free entry visitor attractions. 	<p>For each category</p> <p>70 % in 3 years</p> <p>90 % in 5 years</p> <p>100 % in 7 years</p>

8.115 An Existing MNO, that wins less than 2 × 10 MHz of spectrum in the 700 MHz

Duplex must meet the above obligations, except that, due to the reduced quantum of spectrum available, the 30 Mbit/s minimum single user throughput cell edge level is reduced to 20 Mbit/s.

New Entrants

8.116 A New Entrant who wins spectrum of at least 2 × 10 MHz in the 700 MHz Duplex and 2 × 20 MHz of capacity spectrum or equivalent⁷¹⁸ must meet the obligations as set out in Table 17 below.⁷¹⁹

Table 17. Obligations on New Entrant winning 2 × 10 MHz in the 700 MHz Duplex and 2 × 20 MHz of capacity spectrum⁷²⁰

Outdoor Coverage Service (Single Throughput Edge)	User Cell	Coverage dimension	Coverage level to be met		
			4 Years	6 Years	10 years
30 Mbit/s		Population	75%	80%	90%

8.117 A New Entrant who only wins 2 × 10 MHz or 2 × 5 MHz in the 700 MHz Duplex must meet the above obligation, except that, due to the reduced bandwidth, the applicable single user throughput cell edge level will be reduced to 20 Mbit/s and 10 Mbit/s respectively.

Other related coverage obligations

8.118 ComReg's final position is:

- a) that the coverage obligation identified above will focus on outdoor coverage only; and
- b) that indoor connectivity is achieved via an obligation on any rights of use obtained via the award process where, if a mobile voice service is provided to a licensee's customers (which would include any provided to third party customers by a licensee, for example in the case of MVNO arrangements) then it must also provide Native Wi-Fi within 2 years of licence commencement.

⁷¹⁸ This could also be 40 MHz of TDD spectrum.

⁷¹⁹ This obligation is informed by amongst other things, Oxera's / Real Wireless' Scenario 8, which models a New Entrant obtaining rights of use for 2 × 10 MHz in the 700 MHz Band along with 2 × 20 MHz in the 2.6 GHz Band.

⁷²⁰ Or equivalent: i.e. 40 MHz of TDD spectrum.

Measuring and monitoring the obligations

8.119 In summary ComReg will measure and monitor the coverage obligation based on the following principles:

- a) ComReg's radio network planning tools, supported by field measurements which may include drive tests where appropriate, would be the key component in assessing compliance with the coverage obligations.
- b) That all rights of use available to the licensee can be used to contribute to meeting the coverage obligations.
- c) ComReg proposes to use an RSRP metric as a proxy for determining licensees compliance with the coverage levels.
- d) While acknowledging that newer technologies will be rolled out over time, LTE technology is expected to continue to be used by operators in delivering data to consumers for some time.
- e) The obligations are set to incentivise operators to rollout new sites as appropriate, upgrade sites with additional spectrum and make use of improvements in technology such as new standards including carrier aggregation and carrier sharing or extension techniques.
- f) Depending how the above techniques are deployed on a network, this will yield varying benefits in terms of increasing the range of a cell for a given throughput.
- g) Where carrier aggregation is deployed using carriers with similar propagation characteristics (e.g. 700, 800 and 900 MHz) that the additional bandwidth and resultant throughput gains will be available, to a large extent, for the whole of the cell range.
- h) Where bands with different propagation characteristics are carrier aggregated, the throughput enhancements will be considered over the range of the highest of the frequency bands.
- i) For the purpose of assessing compliance with the coverage obligation an RSRP base level of -103 dBm be used as a proxy for 30 Mbit/s SUTP using a 10 MHz downlink carrier. Where capacity increasing techniques are used such as carrier aggregation and or deploying additional bandwidth, a lower RSRP value can be used as follows:
 - i. Where additional 10 MHz downlink carriers are added using two or three band carrier aggregation across bands with similar propagation characteristics (e.g. 700 MHz, 800 MHz and 900 MHz carriers) an

RSRP level of -108 dBm and -113 dBm will apply respectively.

- j) For the purpose of assessing compliance with the coverage obligation a RSRP base level of -112 dBm be used as a proxy for 3 Mbit/s SUTP using a 10 MHz downlink carrier. Where capacity increasing techniques are used such as carrier aggregation and or deploying additional bandwidth, a lower RSRP value can be used:
 - i. Where additional 10 MHz downlink carriers are added using two or three band carrier aggregation across bands with similar propagation characteristics (e.g. 700 MHz, 800 MHz and 900 MHz carriers) an RSRP level of -114 dBm and -116 dBm will apply respectively.
- k) Noting that there may be many different potential combinations of spectrum and deployment techniques that could be used by a New Entrant, ComReg would apply the same principles as identified above in determining the appropriate approach to measuring and monitoring the coverage obligations; and
- l) As new technologies or coverage enhancing techniques are rolled out, ComReg will consider proposals from licensees as to how this could influence meeting the coverage obligations.

8.120 ComReg shall identify population coverage for the purposes of measuring and monitoring the population obligation by using the most up to date and appropriate datasets available at the time of conducting the measurement, which at this juncture ComReg envisages to consist of:

- a) generating the population dataset by combining information from the CSO and the Eircode datasets; and
- b) using the residential addresses in the Eircode database to determine the geographic coordinates of the residential locations and the population statistics for the small areas dataset as provided by the CSO.

8.121 In the event of any divergence of opinions and in the absence of manifest error, the file used by ComReg would be definitive in assessing compliance with the obligation.

8.4.6 Performance Bands - Summary of ComReg's view in Document 19/124

8.122 In Chapter 7 of Document 19/124, ComReg set out its preliminary positions on rollout obligations for the Performance Bands.

8.123 In summary, and taking into account the clarifications provided in ComReg's

assessment in Document 19/124, the Performance Band rollout obligation proposed by ComReg in Document 19/124⁷²¹ is that:

- the obligation applies to each of the Performance Bands individually, specifically the 2.1 GHz Band, 2.3 GHz Band, 2.6 GHz FDD Band and the 2.6 GHz TDD Band⁷²²;
- Existing Operators must deploy and maintain the appropriate number of base stations within 4 years of licence commencement as set out in Table 18 below;
- New Entrants must deploy and maintain the appropriate number of base stations within 5 years of licence commencement as set out in Table 18 below;
- a minimum base station capability requirement of 4 bits/Hz⁷²³ will apply for a base station to count towards this obligation;
- a compliance reporting mechanism similar to that used for the 3.6 GHz Award will apply;
- base stations deployed under a leasing arrangement will count towards achieving the rollout obligation; and
- where an operator deploys both a mobile and other service using the Performance bands, the mobile base station rollout obligation will apply.

⁷²¹ Noting that in Document 20/32 ComReg clarified that the 550 base station obligation was incorrect, where the correct value as determined in the draft Rollout RIA was 525.

⁷²² For the avoidance of doubt, if an operator was to obtain rights of use in the 2.6 GHz Duplex and the 2.6 GHz Duplex Gap, the base stations obligation would have to be met in each.

⁷²³ 4 bps/Hz is achievable with LTE-A using 16QAM modulation (See section 3.2.1 of Plum Report 3 Document 1575). Other technologies could achieve this throughput rate utilising 64QAM.

Table 18. Base station Rollout obligation for the Performance Bands⁷²⁴

Service	New Entrant Obligation				Existing Operator ⁷²⁵ Obligation			
	2.1 GHz	2.3 GHz	2.6 GHz FDD	2.6 GHz TDD	2.1 GHz	2.3 GHz	2.6 GHz FDD	2.6 GHz TDD
Time	5 Years				4 Years			
Mobile	Option 2 (290)	Option 2 (290)	Option 2 (290)	Option 3 (290)	Option 4 (1,200)	Option 3 (525)	Option 3 (525)	Option 3 (525)
Other	Option 2 (80)	Option 2 (80)	Option 2 (80)	Option 2 (80)	Option 2 (290)	Option 2 (290)	Option 2 (290)	Option 2 (290)

8.4.7 Performance Bands - Summary of Respondents' Views to Documents 19/124, 20/32 and 20/56

8.124 ComReg received comments from Eir, Imagine, and Vodafone in relation to its rollout obligation proposals for the Performance Bands.

8.125 In its response to Document 20/32, Eir accepts that New Entrants might require more time to meet these targets but sees no justification for setting lower rollout targets for New Entrants compared to Existing Operators. In that regard, Eir submits that:

- this does not promote the efficient use of spectrum; and
- ComReg has not shown that end users would benefit with New Entrants thereby providing, in Eir's view, an inferior minimum standard of service over the licence period.

8.126 In its response to Document 20/32, Imagine proposes that, given the finite

⁷²⁴ ComReg set out its proposal for a base station rollout obligation for the Performance Bands in Table 11 of Document 19/124, which included a proposed requirement for Existing Operators winning rights of use to spectrum in the 2.3 GHz Band and / or the 2.6 GHz Band to roll out 550 base stations within 4 years in each of these bands. However, in Annex 11 of document 19/124, "Draft Rollout RIA – Performance Bands", ComReg proposed to set the obligation at 525 base stations for such cases. Therefore, the base station rollout obligation for the Performance Bands has been updated in Table 18 here to reflect the outcome of the Draft Rollout RIA – Performance Bands. The corrected figures were also reflected in Table 10 of Document 20/32.

⁷²⁵ Existing operator refers to the existing licensees in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz bands.

spectrum resources available:

- a higher rollout obligation, e.g. 400 base stations, should apply to an Existing Operator (other than an Existing MNO), than the 290 proposed by ComReg; and
- the same rollout obligation should apply to all New Entrants, whether MNOs or other operators.

8.127 Vodafone, in its response to 19/124, submits that the proposed rollout obligations go beyond ComReg's proposals for precautionary obligations. Further, Vodafone made several specific comments in relation to these proposals in its response to Document 19/124, which it reiterated in its response to Document 20/32.

8.128 Vodafone submits that it is inaccurate to label the 2.1 GHz, 2.3 GHz and 2.6 GHz Bands (FDD and TDD) as Performance Bands and also that the number of such bands to deploy at a particular site is best determined by customer demand.

8.129 In that regard, Vodafone submits that:

- while these additional bands can be used to provide high capacity solutions in areas such as railway stations, rural customers can often obtain better data rates from sites with fewer frequency bands installed than customers in areas with higher population;
- the number of bands is not the most significant of the multiple factors affecting customer experience; and
- the current number of sites equipped with 2.1 GHz Band 3G equipment is not a good measure of the optimum number of sites to be equipped with 2.1GHz in a multi-band technology-neutral network, as the lower bands could more efficiently support the same customer services.

8.130 Vodafone also submits that, as all bands, will be technology and service neutral in the future, the previous justification for having high site numbers equipped with specific bands will not apply, and that it does not anticipate any customer service advantage from installing 2.6 GHz Band equipment at 500 sites within 4 years to meet the rollout targets for Existing MNOs proposed by ComReg.

8.131 In addition, Vodafone submits that, in its view, the proposed rollout obligations would increase the risk of unsold blocks of spectrum in each band in the auction, as bidders interested in procuring small quantities of spectrum in a band⁷²⁶ to deploy at limited locations could be discouraged by the requirement to meet the

⁷²⁶ E.g. 10 MHz of spectrum in the 2.3 GHz Band.

full rollout obligation regardless of the quantum of spectrum won.

8.132 Vodafone proposes a single rollout target of 500 sites in at least one of the Performance Bands within 5 years given the substitutability between those bands. In Vodafone's view, this would be a suitable figure to prevent spectrum hoarding.

8.133 Vodafone also contends that, if 2.3 GHz and 2.6 GHz Band spectrum is to be awarded in two time-slices that it would be inefficient to equip specific counts of sites with high band equipment if different amounts of spectrum are awarded in each time-slice.

8.134 Vodafone further suggests extending the four year rollout obligation for Existing Operators to seven years to align with the seven year timeline of ComReg's proposed coverage obligations for Existing MNOs. In Vodafone's view, this would allow for greater deployment efficiencies as operators could equip a site to meet both coverage and rollout obligations in a single visit.

8.4.8 Performance Bands - ComReg's assessment of respondent's views

Assessment of Eir's New Entrant Rollout Target Proposal

8.135 In relation to Eir's submission that New Entrants should be subject to the same minimum targets as Existing Operators, albeit over a longer timeframe, ComReg does not accept Eir's view for the reasons as set out in ComReg's Rollout RIA, in particular the reasons set out below.

8.136 First, as discussed in more detail below, ComReg considers that there are overall benefits to having new competitors enter the market regardless of the extent of their rollout and that setting New Entrant rollout obligations at too high a level could act as a barrier to market entry. In ComReg's view it would not be appropriate to apply the same rollout targets to operators new to the market, who would have to acquire new sites, compared to Existing Operators who enjoy the advantages of established networks with a large number of sites and an established customer base.

8.137 Second, while promoting the efficient use of spectrum and the interests of end users are important statutory objectives for ComReg, ComReg nevertheless has to balance these objectives with several of its other relevant statutory objectives in its considerations. ComReg's assessment in the 'Draft Rollout RIA' in Document 19/124 was guided by what it considers to be the most relevant of its statutory objectives, including:

- a) assigning rights of use in the 2.1 GHz band in line with the 2.1 GHz

EC Decision and other relevant legislation;

- b) assigning rights of use in the 2.6 GHz band in line with the 2.6 GHz EC Decision and other relevant legislation;
- c) to ensure that all end users, including disabled users, derive maximum benefit in terms of choice, price and quality;
- d) to encourage the efficient use and ensure the effective management of spectrum; and
- e) to ensure there is no distortion or restriction of competition in the electronic communications sector.

8.138 Accordingly, ComReg's assessment in the 'Draft RIA' favoured on balance setting lower rollout targets for New Entrants compared to Existing Operators for reasons including that:

- a) a New Entrant would likely have a lightly loaded network until it gained a sufficient market share and therefore may have little justification in rolling out Performance Bands beyond the more densely populated areas of the country over the rollout period;
- b) a non-mobile entrant would likely prefer a lower obligation closer to the 3.6 GHz Award obligations (**80 sites**) which resulted in new entry in that award;
- c) a high rollout obligation could act as a significant barrier to entry for a New Entrant as such an obligation is unlikely to correspond to the market share and business needs of a New Entrant, at least in the short to medium term;
- d) higher rollout targets for New Entrants could negatively impact on competition at the retail level by increasing the likelihood that they would make inefficient investment in infrastructure;
- e) given the different uses likely to arise from the Performance Bands, consumers are likely to prefer different options for rollout obligations depending on the services provided by winning bidders and whether new entry is promoted;
- f) in that regard, consumers are likely to prefer options that strike the right balance between encouraging rollout to the greatest extent (ensuring that spectrum is used efficiently) and promoting competition; and
- g) consumers would prefer a lower rollout obligation for new mobile

entrants as this would encourage new entry and ensure any New Entrants would be required to provide services to a minimum level.

8.139 Third, in ComReg's view, Eir has not provided any convincing argument that New Entrants might provide an inferior minimum standard of service and has not described how, in its view, such a service would be inferior. In that connection, ComReg considers that there is no basis at this point in time to conclude that the level of service that would be offered by a New Entrant would not be satisfactory for many consumers, considering that:

- a) a particular market segment that is not mobile outside of densely populated urban areas might be satisfied with the offering of a New Entrant that wins only Performance Band spectrum and initially focuses its rollout in those areas to develop its customer base while meeting its minimum rollout obligation;
- b) a New Entrant could win 700 MHz Duplex spectrum in addition to Performance Band spectrum in the Award, thus requiring it to serve a significant percentage of the population⁷²⁷ under coverage obligations and enabling it to provide greater data throughput; and
- c) once established in the market with a customer base, a New Entrant would likely be more confident about further investing in its network and extending its network beyond the minimum rollout obligation target, noting that competition in the market might incentivise the New Entrant to further develop and build out its network.

8.140 In any case, ComReg notes that consumers interested in other levels of service would still have the option to subscribe to established operators.

8.141 Finally in relation to Eir's submission, ComReg considers that only giving New Entrants somewhat more time to achieve the same rollout targets as Existing Operators could discourage potential New Entrants from participating in the Award and entering the market, as they might not see the business case for investing up front in a more extensive longer term rollout without having first achieved a sufficient market share that would justify such additional rollout beyond the medium term.

Assessment of Imagine's Rollout Target Proposals

8.142 ComReg does not accept Imagine's proposals to apply a higher rollout target (400 base stations) to "Existing Operators (Other)" than that proposed in Document 19/124 and to apply the same rollout obligation to all New Entrants,

⁷²⁷Population coverage obligations for a New Entrant of 75% within 4 years, 80% within 6 years and 90% within 10 years. See further Section 8.4.5 above.

whether MNOs or other operators.

8.143 Imagine puts forward its proposals on the grounds of 'finite spectrum resources available'. However, it does not provide any supporting material that would indicate whether its proposals would be achievable for the relevant operators or whether they would be of greater benefit to competition and consumers.

8.144 As earlier outlined, while promoting the efficient use of the radio spectrum is an important statutory objective for ComReg, ComReg nevertheless has to balance this objective with several of its other relevant statutory objectives in its considerations, including the 'Rollout RIA', as updated in Annex 11.

8.145 ComReg's assessment in the 'Rollout RIA' favours on balance, the setting of lower rollout targets for Existing Operators (Other) compared to Existing Operators (Mobile), given that:

- a) "Existing Operators (Other)" are unlikely to prefer a higher rollout obligation of 500 or more base stations, such as in line with Option 3 in the 'Rollout RIA', as that option:
 - i. is informed by the rollout of the 1800 MHz Band which is used to deliver mobile services, and such a rollout would not be suitable for a FWA network;
 - ii. would require existing FWA operators to rollout additional base stations in areas where they may not necessarily have appropriate demand;
 - iii. this could also potentially result in such operators having to make inefficient investments in their network;
- b) a lower rollout target of 290 base stations for Existing Operators (Other) would have a more positive impact on competition with respect to such operators because:
 - i. rollout would not be set at a level above that which they could achieve commercially;
 - ii. higher obligations would likely act as a significant barrier to entry as rollout set at these higher levels would likely be above what could be achieved commercially;
 - iii. higher obligations could also negatively impact on competition at the retail level by increasing the likelihood that winning bidders would make inefficient investment in infrastructure;
- c) consumers would likely prefer a rollout of 290 base stations for **fixed wireless** services compared to higher rollout obligations of 500 or

more for reasons including that:

- i. it would provide for fixed wireless services to be rolled across a meaningful area;
- ii. it is unlikely to place an onerous obligation on FWA service providers requiring inefficient investment or leading to higher prices.

8.146 Therefore, Imagine's proposed rollout target of 400 base stations is in excess of what ComReg considers would, on balance, be in the overall interests of relevant stakeholders.

8.147 Further, ComReg's assessment in the 'Rollout RIA' favours, on balance, setting lower rollout targets for "New Entrants (Other)" compared to "New Entrants (Mobile)", in particular considering that:

- a) a mobile entrant is likely to look more favourably on a rollout obligation of 290 sites as this is unlikely to be above what it would undertake regardless of any obligation;
- b) a non-mobile entrant would also likely prefer a lower rollout obligation of 80 sites, which is closer to the 3.6 GHz Award obligations⁷²⁸ which resulted in new entry in that award;
- c) a lower rollout obligation of 80 base stations for "Existing Operators (Other)" would have a more positive impact on competition with respect to such operators because:
 - i. rollout would not be set at a level above that which operators could achieve commercially. Higher obligations of greater than 290 sites would likely act as a significant barrier to entry as rollout set at these levels would likely be above what could be achieved commercially;
 - ii. Higher obligations could also negatively impact on competition at the retail level by increasing the likelihood that winning bidders would make inefficient investment in infrastructure;
- d) consumers would likely prefer a rollout of 80 base stations for **fixed wireless** services compared to higher rollout obligations of 290 or more for reasons including that:

⁷²⁸ I.e. the obligations that apply in to licensees holding 3.6 GHz Band spectrum rights in all nine regions (i.e. countrywide) under the 3.6 GHz Award: 78 base stations for licensees holding less than or equal to 100 MHz in the band and 131 base stations for licensees holding 100 MHz in the band.

- i. it would provide for fixed wireless services to be rolled across a meaningful area;
- ii. it would best encourage potential new FWA entry which could provide more choice for consumers;
- iii. it is unlikely to place an onerous obligation on FWA service providers requiring inefficient investment or leading to higher prices; and
- iv. this would encourage new entry and ensure any New Entrants would be required to provide services to a minimum level.

8.148 In ComReg's view, Imagine's proposed rollout target would disproportionately favour Imagine over other potential operators in the Performance Bands as:

- a) Imagine has rolled out 235 sites⁷²⁹ in the 3.6 GHz Band and may therefore feel confident that on the basis of these existing sites it could rollout out 400 sites in the Performance Bands;
- b) the other operator within the category "Existing Operator (Other)", Dense Air, has rolled out 31 sites⁷³⁰ in the 3.6 GHz Band and would therefore, if it were to participate in this award, face a greater challenge than Imagine to meet a rollout obligation of 400 sites in the Performance Bands; and
- c) as noted above, higher rollout obligations for New Entrants would likely act as a significant barrier to entry as rollout set at these levels would likely be above what could be achieved commercially.

8.149 In light of the above, ComReg does not consider that Imagine's proposals are appropriate as they are not proportionate or based on a balanced assessment of the options in line with ComReg's statutory objectives.

Assessment of Vodafone's views on terminology and factors likely affecting Performance Band deployment at sites

8.150 In relation to Vodafone's argument that it is inaccurate to label the 2.1 GHz, 2.3 GHz and 2.6 GHz Bands (FDD and TDD) as Performance Bands and also that the number of such bands to deploy at a particular sites is best determined by customer demand, ComReg notes that Vodafone provided the same argument in its response to Document 19/59R and ComReg has already considered these

⁷²⁹ Data from ComReg Siteviewer as of 17 December 2020.

⁷³⁰ Data from ComReg Siteviewer as of 17 December 2020.

arguments in Section 7.4.6 of Document 19/124⁷³¹.

8.151 Further, ComReg observes that Vodafone did not raise any additional points in support of these argument in its responses to Documents 19/124 & 20/32.

Assessment of Vodafone's views on Rollout Targets for Existing MNOs

8.152 Vodafone argues that, as all bands will, in the future, be technology and service neutral, the previous justification for having high site numbers equipped with specific bands will not apply, and that it does not anticipate any customer service advantage from installing 2.6 GHz Band equipment at 500 sites within 4 years to meet the rollout targets for Existing MNOs proposed by ComReg. However, ComReg does not find this argument persuasive for the reasons set out below.

8.153 First, the efficient use of spectrum, promotion of competition and the interests of consumers are taken into account in developing these proposals, as set out in the 'Draft Rollout RIA Performance Bands' in Annex 11 of Document 19/124. In that regard, it would not be appropriate if a Winning Bidder was to deploy in limited areas in the 2.6 GHz Band or any of the other Performance Bands, thus hindering competitors who otherwise might use the spectrum.

8.154 Second, ComReg considered in Section 7.4.6 of Document 19/124, that its proposed rollout obligations would not be in excess of what operators would likely deliver commercially in a competitive market, given that:

- a) rival operators to Vodafone, who both have less market share and, in some cases, (particularly Eir)⁷³² a less developed network, all acknowledge that the proposed rollout rate is achievable;
- b) it seems implausible that the operator with the most subscribers would rollout the Performance Bands (which are used to provide capacity) at significantly lower rates than its rivals; and
- c) even if Vodafone intended to rollout at lower levels, rival operators with less market share are targeting rollout rates significantly in excess of these levels which would likely incentivise Vodafone to increase its rollout rate in order to maintain its market share.⁷³³

8.155 Third, in the 'Draft Rollout RIA Performance Bands' in Annex 11 of Document 19/124, ComReg considered that, for existing **mobile services**, consumers

⁷³¹ Specifically in paragraph 7.151 of Document 19/124.

⁷³² Eir has less sites and spectrum rights of use than both Three and Vodafone.

⁷³³ For example, Didier Clavero, Vodafone Ireland CTO, recently noted that Vodafone "continually work(s) hard to maintain our position as the leading voice and data mobile provider in the country".
<https://n.vodafone.ie/aboutus/press/vodafone-ireland-extends-5g-network-test-bed-as-it-prepares-for-.html>

would likely prefer that the 2.3 GHz Band and 2.6 GHz Band were subject to Option 3 (525 base stations), compared to other options⁷³⁴ for rollout obligations considered for those bands, given that:

- a) it would increase the potential for these bands to be assigned to users who would provide services that consumer's value over a long period;
- b) it would not discourage MNOs from potentially acquiring additional spectrum which enables considerably higher user data rates and supports a greater number of users, all of which will substantially enhance the consumer experience; and
- c) the greater connectivity benefits would be achieved across a wider area benefiting more consumers than Option 2 (290 base stations).

8.156 Fourth, the Frontier Connectivity Report (Document 18/103b) noted that demand for connectivity is growing in Ireland and forecast that mobile data demand would likely increase fourfold from 268 million GB/year in 2017 to 1,059 million GB/year in 2022. Notably, the Frontier Connectivity Report concluded that:

- the award of 700 MHz combined with higher frequency spectrum (such as 2.1 GHz, 2.3 GHz and/or 2.6 GHz) could support capacity in densely populated and congested urban areas; and
- significantly boost speeds currently obtained by existing consumers by enabling three-band Carrier Aggregation, which Frontier consider to be a key technology that will reduce the cost of high-speed connectivity.

8.157 Further to the above, it should be noted that 3GPP Release 15⁷³⁵ supports carrier aggregation across multiple capacity bands above 1 GHz, including the Performance Bands, offering the potential to deliver even greater data speeds to consumers.

8.158 Fifth, ComReg does not find it credible that Vodafone would not deploy at least 500 base stations in the 2.6 GHz Band to meet customer demand, given that:

- a) Vodafone has already deployed [X ██████████ ██████████ X] sites countrywide in the 1800 MHz Band which provide capacity using LTE, as shown in Table 19;
- b) ComReg's analysis indicates that [X ██████████ ██████████ X] of these sites

⁷³⁴ Option 1, (no rollout), Option 2 (290 base stations) and Option 4 (1200 base stations).

⁷³⁵ 3GPP TS 36.101, "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception", <https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=2411>.

are located within the urban and suburban areas of the five cities as shown in Table 20;

- c) these [X [REDACTED] X] sites are in densely populated urban/suburban areas where customer demand for additional capacity to support new services would likely provide a business case for Performance Band rollout compared to more rural areas; and
- d) it is likely that Vodafone would deploy a similar⁷³⁶, or greater number⁷³⁷ of sites in the 2.6 GHz Band in order to provide sufficient additional capacity to meet customer demand for new services across these areas.

8.159 In any case, ComReg considers that competition from the other Existing MNOs would incentivise Vodafone to likely at least match them with capacity and coverage (and therefore correspondingly with rollout) in the band. In that connection, ComReg considers that the other Existing MNOs would likely rollout at least 525 base stations in the 2.6 GHz Band, as required by the rollout obligation for Existing Operators (Mobile), given that:

- a) neither Eir nor Three disagreed in their submissions to Documents 19/124 and 20/32 with setting rollout targets for Existing MNOs at 525 base stations; and
- b) as noted above in relation to Vodafone, the current 1800 MHz Band rollouts⁷³⁸ of these MNOs would at least be indicative of any future rollout by them in the 2.6 GHz Band⁷³⁹.

⁷³⁶ ComReg notes that this number is conservative as it does not include other densely populated areas outside the city areas such as satellite towns (e.g. Swords, Malahide, Skerries, Balbriggan, Leixlip and Maynooth outside Dublin) and other large towns (e.g. Athlone, Drogheda, Dundalk, Letterkenny, Mullingar Tralee, Wexford etc.).

⁷³⁷ Given the less favourable propagation in the 2.6 GHz Band compared to the 1800 MHz Band.

⁷³⁸ As shown in Table 19 for countrywide and Table 20 for the cities.

⁷³⁹ Eir has rolled out [X [REDACTED] X] LTE base stations in the 1800 MHz Band. However, this number is a conservative indication of the 1800 MHz Band LTE base stations that Eir has deployed in the densely populated areas, as Eir has deployed additional 1800 MHz Band LTE base stations in other densely populated areas outside the cities. In any case, Eir has deployed [X [REDACTED] X] such base stations countrywide and has not indicated in its submissions to Documents 19/124 and 20/32 any preference to deploy fewer 2.6 GHz base stations outside the densely populated areas or that it disagrees with applying a rollout target of 525 base stations to Existing MNOs in the 2.6 GHz Band.

Table 19. Current MNO 1800 MHz Band LTE base station deployments countrywide⁷⁴⁰

No. LTE Base Stations in 1800 MHz Band Countrywide		
Eir	Three	Vodafone
[X ■ X]	[X ■ X]	[X ■ X]

Table 20. Current MNO 1800 MHz Band LTE base station deployments in the cities⁷⁴¹

City ⁷⁴² (incl. urban and suburban areas)	No. LTE Base Stations in 1800 MHz Band		
	Eir	Three	Vodafone
Cork	[X ■ X]	[X ■ X]	[X ■ X]
Dublin	[X ■ X]	[X ■ X]	[X ■ X]
Galway	[X ■ X]	[X ■ X]	[X ■ X]
Limerick	[X ■ X]	[X ■ X]	[X ■ X]
Waterford	[X ■ X]	[X ■ X]	[X ■ X]
TOTAL	[X ■ X]	[X ■ X]	[X ■ X]

8.160 In the light of above, ComReg is satisfied that its rollout obligations for Existing MNOs for the 2.3 GHz, and 2.6 GHz bands are in line with what such operators would likely rollout commercially and are thus consistent with the precautionary approach.

Assessment of Vodafone's Views on Bidders Interested in limited Rollout

⁷⁴⁰ From data provided to ComReg by the Existing MNOs in November 2020.

⁷⁴¹ From data provided to ComReg by the Existing MNOs in November 2020.

⁷⁴² City areas as defined by the CSO in the Census 2011 Boundary Files for Cork City and Suburbs, Dublin City and Suburbs, Galway City and Suburbs, Limerick City and Suburbs, and Waterford City and Suburbs. <https://www.cso.ie/en/census/census2011boundaryfiles/>. In particular, the ESRI shape files that set out the boundaries of these areas, among others, can be downloaded from http://census.cso.ie/censusasp/saps/boundaries/Census2011_Settlements.zip.

in Performance Bands

- 8.161 Vodafone's submits that the proposed rollout obligations would discourage bidders interested in procuring small quantities of spectrum in a band to deploy at limited locations and increase the risk of unsold lots.
- 8.162 ComReg notes that Vodafone provided the same argument in its response to Document 19/59R. ComReg already addressed this argument in Section 7.4.6 of Document 19/124⁷⁴³.
- 8.163 Further, ComReg observes that Vodafone did not raise any additional points in support of this view in its responses to Documents 19/124 & 20/32.

Assessment of Vodafone's Proposal for a Single Rollout Target for the Performance Bands

- 8.164 Vodafone proposes a single rollout target of 500 sites in at least one of the Performance Bands within 5 years given the substitutability between those bands and Vodafone's view that this would be a suitable figure to prevent spectrum hoarding.
- 8.165 ComReg notes that Vodafone provided the same proposal in its response to Document 19/59R. ComReg already addressed this proposal in Section 7.4.6 of Document 19/124⁷⁴⁴.
- 8.166 Further, ComReg observes that Vodafone did not raise any additional points in support of this proposal in its responses to Documents 19/124 & 20/32.

Vodafone's concern in relation to winning different quantum of spectrum across two time slices

- 8.167 In relation to Vodafone's concern ComReg notes that a licensee would have spectrum rights in the band across the full period of both time slices and would continue to enjoy the benefits of a Time Slice 1 rollout into Time Slice 2;
- 8.168 It may be the case that the licensee needs to modify equipment at its sites to transition to its new quantum of spectrum assigned in Time Slice 2. However, such factors need not constrain a licensee's rollout, as ComReg has set out a Transition Framework⁷⁴⁵ to facilitate such transition activities. This framework includes arrangements for Time Slice 2 Transition which may be required where any new rights of use won by a winning bidder in the 2.1 GHz, 2.3 GHz and/or 2.6 GHz bands for Time Slice 2 are different, in frequency location and/or

⁷⁴³ Specifically, in paragraph 7.154 of Document 19/124.

⁷⁴⁴ Specifically in paragraph 7.154 of Document 19/124.

⁷⁴⁵ See further Chapter 9.

quantum of spectrum, to the spectrum rights in those band(s) won by same bidder in Time Slice 1.

8.169 Further, in that regard, ComReg notes that should a bidder have a strategy of not holding a different quantum of spectrum in a band across time slices, it can ensure this by bidding only for packages that have the same quantum in both time slices.

Assessment of Vodafone's Proposal to Extend Timescale for Existing Operator Rollout Obligations

8.170 ComReg does not agree with Vodafone's proposal to modify the four-year timeline of the rollout obligation for Existing Operators to seven years to align with the seven year timeline of ComReg's proposed coverage obligations for Existing MNOs.

8.171 The Oxera / Real Wireless Report (Document 18/103c) modelled a standard network rollout of 2.5% CAGR which corresponds to a new site every week or an upgrade every two days⁷⁴⁶. Over a three-year period this would result in approximately 156 new sites and 547 upgrades. ComReg also notes that since the issue of the COVID-19 Temporary ECS licences in April this year, existing operators have shown an ability to upgrade sites rapidly⁷⁴⁷. In that regard, ComReg notes that it has set the timescale for Existing operators conservatively at four years. ComReg considers that in the interests of rolling out new services and capacity for consumers as soon as possible in the Performance Bands, it would not be appropriate to delay such rollout any further than is necessary.

8.172 Additionally, ComReg notes that Vodafone submits that a seven-year rollout timescale would enable an MNO to implement a site upgrade and rollout programme based on single visits to sites to equip sites to meet both coverage and rollout obligations.

8.173 However, in ComReg's view, a four year rollout timescale for Existing Operators is not necessarily inconsistent with a programme to equip sites in a single visit for both coverage and rollout, as an Existing MNO would likely have to visit between 469 and 675 sites in the first 4 years as part of its programme to equip sites for coverage within seven years. ComReg takes this view considering that:

- a) the Oxera / Real Wireless Report estimates that to achieve 95% population coverage at 30 Mbit/s in seven years would require 270 to

⁷⁴⁶ Footnote 10 of Document 18/103c

⁷⁴⁷ Where for 700 MHz Duplex and 2.1 GHz Band operators have upgraded in the last 8 months on average 313 and 515 sites, respectively.

378 new sites to be built and 825 to 1197 site upgrades⁷⁴⁸;

- b) this would therefore entail visiting a minimum of 1095 and a maximum of 1575 sites over seven years;
- c) on a pro-rata basis an operator would have to visit a minimum of 469 and a maximum of 675 sites in the first four years; and
- d) on average this would be 572 sites in the first four years, which is greater than 525 sites, noting that the minimum number of site visits likely to be required is not significantly below the 525 base station rollout requirement for Existing MNOs in the 2.3 GHz and 2.6 GHz Bands.

8.174 However, clearly, if an existing operator were to obtain rights of use in both the 700 MHz Duplex and Performance Bands, how it might achieve the respective obligations would be a matter for it to consider, noting that existing operators have existing coverage footprints using existing rights of use.

8.175 In view of the above, and noting that no other respondents, including other MNOs disagree with the rollout timescales proposed by ComReg, ComReg does not find Vodafone's proposal to extend the timescales persuasive and remains of the view that they are appropriate.

8.176 Finally, having considered above the views of all respondents on the matter, ComReg is of the view that (i) the proposed rollout obligations are precautionary and (ii) they are achievable within the timelines set out by ComReg in Document 19/124 and (iii) not overburdensome.

8.4.9 Performance Bands - ComReg's Final position

8.177 In light of the above, ComReg's Final position on the appropriate rollout obligation is that:

- a) the obligation applies to each of the Performance Bands, specifically the 2.1 GHz Band, 2.3 GHz Band, 2.6 GHz FDD Band and the 2.6 GHz TDD Band;
- b) Existing Operators must deploy and maintain the appropriate number of base stations within 4 years as set out in Table 21 below;
- c) New Entrants must deploy and maintain the appropriate number of base stations within 5 years as set out in Table 21 below;

⁷⁴⁸ Table 5.8 of the Oxera / Real Wireless Report.

- d) a minimum base station capability requirement of 4 bits/Hz⁷⁴⁹ applies for a base station to count towards this obligation;
- e) a compliance reporting mechanism similar to that used for the 3.6 GHz Award will apply and as currently set out in draft form in Document 20/32;
- f) base stations deployed under a leasing arrangement will count towards achieving the rollout obligation; and
- g) where an operator deploys both a mobile and other service using the Performance bands, the mobile base station rollout obligation will apply.

Table 21. Base station Rollout obligation for the Performance Bands for rights in a band across both Time Slice 1 and Time Slice 2

Service	New Entrant Obligation				Existing Operator ⁷⁵⁰ Obligation			
	2.1 GHz	2.3 GHz	2.6 GHz FDD	2.6 GHz TDD	2.1 GHz	2.3 GHz	2.6 GHz FDD	2.6 GHz TDD
Time	5 Years				4 Years			
Mobile	290	290	290	290	1,200	525	525	525
Other	80	80	80	80	290	290	290	290

8.4.10 Precautionary and interventionist coverage obligations

Summary of ComReg's view in Document 19/124

8.178 In Chapter 7 of Document 19/124, ComReg's consideration of coverage obligations for the 700 MHz Duplex was informed by amongst other things the DotEcon Connectivity Report (Document 18/103d) and also considered various options, including the use of 'precautionary' and 'interventionist' coverage obligations where:

- 'precautionary' coverage obligations refer to obligations which do not exceed the levels of coverage that might be expected anyway from well-functioning competition between network operators; and
- 'interventionist' coverage obligations refer to obligations that can be

⁷⁴⁹ 4 bps/Hz is achievable with LTE-A using 16QAM modulation (See section 3.2.1 of Plum Report 3 Document 1575). Other technologies could achieve this throughput rate utilising 64QAM.

⁷⁵⁰ Existing operator refers to the existing licensees in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz bands.

expected to constrain the commercial choices of network operators and force coverage in excess of competitively-determined levels.

- 8.179 ComReg's approach, as outlined in Document 19/124⁷⁵¹ was to set coverage obligations which are precautionary in nature, and are towards the upper end of the range of commercially realistic competitive outcomes. ComReg noted that among other things, this would encourage competition in the award process, thereby underpinning the role of competition in driving coverage, and avoid outcomes where spectrum rights may be unassigned because the coverage obligation was excessive.
- 8.180 ComReg set out comprehensive proposals in relation to precautionary coverage obligations in Document 19/124. ComReg also noted that there may be broader social reasons that would support 'interventionist' coverage obligations to secure more extensive coverage outcomes than would result from marketplace competition alone and observed that such an approach would need to be carefully designed, and based on an assessment of the costs and benefits to society of the additional coverage sought.
- 8.181 ComReg further observed that 'interventionist' obligations are ideally achieved via a sequential step in a spectrum award or through a separate process. Where such mechanisms may provide advantages for the State in ensuring that the societal benefits obtained exceed the costs of any such obligations. The use of a separate step would also allow policy makers the ability to identify what 'precautionary' coverage obligations and competition between network operators would first deliver, retaining the ability for more targeted interventions later if necessary.
- 8.182 Noting the above and having regard to, among other things, the limited submissions received at that time in support of the inclusion of a mechanism in the Proposed Award by which to procure coverage outcomes beyond market-driven levels and mindful of the timing obligations, and clear benefits of a prompt award of rights of use in the 700 MHz Duplex (along with the spectrum efficiency and related consumer benefits from the earlier award of rights of use in the other Proposed Bands), ComReg stated that it intended to advance the Proposed Award targeting the imposition of precautionary coverage and other obligations as summarised above and as set out in Sections 7.4.5, 7.4.6 and 7.4.7 of Document 19/124.
- 8.183 ComReg further outlined that it remains prepared to assist the State in any subsequent step it may wish to pursue by which to procure coverage outcomes beyond market-driven levels, noting the advantages of a separate step

⁷⁵¹ And also in Document 19/59R

previously identified by ComReg including:

- seeing what the proposed precautionary obligations and competition between operators would first deliver; and
- thereby better ensuring that the societal benefits obtained from any intervention exceed the costs of imposing same.

Summary of Respondents Views to Document 19/124, 20/32, 20/56

8.184 Two respondents (Three and Vodafone) commented on precautionary and interventionist obligations in their responses to Document 19/124. Both respondents agree with ComReg's proposed overall approach to set coverage and other obligations which are precautionary in nature.

8.185 Both respondents⁷⁵² also provided their related views on whether the coverage and rollout obligations proposed by ComReg are precautionary or interventionist in nature. These views are described in Sections 8.4.3 and 8.4.7 above.

8.186 No respondents submitted views to the above documents on implementing interventionist obligations.

ComReg's Assessment of Respondent's Views

8.187 ComReg notes that both respondents agree with the overall precautionary approach to setting coverage and other obligations and that no respondents disagree with the approach. ComReg is not aware of any other information which would warrant reconsideration of the precautionary approach.

8.188 In relation to the related views of Three and Vodafone as to whether the coverage and rollout obligations proposed by ComReg are precautionary or interventionist in nature, ComReg has set out its careful considerations of these views in Sections 8.4.4 and 8.4.8 above, where it has revised certain parameters relating to the method for measuring and monitoring the 700 MHz Duplex coverage obligation.

8.189 In the light of these respondents' views, ComReg concludes in Sections 8.4.4 and 8.4.8 above that the proposed coverage and rollout obligations are (i) precautionary and (ii) they are achievable within the timelines set out by ComReg in Document 19/124 and (iii) not overburdensome.

⁷⁵² Vodafone in relation to Both the coverage and rollout obligation and Three in relation to the coverage obligation.

ComReg's Final position

8.190 ComReg sets out in its decision an extensive set of precautionary coverage obligations and other obligations to be met over a seven (7) year time period from the commencement of spectrum rights of use in the Award Bands.

8.191 The obligations for an existing MNO include obligations to⁷⁵³:

- a) deploy and maintain VoLTE⁷⁵⁴ and Native Wi-Fi⁷⁵⁵ technology on its network to improve the coverage and quality of voice and text services as appropriate and make them available to consumers under certain conditions within 2 years;
- b) provide and maintain:
 - i. 30 Mbit/s outdoor coverage to 95% of the population in 7 years, with milestone obligations of 92% in 5 years and 85% in 3 years;
 - ii. 30 Mbit/s outdoor coverage to 90% of the motorway network in 7 years with milestone obligations of 85% in 5 years and 75% in 3 years;
 - iii. 30 Mbit/s outdoor coverage to 80% of the primary road network in 7 years with milestone obligations of 75% in 5 years and 60% in 3 years;
 - iv. 3 Mbit/s outdoor coverage to 99% of the population in 3 years;
 - v. 3 Mbit/s outdoor coverage to 92% of the geographic area of the state in 7 years with milestone obligations of 91% in 5 years and 90% in 3 years; and
 - vi. 30 Mbit/s outdoor coverage to 345 specific locations, including, 65 hospitals, 24 higher education campuses, 40 industrial areas, 14 air and sea ports, 160 train and bus stations and 42 top visitor attractions information points. 100% coverage of each category in 7 years, with milestone obligations of 90% in 5 years and 70% in 3 years.

8.192 Further, should an existing mobile operator obtain rights of use and deploy mobile services in the 2.1 GHz, 2.3 GHz, 2.6 GHz FDD Band or 2.6 GHz TDD Band, it must deploy and maintain 1,200 base stations in the 2.1 GHz Band and

⁷⁵³ All throughput obligations relate to a single user throughput cell edge requirement (SUTP).

⁷⁵⁴ See Section 8.5 for relevant detail.

⁷⁵⁵ See Section 8.4.5 for relevant detail.

525 base stations in each of the other bands across the country within four years.

8.193 These obligations will oblige existing mobile network operators to improve mobile coverage to levels towards the upper end of the range of commercially realistic competitive outcomes. Competition may also drive coverage beyond these levels, and the setting of precautionary coverage obligations as outlined above will, among other things, encourage competition in the award process, thereby underpinning the role of competition in driving coverage. This should also avoid outcomes where spectrum rights may be unassigned because the coverage obligation was excessive.

8.194 Accordingly, ComReg has set out a range of precautionary coverage and other obligations, as summarised above, for inclusion in the conditions of MBSA2 Liberalised Licences to be issued on foot of the Award.

8.195 ComReg nevertheless remains prepared to assist the State in any subsequent step it may wish to pursue by which to procure coverage outcomes beyond market-driven levels, noting the advantages of a separate step previously identified by ComReg including:

- a) seeing what the precautionary obligations and competition between operators would first deliver; and
- b) thereby better ensuring that the societal benefits obtained from any intervention exceed the costs of imposing same.

8.5 Quality of service obligations

8.5.1 Introduction

8.196 In Section 7.5 of Document 19/124, ComReg proposed to apply Quality of Service (QoS) conditions, consisting of network availability and voice call standards including VoLTE obligations, in respect of any rights of use issued on foot of the Proposed Award.

8.197 Considering the above, this section sets out the following in relation to its proposals for Network Availability, Voice Call Standards and VoLTE Obligations:

- a summary of ComReg's proposals in Document 19/124;
- a summary of the views of respondents to Document 19/124;
- ComReg's assessment of respondents' views in relation to same; and
- ComReg's final position.

8.5.2 Summary of ComReg's view in Document 19/124

Network Availability

8.198 In relation to the network availability obligation, ComReg proposed the following:

- each licensee is to keep a log of network availability, available for inspection by ComReg;
- each licensee is to ensure that network unavailability is less than 35 minutes per six-month period; and
- the calculation of network unavailability will be subject to weighting factors⁷⁵⁶ that take account of traffic load variations.

8.199 ComReg further proposed that all relevant services provided to a licensee's customers and third party customers (e.g. MVNOs) by a licensee would be encompassed by this QoS obligation, which would be assessed against the aggregate total.

8.200 Reasons informing these proposals included:

- ComReg's draft RIA on the proposed imposition of an 'availability of the network' QoS obligation (as set out in Annex 12 of Document 19/124); and
- the need to protect end users against unreasonable levels of disruption to their service and safeguard the interests of consumers against operators who might otherwise have unacceptably high levels of network unavailability.

8.201 ComReg subsequently reflected this proposed condition in Section 6 ("Quality of Service (QoS) Obligations") of Part 4 to Schedule 1 of the Draft Regulations published in Annex 2 of Document 20/32.

Voice Call Standards

8.202 ComReg proposed to apply the same minimum voice call standards in the Proposed Bands as those applied in the 3.6 GHz Band Award. In that connection, each licensee providing voice services would ensure that for each six-month period:

- the maximum Permissible Blocking Rates are not exceeded;

⁷⁵⁶ As set out in paragraph 8.238 of Document 19/59R.

- the maximum Permissible Dropped Call Rates are not exceeded; and
- the speech transmission quality meets or exceeds the appropriate standard.

8.203 ComReg also proposed that all relevant 'Managed' voice call services⁷⁵⁷, provided to customers and third-party customers by a licensee would be captured under this QoS obligation. ComReg did not consider including 'unmanaged' voice call services⁷⁵⁸ in this proposed licence condition.

8.204 ComReg further proposed that any assessment of this obligation would be made against the aggregate total.

8.205 Reasons informing these proposals included:

- ComReg's updated draft RIA on 'Voice Call Services' (as set out in Annex 12 of Document 19/124); and
- safeguarding the interests of consumers against operators who might not otherwise maintain acceptable quality levels for voice calls in line with current expectations.

8.206 ComReg subsequently reflected this proposed condition in Section 6 ("Quality of Service (QoS) Obligations") of Part 4 to Schedule 1 of the Draft Regulations published in Annex 2 of Document 20/32.

VoLTE

8.207 In relation to the VoLTE obligation, ComReg proposed that, if a licensee has deployed LTE technology in the Proposed Bands and also offers a mobile voice service to consumers using those bands, it would be obliged to:

- (a) enable VoLTE technology on its network and on its Base Stations which use those bands;
- (b) make a VoLTE service available to consumers (including MVNO consumer) that have a VoLTE-enabled handset; and

⁷⁵⁷ Including traditional voice call services carried over circuit-switched connections and the 'managed' packet-switched voice call services (e.g. using VOIP or similar protocols) which can be provided over different technologies (e.g. VoLTE, Native Wi-Fi, etc.).

⁷⁵⁸ 'Unmanaged' voice call services are provided over the applications and/or networks of third parties which the licensee would have very limited control over the quality of the service experienced by the end user e.g. over the top (OTT) applications which are delivered in best effort manner through the Internet access service (i.e. with no prioritisation).

- (c) deploy and maintain VoLTE across 50% of its LTE Base Stations which use those bands within 1 year and across 100% of such base stations within 2 years.

8.208 These proposals were informed by:

- (a) ComReg's previous consideration in Document 19/59R that a VoLTE obligation would be appropriate;
- (b) ComReg's updated draft RIA on 'Voice Call Services' (as set out in Annex 12 of Document 19/124); and
- (c) ComReg's assessment of respondents' views on the proposed VoLTE obligation (as set out in Section 7.5.5 of Document 19/124).

8.209 Reasons which informed ComReg's view that a VoLTE obligation would be appropriate included:

- a) the 700 MHz EC Decision identifies the importance of the 700 MHz Band for the provision of data services to meet the increasing demand for wireless data and that the band is a valuable asset for deploying cost efficient terrestrial wireless networks with high capacity coverage;
- b) networks are moving to provide voice services over data in the future (e.g. VoLTE);
- c) as MNOs are likely to begin transitioning to 4G/5G networks over time, it would likely be more efficient for them to target investments to improve voice services at 4G/5G networks rather than at 2G/3G networks;
- d) any obligation to improve voice services over 2G/3G networks would seem unlikely to be proportionate given the availability of alternative more efficient measures to achieve the same ends (e.g. VoLTE);
- e) Vodafone has already launched VoLTE on its network⁷⁵⁹, while Eir had announced that it would roll out VoLTE over the next two years^{760 761 762}.
- f) VoLTE should improve consumers' mobile voice experience with:

⁷⁵⁹ <https://www.siliconrepublic.com/comms/volte-vodafone-voice-over-4g-wi-fi-5g>

⁷⁶⁰ <https://www.siliconrepublic.com/comms/huawei-eir>

⁷⁶¹ <https://www.eir.ie/mobilenetworkupgrade/>

⁷⁶² [3<



- i. faster call connection than GSM or UMTS;
 - ii. higher quality calls through enhanced HD voice;
 - iii. improved voice quality over narrowband and HD voice services on existing 2G and 3G networks; and
 - iv. flexibility for subscribers to make calls and use 4G data services simultaneously without compromising 4G data connectivity speed;
- g) the wide variety of handsets supporting VoLTE; and
- h) the availability of additional spectrum to MNOs to use for LTE services following any transition from 2G/3G voice services.

8.210 Further, ComReg's updated draft RIA on 'Voice Call Services' (as set out in Annex 12 of Document 19/124) identified a number of potential benefits of a VoLTE obligation for stakeholders (i.e. MNOs, New Entrants and MVNOs), competition and consumers, several of which are outlined below.

Impact on stakeholders

8.211 The benefits of a VoLTE obligation for stakeholders, as identified in the RIA, included that:

- a) VoLTE provides greater spectral efficiency and capacity gains compared with conventional circuit-switched calls over legacy 2G and 3G networks⁷⁶³;
- b) VoLTE can provide operational savings for operators as voice and data can be run across the same rather than separate infrastructure;
- c) a New Entrant would more likely rollout VoLTE rather than a 2G/3G network to provide voice services; and
- d) an MVNO would likely prefer a VoLTE obligation as it would maximise the amount of services that would be available to consumers.

Impact on competition

8.212 Potential benefits of a VoLTE obligation for competition, as identified in the draft

⁷⁶³ In that regard, ComReg notes that VoLTE can support up to twice as many voice users in a given bandwidth (per megahertz) compared to conventional circuit-switched 2G and 3G networks. <https://www2.deloitte.com/ie/en/pages/technology-media-and-telecommunications/articles/tmt-pred16-telecomm-volte-vowifi-capacity-reach-capability.html>

RIA, included that:

- a) such a measure would provide greater protections against distortions or restrictions of competition, which might arise if one or more operators failed to rollout VoLTE, having already rolled out an LTE network;
- b) the proposed obligation would provide protection that VoLTE would be provided in a timely fashion by all operators, thus promoting competition and maximising benefits for consumers; and
- c) VoLTE optimises the spectral efficiency of mobile voice using LTE and delivers voice calls three times more efficiently for the same quality of voice call. This would promote competition by facilitating operators repurposing spectrum and making available more spectrum resources for the provision of high growth services (i.e. data).

Impact on consumers

8.213 Potential benefits of a VoLTE obligation for consumers, as identified in the draft RIA, included that:

- a) VoLTE offers better voice quality compared to OTT and circuit-switched calls and quicker call set-up times compared to 3G;
- b) the benefits for consumers of VoLTE would not be fully realised unless all MNOs transition to VoLTE where both ends of a call between two different networks can be delivered through LTE; and
- c) due to the spectrum efficiency gains, consumers will be able to avail of better/ faster services from the networks.

8.214 Following consideration of respondents' views on the matter, ComReg remained of the view that it is appropriate to apply a VoLTE obligation to any rights of use in the Proposed Bands, noting that it had provided further specificity on the proposed obligation as set out in Section 7.5.6 of Document 19/124 and in the draft RIA.

8.215 In its consideration of respondents' views on the proposed VoLTE obligation, ComReg further noted the following considerations which would positively favour the introduction of such an obligation:

- a) A VoLTE obligation would be consistent with service and technology neutrality as it would not preclude operators from providing other services and/or technologies in those bands that comply with the relevant EC/ECC harmonisation decisions for the Proposed Bands.

- b) Condition 1 of Part B of the Schedule to the Authorisation Regulations⁷⁶⁴ gives ComReg authority to attach to any rights of use, as may be issued on foot of the Proposed Award, obligations to provide a service or to use a type of technology, including, where appropriate, coverage and quality requirements in accordance with Condition 1 of Part B of the Schedule to the Authorisation Regulations.
- c) The results of ComReg's recent 2019 Mobile Consumer Experience Survey⁷⁶⁵, as discussed in the updated draft 'Voice Call Services' RIA, indicated that all the main outdoor service issues related to voice calls rather than data usage. While the outdoor population coverage options considered in section 8.4 of Document 19/59R would provide for voice coverage, it is not clear whether a population coverage obligation at a rate of 30 Mbit/s would necessarily improve the quality of service for voice calls to any material degree, because voice services are currently provided over GSM and UMTS (i.e. 2G and 3G networks).
- d) It would be justified and proportionate for reasons including that it would:
- i. better facilitate the rollout of VoLTE in an efficient manner, which should contribute to users deriving maximum benefit in terms of choice, price and quality⁷⁶⁶;
 - ii. encourage the efficient use of the radio spectrum and avoid inefficient investment costs in 2G/3G technologies that will likely be decommissioned over time;
 - iii. would promote efficient investment and innovation in new and enhanced infrastructures by encouraging the rollout of VoLTE;
 - iv. be proportionate because, among other things:
 - A. the objective of the obligation (i.e. improve voice QoS in a manner which would avoid inefficient investment costs) would accord with ComReg's statutory objectives and regulatory principles as described above;
 - B. there do not appear to be less onerous means by which

⁷⁶⁴ Part B of the Authorisation Regulations includes (as Condition 1 thereof) the following condition which may be attached to rights of use:

- Obligation to provide a service or to use a type of technology for which the rights of use for the frequency has been granted including, where appropriate, coverage and quality requirements.

⁷⁶⁵ ComReg's 2019 Mobile Consumer Experience Survey.

⁷⁶⁶ In that regard, ComReg notes Vodafone's support for ComReg's VoLTE obligation proposal, which Vodafone considers to be to be appropriate and useful to promote the best service to customers.

improved voice services could be achieved;

- v. accord with the principle of safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition; and
 - vi. provide winning bidders with 2 years to deploy VoLTE⁷⁶⁷, reflecting the need for careful deployment and orderly availability to consumers, which in ComReg's view provides sufficient time for appropriate testing and validation.
- e) relevant mobile industry publications indicate significant improved customer experience resulting from VoLTE compared to circuit switched voice, in that VoLTE offers:
- i. the best voice quality compared to OTT and circuit-switched voice calls. LTE with a speech rate of 12.65 kbps falls within the range of 'good quality' specified in ITU-T P.863. On the other hand, 3G and OTT falls within the range of 'Acceptable Quality' while 2G falls in to 'poor quality'.⁷⁶⁸
 - ii. quicker call set-up times (0.9 – 2.2 seconds) compared to 3G circuit-switched networks (4 – 6 seconds).⁷⁶⁹

8.216 ComReg subsequently reflected this proposed condition in Section 6 ("Quality of Service (QoS) Obligations") of Part 4 to Schedule 1 of the Draft Regulations published in Annex 2 of Document 20/32.

8.5.3 Summary of respondents' views to Documents 19/124, 20/32 and 20/56

Network Availability

8.217 Only one respondent, Three, submitted views on the network availability obligation proposal. In its response to Document 19/124, Three proposes that the network availability obligation should exclude periods where Met Éireann has issued a weather warning. Three states that such events are becoming more frequent and often have consequences for network availability, which it contends are outside of an MNO's control, citing examples such as power outages and site access issues due to impassable roads.

⁷⁶⁷ With an interim milestone at 1 year for 50% of the relevant sites.

⁷⁶⁸ Einashar, A & A. El-Saidny, M (2018), 'Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G: 1st Edition' Wiley, p212 – 213.

⁷⁶⁹ Holma, H, Toskalka, A & Reunanen (2016) 'LTE Small Cell Optimization: 3GPP Evolution to Release 13' John Wiley and Sons, p 404.

Voice Call Standards

8.218 ComReg did not receive any submissions from respondents on this proposal.

VoLTE

8.219 Two respondents submitted views on the VoLTE obligation proposal. In their responses to Document 19/124, Vodafone agrees⁷⁷⁰ with the proposal while Three, which has yet to provide VoLTE services on its network, disagreed.

8.220 In its response, Three contends that:

- The proposal contradicts the principle of service and technology neutrality;
- ComReg has placed far too much weight on VoLTE, and this proposal is not supported by evidence of benefit;
- VoLTE is one technology among many others to support voice calls including circuit switched mode, voice over Wi-Fi, Voice over IP through APP, etc.;
- It is not appropriate for ComReg to depend on a web article from Deloitte giving predictions for 2016 in support;
- The experience of other MNOs shows VoLTE quality not yet equivalent to circuit switched voice. In that regard, Three stated that it has access to confidential reports on VoLTE implementation that it might share on a confidential basis⁷⁷¹; and
- In the short term (3-5 years) it will not be possible, in its view, to maintain and guarantee the minimum dropped call and call blocking rates currently experienced by MNOs who provide the service with circuit switched calls.

8.221 Notwithstanding the above, Three considers that 3 rather than 2 years would be a more appropriate rollout obligation for VoLTE, based on experience from other countries

⁷⁷⁰ ComReg notes that Vodafone does not provide further specific rationale in support of the VoLTE obligation rather it references the “...very extensive section [in Document 19/124] on coverage requirements that may attach to the new licence. We agree with the general design of the coverage proposals ... Including a requirement for WiFi and VoLTE is appropriate”.

⁷⁷¹ ComReg notes that it did not receive any confidential reports from Three in relation to this.

8.5.4 ComReg's Assessment of Respondents' Views

Network Availability

8.222 In considering Three's proposal that the network availability obligation should exclude periods where Met Éireann has issued a weather warning, ComReg notes that:

- a) obligations exist on authorised undertakings, providing public communications networks or publicly available electronic communications services, to ensure continuity of supply of services provided over such networks. These obligations have been in place since 2011 under Regulation 23 of S.I. No. 333/2011, European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 ("Framework Regulations");
- b) authorised undertakings are obliged, in particular under Regulation 23 (3) of the Framework Regulations, to ensure continuity of supply of services, and this obligation does not provide for exclusions and/or is not conditional on any weather warnings which may, from time to time, issue from Met Éireann;
- c) ComReg is obliged to ensure authorised undertakings, providing public communications networks or publicly available electronic communications services comply with Regulation 23 (1), (2) and (3) of the Framework Regulations under Regulation 24 of the same Regulations;
- d) an important consideration informing ComReg's proposed obligation, as set out in Document 19/124, was the need to protect end users against unreasonable levels of disruption to their service and safeguard the interests of consumers against operators who might otherwise have unacceptably high levels of network unavailability;
- e) the proposed obligation is consistent with the network availability licence condition in the Liberalised Licences for spectrum rights in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz bands; and
- f) no other respondents disagreed with the proposed obligation.

8.223 In light of the above and of the and the reasons as set out previously, ComReg remains of the view that it is appropriate to propose the network availability obligation as set out in Document 19/124. ComReg notes that in monitoring and assessing compliance with same, ComReg will act in accordance with its statutory obligations, which include taking into account all relevant information as may be presented by a licensee at that time.

8.224 Further, and in considering, Regulation 23 and 24 of the Framework Regulations, ComReg's proposed obligation, as set out in Document 19/124, is consistent with (a) the current existing obligations under Regulation 23 (3) on authorised undertakings to ensure continuity of supply of services, and (b) ComReg's obligation under Regulation 24 to ensure authorised undertakings comply.

8.225 However, where appropriate, in the context of ComReg's statutory functions, objectives and duties, and objectively justified, ComReg will take into account, on a case by case basis, any reasonably unforeseen events (i.e. *force majeure* events) that are not under the control of the licensee when assessing licensees' compliance with the network availability obligation.

8.226 ComReg observes that this approach is consistent with ComReg's previously indicated approaches to similar matters, namely:

- a) the taking into account of *force majeure events* in the assessment of compliance with obligations in the Transition Project Plan for Time Slice 1 following the 2012 MBSA⁷⁷²; and
- b) the taking into account of exceptional circumstances in assessing Compliance with the notification of the termination of a technology obligation in the 3.6 GHz Band Award⁷⁷³.

Voice Call Standards

8.227 ComReg notes that no respondents disagreed with its proposals in relation to Voice Call Standards and ComReg is not aware of any other information which would warrant reconsideration of this proposal.

VoLTE

8.228 ComReg firstly notes that just one of the respondents, Three, disagreed with including a VoLTE obligation.

8.229 Considering Three's argument that that the proposed VoLTE obligation contradicts the principle of service and technology neutrality, ComReg recalls that it already substantively addressed the same argument from Three in Section 7.5 of Document 19/124. There, ComReg assessed Three's views on the proposed VoLTE obligation, which Three had submitted in response to Document 19/59R. In its assessment, ComReg did not accept Three's argument that the proposed VoLTE obligation contradicts ComReg's normal 'technology neutrality' approach.

⁷⁷² As set out in Section 2.6 of Document 13/19.

⁷⁷³ As set out in Section 6.4 of Document 16/57.

8.230 In that connection, ComReg noted that:

- a) firstly, service and technology neutrality is the principle that spectrum rights of use, and the conditions applied thereto, should not preclude the provision of any specific service and/or the use of any technology;
- b) secondly, in mandating VoLTE where a mobile operator has deployed LTE in the Proposed Bands, ComReg would not be precluding operators from providing other services and/or technologies in those bands that comply with the relevant EC/ECC harmonisation decisions for the Award Bands; and
- c) in any case, Condition 1 of Part B of the Schedule to the Authorisation Regulations⁷⁷⁴ gives ComReg authority to attach to any rights of use, as may be issued on foot of the Proposed Award, obligations to provide a service or to use a type of technology, including, where appropriate, coverage and quality requirements in accordance with Condition 1 of Part B of the Schedule to the Authorisation Regulations.

8.231 Further, ComReg observes that in repeating its argument regarding the proposed VoLTE obligation and service and technology neutrality in its response to Document 19/124, Three did not provide or submit any additional information in support of that argument.

8.232 Considering the above, ComReg remains of the view that its proposal for a VoLTE obligation does not contradict the principle of service and technology neutrality.

8.233 ComReg does not accept Three's view that it has placed too much weight on VoLTE. In this regard, ComReg notes that the implementation of VoLTE is favoured by Government policy, noting in particular matters set out by the Mobile Phone and Broadband Taskforce.

8.234 In that connection, ComReg recalls that in the draft 'Voice Call Services' RIA set out in Annex 12 of Document 19/124, it identified the relevance to the issue of voice obligations for 700 MHz rights of use of the Government's Mobile Phone & Broadband Taskforce Focus Group Report on Mobile Coverage⁷⁷⁵ and in particular the 2017 Action Point 39, contained therein, which notes that

⁷⁷⁴ Part B of the Authorisation Regulations includes (as Condition 1 thereof) the following condition which may be attached to rights of use:

- Obligation to provide a service or to use a type of technology for which the rights of use for the frequency has been granted including, where appropriate, coverage and quality requirements.

⁷⁷⁵ <https://assets.gov.ie/76372/d8a4e27c-7932-479e-8e3b-f0c5dda2d739.pdf>

“All operators will introduce WiFi calling, VoLTE and other network feature and functionality enhancements at the earliest juncture and report on progress to the Taskforce Implementation Group.”

8.235 ComReg considers that this remains important, in particular given that:

- a) these network features and functionality enhancements remain unavailable for certain consumers; and
- b) ComReg’s most recent 2019 Mobile Consumer Experience Survey⁷⁷⁶ found a still very high level of use of mobile phones for traditional voice calls by consumers, with:
 - i. 93% of mobile users using their mobile phones to make traditional voice calls on their mobile phones; and
 - ii. mobile users spending an estimated average of 30.23 minutes per day on their mobile phones making traditional voice calls, compared to an estimated average of 8.10 minutes per day on voice calls via Internet based applications⁷⁷⁷ on their mobile phones.

8.236 Further, ComReg understands that all three MNOs planned to have already commercially deployed VoLTE two years ago, as the Mobile Phone & Broadband Taskforce Quarterly Progress Report Q1 2018⁷⁷⁸ relevantly noted that:

“Mobile operators, through TIF, have indicated that the Commercial Implementation of VoLTE is planned by all operators for 2018.”⁷⁷⁹

8.237 ComReg does not agree with Three’s assertion that its VoLTE obligation proposal is not supported by evidence of benefit.

8.238 In its assessment in the draft ‘Voice Call Services’ RIA in Document 19/124 of the appropriateness of including a VoLTE obligation, ComReg considered a number of benefits of VoLTE which are supported by relevant literature and mobile industry sources, including that:

- a) VoLTE offers improved voice call quality⁷⁸⁰ and would reduce consumer

⁷⁷⁶ ComReg Document 19/101, ‘Mobile Consumer Experience - Survey of Consumers Summer 2019’, ComReg Document 19/101, Slides 50 to 53.

⁷⁷⁷ E.g. VoIP, Skype, Facetime etc.

⁷⁷⁸ Action 14 of the Q1 2018 Report – “Mobile operators, through TIF, have indicated that the Commercial Implementation of VoLTE is planned by all operators for 2018”.

⁷⁷⁹ TIF: Telecommunications and Internet Federation, <https://www.ibec.ie/connect-and-learn/industries/technology-telecoms-and-audiovisual/telecommunications-industry-ireland>

⁷⁸⁰ Einashar, A & A. El-Saidny, M (2018), ‘Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G: 1st Edition’ Wiley.

service issues relating to voice. Consumer switching related to voice call issues would therefore arguably be reduced;

- b) VoLTE should slow down revenue erosion towards OTT providers by leveraging the seamless use experience between all access networks without disruption even in the case of network congestion⁷⁸¹;
- c) the full benefits of VoLTE would not be provided unless both ends of the call are delivered through LTE. For example, to make a VoLTE call using an iPhone (which accounts for a third of all phones) both ends of the call need to have VoLTE enabled.⁷⁸² In the absence of a VoLTE obligation, operators could delay or avoid the rollout of VoLTE meaning that significant portions of calls would have a lower standard of voice calls regardless of whether other operators rolled out VoLTE or not; and
- d) while a VoLTE to 3G call improves call quality compared to a 3G to 3G call⁷⁸³ a VoLTE to VoLTE call (as would arise under Option 2B in the Voice Call Services RIA) maximises the voice quality for all callers.⁷⁸⁴ In particular:
 - i. the call set up latency for VoLTE to 3G calls is longer than in VoLTE to VoLTE call (even in near cell conditions).⁷⁸⁵
 - ii. A higher call latency can lead to broken voice or echo on the call.
 - iii. a VoLTE to 3G call can experience higher delays (e.g. call setup) due to the circuit switched part of the call.⁷⁸⁶
 - iv. VoLTE also offers several benefits to consumers that may not arise for all consumers in the absence of a VoLTE obligation. These include:
 - A. the best voice quality compared to OTT and circuit-switched voice calls. LTE with a speech rate of 12.65 kbps falls within the range of 'good quality' specified in ITU-T P.863. On the

⁷⁸¹ Krussel, P (2016), 'Future Telco: Successful Positioning of Network Operators in the Digital Age' Springer, p144.

⁷⁸² <https://support.apple.com/en-ie/HT203078>

⁷⁸³ Einashar, A & A. El-Saidny, M (2018), 'Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G: 1st Edition' Wiley, p177.

⁷⁸⁴ Ibid.

⁷⁸⁵ Ibid.

⁷⁸⁶ Ibid.

other hand, 3G and OTT falls within the range of 'Acceptable Quality' while 2G falls into 'poor quality'.⁷⁸⁷

- B. quicker call set-up times (0.9 – 2.2 seconds) compared to 3G circuit-switched networks (4 – 6 seconds).⁷⁸⁸
- C. seamless use of different applications as VoLTE enables customers to make high quality voice calls while simultaneously using 4G data, (e.g. to access information (maps, banking, documents) while talking to someone over the phone).⁷⁸⁹
- D. compared to using OTT Voice apps, VoLTE calls use less battery resources. Many factors affect battery life, but VoLTE uses network resources more efficiently such that, all else being equal, a battery will last longer.⁷⁹⁰

8.239 Further, ComReg observes that updated information from the GSMA supports ComReg's view that VoLTE is a beneficial technology for all stakeholders⁷⁹¹.

8.240 The GSMA in its most recent VoLTE Implementation Guide⁷⁹², published in July 2020, notes that VoLTE provides the following five benefits over traditional circuit switched voice calls:

- a) VoLTE enables operators to migrate their circuit switched infrastructure a fully IP centric network;
- b) VoLTE offers significantly higher voice quality than legacy circuit switched voice and provides voice in a wider range of auditory frequencies that humans can hear, as illustrated in Figure 16 below. Implementation of the EVS⁷⁹³ codec, extends this range even further to provide very high-quality voice;
- c) VoLTE reduces call setup time to about a third of that of legacy circuit switched voice;

⁷⁸⁷ Einashar, A & A. El-Saidny, M (2018), 'Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G: 1st Edition' Wiley, p212 – 213.

⁷⁸⁸ Holma, H, Toskalka, A & Reunanen (2016) 'LTE Small Cell Optimization: 3GPP Evolution to Release 13' John Wiley and Sons, p 404.

⁷⁸⁹ <https://www.ericsson.com/en/digital-services/offerings/voice-services/voice-over-lte/why-deploy-volte-now>

⁷⁹⁰ <https://www.nokia.com/blog/why-operator-volte-beats-ott-voip/>

⁷⁹¹ For example, see <https://www.gsma.com/futurenetworks/volte-2-2/>

⁷⁹² <https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2020/08/VoLTE-Implementation-Guide-July-2020.pdf>

⁷⁹³ Enhanced Voice Services.

- d) VoLTE also enables ViLTE⁷⁹⁴ video calls to be provided in conjunction with HD voice; and
- e) as VoLTE calls are natively supported by LTE networks, the scarce radio resources are used much more efficiently than with legacy technologies.

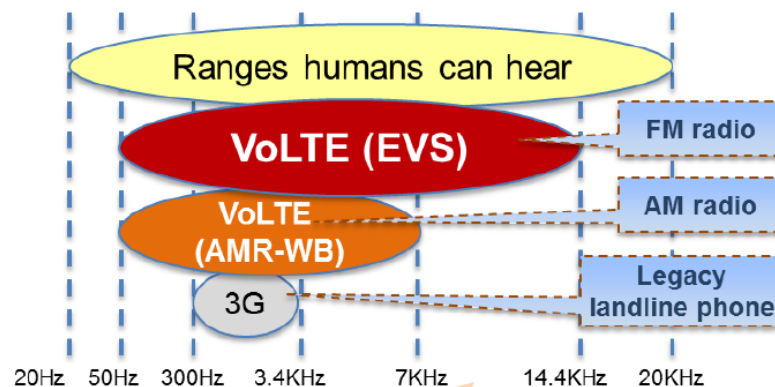


Figure 16. Higher voice quality offered by VoLTE⁷⁹⁵

- 8.241 Further, ComReg notes that with the liberalisation and re award of the 2.1 GHz spectrum rights of use and the move to carrying greater amounts of voice traffic using VoLTE, existing MNOs can re-purpose the 2.1 GHz Band spectrum to LTE and thus enhance data coverage and other 5G technology enhancements generally.
- 8.242 In relation to Three's submission that *"it is not appropriate for ComReg to depend on a web article from Deloitte giving predictions for 2016 in support"*⁷⁹⁶, first, ComReg wishes to clarify that the predictions in the Deloitte article related to the likely worldwide use and deployment of VoLTE by the end of 2016 and the benefits of VoLTE, as cited by ComReg in Document 19/124, were implicitly presented in the article as established capabilities of VoLTE as of the date of publication of that article.
- 8.243 In Document 19/124, ComReg identified two benefits of VoLTE, which were supported by the 2016 Deloitte web article, i.e.:

- a) VoLTE provides greater spectral efficiency and capacity gains compared with conventional circuit-switched calls over legacy 2G and 3G networks⁷⁹⁷

⁷⁹⁴ Video over LTE.

⁷⁹⁵ Source: <https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2020/08/VoLTE-Implementation-Guide-July-2020.pdf>

⁷⁹⁶ <https://www2.deloitte.com/ie/en/pages/technology-media-and-telecommunications/articles/tmt-pred16-telecomm-volte-vowifi-capacity-reach-capability.html>

⁷⁹⁷ In that regard, ComReg noted that VoLTE can support up to twice as many voice users in a given bandwidth (per megahertz) compared to conventional circuit-switched 2G and 3G networks.

⁷⁹⁸; and

- b) VoLTE can provide operational savings for operators as it can run all services (voice and data) across the same infrastructure compared to having one for data and one for voice⁷⁹⁹.

8.244 In any case, ComReg observes that the above benefits are also identified by the GSMA in its most recent VoLTE Implementation Guide⁸⁰⁰, published in July 2020, which relevantly notes that:

- a) “As VoLTE calls are natively supported by LTE networks, the scarce radio resources are used much more efficiently than with legacy technologies”; and
- b) a business case justification for migration to VoLTE is “*reduced operating expenses*”.

8.245 In relation to Three’s view that that the experience of other MNOs shows that VoLTE quality is not yet equivalent to circuit switched voice⁸⁰¹, ComReg notes that:

- a) the advantages of VoLTE over circuit switched voice are recognised by the GSMA in its most recent VoLTE Implementation Guide⁸⁰², published in July 2020, as mentioned above;
- b) no other respondent suggests that VoLTE quality might be an issue, with one of those respondents, Vodafone, already having launched VoLTE on its network almost two years ago, in March 2019⁸⁰³;
- c) in that regard, ComReg notes that a recent Q1 2020 performance benchmarking audit of Irish mobile networks conducted by umlaut⁸⁰⁴

⁷⁹⁸ In paragraph 7.210 of Document 19/124.

⁷⁹⁹ In paragraph A12.30 of Document 19/124.

⁸⁰⁰ <https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2020/08/VoLTE-Implementation-Guide-July-2020.pdf>

⁸⁰¹ In that regard, ComReg notes that while Three indicated in its response to Document 19/124 that it has access to relevant confidential reports on VoLTE implementation that it might share on a confidential basis, Three did not opt to include this material as a confidential submission with its response.

⁸⁰² <https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2020/08/VoLTE-Implementation-Guide-July-2020.pdf>

⁸⁰³ <https://www.siliconrepublic.com/comms/volte-vodafone-voice-over-4g-wi-fi-5g>

⁸⁰⁴ For the audit umlaut tested and measured the performance of Vodafone’s voice and data services on smartphones in comparison to other LTE/UMTS/GSM mobile radio networks in metropolitan and rural areas of Ireland. The audit was conducted as a performance benchmark performed between 07/02/2020 and 21/02/2020 in cities and towns as well as on connection roads.

<https://www.umlaut.com/en/benchmarking/ireland>

reported that Vodafone's network achieved the best scores in each of the relevant voice key performance indicators, including call setup time and speech quality. Voice measurements were conducted in 4G/4G (i.e. VoLTE to VoLTE) preferred mode on both sides of the test calls;

- d) a 2018 white paper published by the UAE 5G Innovation Gate⁸⁰⁵ presented a performance analysis of VoLTE based on field measurements of commercially deployed 3GPP Release-10 LTE networks and concluded that VoLTE engenders the best voice quality compared to CS voice calls;
- e) data from the GSA⁸⁰⁶ indicates confidence in VoLTE technology among MNOs globally, with 215 MNOs already having launched VoLTE in 102 countries, including subsidiaries of Three's parent company in six countries⁸⁰⁷. The GSA data also indicates that 29 MNOs are currently in the process of deploying VoLTE, 8 MNOs are currently trialling VoLTE and 22 MNOs are planning to launch VoLTE; and
- f) on October 22 2020, Three UK announced that it had completed the rollout of its VoLTE service, "Super Voice", which is now available across its entire 4G network.

8.246 In light of the above, and notwithstanding any confidential reports that Three may have regarding VoLTE implementation, ComReg considers that the weight of evidence from the GSMA and from practical network measurements, and noting that Three itself has rolled out the service in the UK, indicates that VoLTE offers superior call quality to that of circuit switched voice.

8.247 In its response to Document 19/124, Three also suggested that in the short term (3-5 years) it will not be possible to maintain and guarantee the minimum dropped call and call blocking rates currently experienced by MNOs providing the service with circuit switched calls. In that regard, ComReg notes that circuit switched fallback is an option for an MNO to mitigate any potential VoLTE call issues and maintain existing minimum dropped and blocked call rates, for as long as that MNO continues to provide 2G and 3G voice services on its network. The GSMA recommends that operators wishing to offer VoLTE will need to still support legacy technologies and use circuit switched fallback techniques to redirect the

⁸⁰⁵ Performance Evaluation of VoLTE Based on Field Measurement Data", Ayman Elnashar, Mohamed A. El-Saidny, and Mohamed Yehia, UAE 5G Innovation Gate, October 2018.

http://www.u5gig.ae/VoLTE_Performance_v23.pdf

⁸⁰⁶ Data downloaded 14 December 2020 from the GSA 4G & 5G Devices Networks, Technologies and Spectrum Database – GAMBoD, <https://gsacom.com/gambod/>

⁸⁰⁷ 3 Austria, 3 Denmark, 3 HK, 3 Sweden, 3 UK and 3Macau.

user towards them when a call is made or received⁸⁰⁸.

8.248 As reflected earlier, ComReg notes that almost four years ago, in 2016, Three became the first UK operator to use 4G for voice calls following its 800 MHz rollout there, a rollout that it has recently completed. Three UK cites several key benefits arising from VoLTE, including the addressing of indoor black spots, better connectivity, fewer dropped calls and ease in consumer set up⁸⁰⁹.

8.249 ComReg observes that, notwithstanding its views on ComReg's VoLTE obligation proposal, Three nevertheless considers that three rather than two years would be a more appropriate rollout obligation for VoLTE, based on experience from other countries.

8.250 In that regard, ComReg notes that at the time of the publication of Document 19/124 ComReg estimated, for illustration purposes, a proposed commencement date of 1 December 2020. However, given a number of factors including those relating to the COVID-19 pandemic⁸¹⁰, ComReg now does not expect licences to commence until 1 December 2021⁸¹¹, a year beyond what was originally illustrated. In this regard, ComReg notes that the 3 years suggested by Three in allowing enough time to implement VoLTE on a network, is largely available to Three should it be successful in obtaining rights of use in the Proposed Award.

8.5.5 ComReg's Final position

8.251 In light of the above, ComReg's final position is that it will apply minimum QoS licence obligations for network availability and voice call standards including as appropriate relating to VoLTE, in respect of any rights of use issued on foot of the Proposed Award as follows:

Network Availability

8.252 In relation to the network availability obligation,

- a) each licensee is to keep a log of network availability, available for inspection by ComReg;
- b) each licensee is to ensure that network unavailability is less than 35 minutes per six month period; and
- c) the calculation of network unavailability will be subject to weighting

⁸⁰⁸<https://www.gsma.com/aboutus/workinggroups/wp-content/uploads/2020/08/VoLTE-Implementation-Guide-July-2020.pdf>

⁸⁰⁹ <http://www.three.co.uk/hub/4g-super-voice/>

⁸¹⁰ ComReg notes the COVID-19 Temporary ECS Licensing Framework and Further Temporary ECS Licensing Frameworks established since the publication of Document 19/124.

⁸¹¹ See further Chapter 5.

factors⁸¹² that take account of traffic load variations.

Minimum Voice Call Standard

8.253 In relation to the Minimum Voice Call Standard, each licensee providing voice services⁸¹³ would ensure that for each six-month period:

- a) the maximum Permissible Blocking Rates⁸¹⁴ are not exceeded;
- b) the maximum Permissible Dropped Call Rates⁸¹⁵ are not exceeded; and
- c) the speech transmission quality meets or exceeds the appropriate standard.

And further in relation to **VoLTE**

8.254 If LTE is deployed in the Award Bands, and where consumers using services provided using the Award Bands are also offered a mobile voice service by the licensee, VoLTE technology must be enabled on the licensee's network and the base stations in the Award Bands and made available to consumers (including MVNO consumers) that have a VoLTE enabled handset. This obligation is to deploy and maintain VoLTE across all relevant LTE base stations within 2 years and that 50% of LTE base stations should be enabled within 1 year.

8.6 The notification of the termination of a technology

8.6.1 Summary of ComReg's view in Document 19/124

8.255 In Section 7.6 of Document 19/124, ComReg proposed to attach a licence condition to spectrum rights in the Proposed Bands requiring prior notification⁸¹⁶ from licensees of their termination of a technology, given the potential for consumer disruption, and considering that the cessation of a technology is not currently within the scope of the consumer protection provisions of Condition 18 of the General Authorisation. In the interests of regulatory consistency, the licence condition would be on substantively the same terms as that imposed previously for licences in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz

⁸¹² As set out in paragraph 8.238 of Document 19/59R and as particularised in Section 6 of Schedule 1 of the Draft Regulations.

⁸¹³ Including any third party by means of a contractual or other arrangement with the licensee.

⁸¹⁴ As set out in Section 6 of Schedule 1 of the Draft Regulations.

⁸¹⁵ As set out in Section 6 of Schedule 1 of the Draft Regulations.

⁸¹⁶ Not less than six months.

Bands⁸¹⁷.

8.256 ComReg subsequently reflected this proposed condition in Regulation 6(1)(l) of the Draft Regulations published in Annex 2 of Document 20/32.

8.6.2 Summary of Respondents Views to Document 19/124, 20/32, 20/56

8.257 ComReg did not receive any submissions from respondents on this proposal, nor is ComReg aware of any other information which would warrant reconsideration of this proposal.

8.6.3 ComReg's Final position

8.258 Accordingly, ComReg's final position is that a licence condition requiring a 6 month prior notification to ComReg of the termination of a technology will be attached to licences issued on foot of the Award Process and where the relevant provisions are set out in draft form in the Draft Regulations⁸¹⁸.

8.7 Potential wholesale access (MVNO) conditions

8.7.1 Summary of ComReg's view in Document 19/59R and 19/124

8.259 In Section 8.7 of Documents 19/59R, ComReg set out some preliminary observations as to whether, in the context of ComReg's obligation to promote effective competition (and to avoid distortions of competition in the internal market for ECS), it may be appropriate to attach wholesale access (MVNO) conditions to some or all of the 700 MHz rights of use.

8.260 In order to determine whether it would be appropriate to attach such conditions, ComReg sought views and supporting material from interested parties regarding MVNO's (See Section 8.7.5 of Document 19/124 - "Seeking views and supporting material from interested parties")

8.261 Having considered the responses to Document 19/59R, ComReg reaffirmed its view, in Document 19/124, that it is not appropriate at this time to attach MVNO access obligations to some or all of the 700 MHz rights of use. Notwithstanding, ComReg was of the view that there would be benefit in commencing a study that considers the current and future role of MVNOs in the Irish mobile market

⁸¹⁷ i.e. as set out in S.I 251 of 2012, but with the wording adapted, as appropriate, to refer to the types of licenses applicable to the Proposed Bands and to align with the relevant schedules in those licences.

⁸¹⁸ "notify the Commission in writing, not less than 6 months prior to the proposed cessation of use of any terrestrial system listed in Part 2 of the MBSA2 Liberalised Use Licence or MBSA2 Spectrum Lease Licence as the case may be"

(“MVNO Study”) which, among other things, would:

- a) assess what the different types of MVNOs and their business models;
- b) provide an overview of the economics of MVNOs services and the conditions under which the presence of MVNOs could be welfare enhancing;
- c) describe the regulatory approaches and experience of MVNOs internationally;
- d) assess the current state of MVNOs in Ireland, including their market share, their business strategies, the services they offer, and other such measures to provide a view of the role played by MVNOs; and
- e) explore the future evolution of the MVNO Market given current market conditions and emerging trends.

8.7.2 Summary of Respondents Views

8.262 Eir notes ComReg’s preliminary position as per paragraph 7.256 of Document 19/124 and (i) agrees that this is the appropriate approach and (ii) looks forward to engaging in the MVNO Study.

8.263 Vodafone agrees with ComReg’s view as per Document 19/124 and submits that no market failure has been identified and no effective MVNO conditions have been identified.

8.264 In a letter of 19 November 2020, Tesco Mobile identifies four potential options which in its view ComReg could exercise to enable MVNOs secure better wholesale access. In summary:

- a) **Option 1:** to delay the Spectrum Award and consult in respect of a detailed MVNO access obligation prescribing the nature/price of such an access obligation;
- b) **Option 2:** to delay the Spectrum Award and consult in respect of a general MVNO access obligation to provide reasonable wholesale access;
- c) **Option 3:** to delay the Spectrum Award and consult in respect of the reservation by ComReg to itself of a right to impose either of the above MVNO access obligations in the event that the market deteriorated any further; and
- d) **Option 4:** To signal to the MNOs, via the MVNO Study, ComReg’s willingness to intervene in the event that the market deteriorated any further.

8.7.3 Consideration of responses

8.265 ComReg acknowledges the views of Eir and Vodafone in relation to MVNO access obligations.

8.266 In relation to the views of Tesco Mobile, ComReg previously addressed matters related to MVNO access obligations in Document 19/59R and Document 19/124:

- a) in Document 19/59R, ComReg sought the views of interested parties on whether, in the context of ComReg's obligation to promote effective competition (and to avoid distortions of competition in the internal market for ECS), it would be appropriate to attach wholesale access (MVNO) conditions to some or all of the 700 MHz rights of use that would be granted on foot of the Proposed Award and requested views and supporting material on a number of matters described in Paragraph 8.270 of that document.
- b) in Document 19/124, ComReg was of the preliminary view that given the information provided by respondents, it was not appropriate at this time to attach MVNO access obligations to some or all of the 700 MHz rights of use for the reasons set out in Section 7.7.3 of that document.

8.267 ComReg is of the view that Tesco Mobile's latest response did not provide any additional information that would cause ComReg to revise its views in relation to the inclusion of a wholesale access (MVNO) condition as set out in Document 19/59R and Document 19/124. ComReg notes that Tesco Mobile's options primarily involve delaying the spectrum award to consult on matters unspecified by Tesco Mobile and without any further consideration of the matters described by ComReg in Document 19/59.

MVNO Study

8.268 Separately, in Q1 2020, ComReg engaged WIK Consulting to produce an MVNO Study, a detailed report examining the role of MVNOs in the Irish mobile market. The MVNO Study is a separate workstream to MBSA2, which will provide ComReg with up to date relevant information on the issues referred to above and would, among other things:

- a) inform ComReg's understanding of the role that MVNOs play in the mobile market;
- b) provide ComReg with insight into how MVNOs affect the competitive dynamic of the mobile market; and
- c) inform ComReg's understanding of the entry conditions faced by MVNOs.

8.269 WIK Consulting has now conducted interviews with a number of relevant stakeholders, including MVNOs and MNOs, to inform the MVNO Study.

8.270 ComReg intends to publish this MVNO Study in Q1 2021 and interested parties will have the opportunity to consider the findings of the study and to respond to MVNO related matters at that time.

8.7.4 ComReg's final position

8.271 In light of the foregoing, ComReg's final position that it is not appropriate at this time to attach MVNO access obligations to some or all of the 700 MHz rights of use.

8.8 Spectrum transfers, spectrum leasing and spectrum hoarding

8.8.1 Summary of ComReg's view in Document 19/124

8.272 In Section 7.8 of Document 19/124, ComReg proposed to allow spectrum transfers and spectrum leases in all of the Proposed Bands. In that connection, ComReg proposed to:

- amend its Spectrum Transfer Framework⁸¹⁹ to include the 700 MHz and 2.3 GHz bands in addition to the currently included 2.1 GHz and 2.6 GHz bands; and
- allow spectrum leases in the 2.3 GHz band, although that band is not currently subject to any EU spectrum leasing requirements and is not included in ComReg's proposal in Document 17/82 for a spectrum leasing framework which includes the other Proposed Bands.

8.273 In the same section, ComReg also proposed to impose an obligation on winners of liberalised spectrum rights in the Proposed Bands to comply with any rules to prevent spectrum hoarding as may be laid down by ComReg under Regulation 17(10) of the Framework Regulations.

8.274 ComReg subsequently reflected these proposals in the Draft Regulations published in Annex 2 of Document 20/32, as follows:

- spectrum transfers in Regulation 6(1)(o, p, t);
- spectrum leasing in Regulation 6(1)(q, r, s, t); and

⁸¹⁹ The provisions and procedures of the Spectrum Transfer Framework are set out in the:

- Spectrum Transfer Regulations (S.I. 34 of 2014); and
- Spectrum Transfer Procedures and Guidelines (ComReg Document 14/11R).

- spectrum hoarding in Regulation 6(1)(e).

8.8.2 Summary of Respondents Views to Document 19/124, 20/32, 20/56

8.275 ComReg did not receive any submissions from respondents on these proposals, nor is ComReg aware of any other information which would warrant reconsideration of these proposals.

8.8.3 ComReg's Final position

8.276 Accordingly, ComReg's final position is that:

- a) spectrum transfers and spectrum leases will be permitted in the Award Bands;
- b) spectrum transfers and spectrum leases in the 700 MHz and 2.3 GHz Bands will however be subject to ComReg's Spectrum Transfer and Spectrum Leasing Frameworks as amended; and
- c) winners of liberalised spectrum rights in the Award Bands will be obliged to comply with any rules to prevent spectrum hoarding as may be laid down by ComReg under Regulation 17(10) of the Framework Regulations.

8.9 Technical Conditions

8.9.1 Summary of ComReg's view in Document 19/124 and 20/32

8.277 In Section 7.9 and Annex 14 of Document 19/124 ComReg set out its preliminary positions and proposed technical licence conditions to attach to spectrum rights of use in the 700 MHz Duplex, 2.1 GHz Band, 2.3 GHz Band and 2.6 GHz Band.

8.278 In Chapter 9 of Document 19/124 (see paragraph 3.10), ComReg set out its draft decision in relation to technical conditions, being:

to attach conditions to rights of use to the Award Spectrum as generally described in Chapter [XX] of Document 20/XX [document to which the final decision will be attached] and which will be further particularised in the MBSA2 Licence Regulations;

8.279 In Section 2.3 ("The MBSA2 Liberalised Use Licence – Terms and Conditions") and Annex 2 ("Draft MBSA2 Licensing Regulations") of Document 20/32, ComReg set out the draft technical conditions to implement the preliminary positions set out in Section 7.9 and Annex 14 of Document 19/124.

8.9.2 Summary of Respondents Views to Document 19/124, 20/32, 20/56

8.280 Vodafone in its response to Document 19/124 states that,

- *“We agree with ComReg’s position that issues with installation of equipment and potential interference with cable networks are best handled by local co-operation rather than trying to define obligations.”*
- *“We note that when LTE equipment was being installed in the 800MHz band similar concerns were expressed but no significant interference occurred in practice”* and that
- *“We can work with the proposed compatibility considerations in the 700MHz, 2.1 GHz, and 2.6 GHz bands⁸²⁰.”*

8.281 ComReg did not receive any other submissions from respondents on its technical conditions proposals.

8.9.3 Updated EC Implementing Decisions on the 2.1 GHz and 2.3 GHz Band

8.282 As noted in Section 5.2 of this document the EC Implementation Decisions for both the 2.1 GHz Band⁸²¹ and the 2.6 GHz Band⁸²² have been amended since Document 19/124 was published.

8.283 The technical licence conditions for both 2.1 GHz and 2.6 GHz bands as set out in this document are amended to reflect these updated decisions.

8.9.4 ComReg’s Assessment of Respondent’s Views

8.284 ComReg notes that no respondents disagree with any aspects of the proposed technical conditions, and that Vodafone supports ComReg’s preliminary position on the compatibility of MFCN in the 700 MHz Duplex with cable networks (as set out in paragraphs 7.279 to 7.288 of Document 19/124).

8.285 ComReg therefore remains of the view that it is appropriate to adopt the proposed technical licence conditions as set out Section 7.9 and Annex 14 of Document 19/124, updated as appropriate to reflect the updated EC Implementing Decision for the 2.1 GHz Band and 2.6 GHz Band.

⁸²⁰ Vodafone’s comments in relation to the 2.3 GHz band and RurTel transition are addressed in Chapter 9.

⁸²¹ 2.1 GHz EC Decision 2012/688/EU is amended by 2.1 GHz EC Decision 2020/667/EU.

⁸²² 2.6 GHz EC Decision 2008/477/EU is amended by 2.6 GHz EC Decision 2020/636/EU.

8.9.5 ComReg's Final position

8.286 Having regard to the above, and ComReg's updated compatibility considerations as set out in Section 5.2 of this document, ComReg's final position on the technical conditions is to require new licensees:

- a) to comply with the BEMs for the 700 MHz Duplex, 2.1 GHz Band, and 2.6 GHz Band as set out in relevant EC Decisions⁸²³;
- b) to comply with the BEMs for the 2.3 GHz Band as set out in the ECC Decision⁸²⁴;
- c) to comply with maximum in-block power limits for base stations and terminal stations as set out in Annex 13 of this document;
- d) to comply with planning arrangements agreed in all relevant cross border Memorandum of Understandings (MoU)⁸²⁵;
- e) with spectrum rights of use starting at 703 MHz and having more than 2 × 10 MHz of spectrum rights in the 700 MHz Duplex, to ensure that the terminal station bandwidth is no greater than 10 MHz in order to meet the conditions as set out in Table 12 of the Annex to the Decision of 2016 to provide protection to the frequency range 470 - 694 MHz;
- f) with spectrum rights in the 2305 – 2330 MHz frequency range to ensure protection of Eir's RurTel network until otherwise notified by ComReg, by coordinating with Eir in relation to its MFCN deployments within the coordination areas defined in Figures 1.7 of the Plum Report (ComReg 20/122b)⁸²⁶ ;
- g) with spectrum rights in 2.6 GHz Band to ensure protection of all Aeronautical Primary Radars by implementing the compatibility measures as set out in Section 5.2 of this document; and
- h) with TDD spectrum rights in the 2.3 GHz Band and 2.6 GHz Band to comply with the Inter-Licensee Synchronisation Procedures as set out in section 7.9.5 of Document 19/124.

8.287 Details on the technical conditions for the Award Bands are set out in Annex 13.

⁸²³ For 700 MHz Duplex – EC decision 2016/687/EU, for the 2.1 GHz Band EC Decision 2012/688/EU amended by EC Decision 2020/667/EU, and for the 2.6 GHz Band EC Decision 2008/477/EU amended by EC Decision 2020/636/EU.

⁸²⁴ For the 2.3 GHz Band – ECC Decision (14)02.

⁸²⁵ [International Coordination of Radio Spectrum](#)

⁸²⁶ As may be updated from time to time by ComReg.

Chapter 9

9 Transition arrangements and preparatory licences

Introductory remarks

“Transition” refers to the activities required from existing and new licensees to adjust their respective networks to comply with the outcome of a spectrum award process.

Transition processes are a normal activity in respect of bands that have been previously licensed, and transition was, for example, a feature of the 2012 MBSA⁸²⁷ in respect of the 900 MHz and 1800 MHz bands.

What is the key issue?

The following potential Transition circumstances have been identified for the Proposed Award, being:

1. for the 2.1 GHz Band - in advance of the commencement date for Time Slice 1 in that band (“**2.1 GHz Band Time Slice 1 Transition**”);
2. in advance of the commencement date for Time Slice 2 in respect of the 2.1 GHz, 2.3 GHz and 2.6 GHz bands (“**Time Slice 2 Transition**”); and
3. in respect of Eir’s existing RurTel network in the 2.3 GHz Band (“**Eir’s 2.3 GHz Band Transition**”).

The key issue is to define Transition arrangements (i.e. transition rules to define a transition plan, and transition licensing framework(s) as appropriate) for these three transition circumstances.

What did ComReg propose?

For all three transition circumstances, ComReg proposed transition rules⁸²⁸ based on those successfully used for the 2012 MBSA.

⁸²⁷ See Annex 11 of Document 19/59R for a summary of transition in the 2012 MBSA.

⁸²⁸ This included:

- the setting of transition rules (a draft is set out in Section 3.8 of the draft IM) by which to formulate a transition plan;
- an obligation on existing licensees and bidders to abide by the transition rules;
- the collection of information from existing licensees to inform ComReg’s transition plans. For the “Time Slice 2 Transition”, ComReg proposed provisional timeframes for the submission of transition proposals in advance of 12 March 2027 - the commencement date of time slice 2; and
- the implementation of the transition plan.

Additionally, for “Eir’s 2.3 GHz Band Transition” ComReg proposed the use of:

- transition principles⁸²⁹ similar to that used in 3.6 GHz band transition process; and
- a transitional licensing framework for the RurTel network.

What Respondents said?

Vodafone, Eir and Three all submitted that the 2012 MBSA transition process worked well, but not the 3.6 GHz band transition process.

Vodafone submitted that ComReg should strictly define in advance of the Proposed Award the time to develop and execute a transition plan.

Imagine submitted that a migration plan should be agreed and published for the migration of RurTel in the 2.3 GHz band. Vodafone submitted that ComReg should set an end-date for RurTel.

What has ComReg finally decided, and why?

ComReg’s decision is to adopt the transition process and rules as proposed in Document 19/59R (and as used in the 2012 MBSA). The time required to develop and execute a transition plan will be determined by the transition process encompassed by these rules.

For “Eir’s 2.3 GHz Band Transition”, ComReg’s decision is to adopt:

- transition principles similar to those used in 3.6 GHz band transition process; and
- a transitional licensing framework for the RurTel network.

In addition, ComReg will continue to work towards finalising a migration plan for the RurTel network and will publish same once available.

⁸²⁹ The Transition principles are:

- minimise the potential for disruption to existing consumer services;
- introduce new rights of use in the 2.3 GHz Band as soon as possible without unnecessarily delaying the delivery of future liberalised services;
- maximise benefits to end-users; and
- ensuring the efficient use of spectrum during the Transition period

9.1 Transition Arrangements

9.1 “Transition” refers to the activities required from existing and new licensees to adjust their respective networks to comply with the outcome of a spectrum award process.

9.2 Transition processes are a normal activity in respect of bands that have been previously licensed and transition was, for example, a feature of the 2012 MBSA⁸³⁰ in respect of the 900 MHz and 1800 MHz bands.

9.1.1 Summary of ComReg’s view in Document 19/124 (and 20/32)

9.3 In Chapter 8 of Document 19/124, ComReg set out its preliminary positions on the potential need for Transition arrangements in the following three circumstances:

- a) for the 2.1 GHz Band - in advance of the commencement date for Time Slice 1 in that band (“**2.1 GHz Band Time Slice 1 Transition**”);
- b) in advance of the commencement date for Time Slice 2 in respect of the 2.1 GHz, 2.3 GHz and 2.6 GHz bands (“**Time Slice 2 Transition**”); and
- c) in respect of Eir’s existing RurTel network in the 2.3 GHz Band (“**Eir’s 2.3 GHz Band Transition**”).

9.4 ComReg’s preliminary positions in relation to these circumstances are set out in:

- a) Section 8.5.1 of Document 19/124 for the **2.1 GHz Band Time Slice 1 Transition**, where ComReg proposed to adopt the proposals as set out in Section 9.1.2 of Document 19/59R;
- b) Section 8.5.1 of Document 19/124 the **Time Slice 2 Transition**, where ComReg proposed to adopt the proposals as set out in Section 9.2 of Document 19/59R; and
- c) Section 8.5.3 of Document 19/124 for **Eir’s 2.3 GHz Band Transition**, where ComReg noted that, while Eir had reduced the extent of its RurTel Network in the 2.3 GHz Band, this did not materially impact the transition analysis or proposals as set out in Document 19/59R. ComReg therefore proposed to adopt the proposals as set out in Section 9.3.2 of that document.

9.5 In Chapter 9 of Document 19/124, ComReg set out its draft decisions based on its preliminary positions on Transition (see paragraphs 3.5, 3.9, 3.15.13, 3.15.14,

⁸³⁰ See Annex 11 of Document 19/59R for a summary of transition in the 2012 MBSA.

3.16, and 3.17).

- 9.6 In Sections 3.8 (“Transition Rules”) and Section 2.5 (“MBSA2 2.3 GHz Band Transition Licence – Terms and Conditions”) of Document 20/32, ComReg set out the draft rules and procedures to implement the above preliminary positions and draft decisions on Transition.

9.1.2 Summary of Respondents Views to Documents 19/124 and 20/32

- 9.7 Two respondents (Imagine and Vodafone)⁸³¹ provided comments on ComReg’s transition proposals in their submissions to Document 19/124 and 20/32⁸³².
- 9.8 Vodafone submitted a number of general comments on Transition which it had previously submitted in its response to Document 19/59R. These views are outlined⁸³³ and addressed⁸³⁴ in Document 19/124 and are not discussed further in this document.
- 9.9 In relation to the proposals on Eir’s 2.3 GHz Band Transition, Vodafone and Imagine provided several comments which are outlined below.
- i. Imagine submits that the end-date for transitional rights for Eir in the 2.3 GHz Band could and should be informed not just by the availability of services via the NBP⁸³⁵, but also by the availability of equivalent voice services⁸³⁶. For example, an equivalent VoIP service delivered via FWA or indeed a fixed voice service delivered via a mobile connection.
 - ii. Imagine also submits that Eir’s current use of the 2.3 GHz Band gives it an advantage in bidding for the 2.3 GHz Fixed Frequency Block because Eir has internal knowledge of the timetable for migration that

⁸³¹ While Eir in its submission to Document 19/124 noted that the detailed Transition rules would be set out in the draft Information Memorandum (Document 20/32) and it looked forward to the commenting on same in due course, it did not provide any comments on Transition in its submission to Document 20/32.

⁸³² No views on Transition were submitted in the respondents’ submission to Documents 20/56 and 20/78.

⁸³³ See paragraphs 8.36 and 8.36 of Document 19/124.

⁸³⁴ See Section 8.4.1 (“3.6 GHz Band Transition”) and Section 8.4.2 (“ComReg’s Transition proposals”) of Document 19/124.

⁸³⁵ As noted by ComReg in paragraph 8.24 bullet 4 of Document 19/124, where ComReg state that: *“there would be a clear end-date for all transitional rights. ComReg observed that based on current information and noting the rural locations of the existing customers, this could be informed by the ability of the RurTel customers to avail of the services that would be provided via the NBP.”*

⁸³⁶ As proposed in section 9.3.2 (paragraph 9.55 bullets 1 and 8) of Document 19/59R, where ComReg state:

“until Eir migrated these customers onto an alternative platform/s, or sufficiently comparable services became available to these customers from another provider/s – which ever was the earliest”

other bidders would not. To address this, Imagine submits that Eir should be required to submit a migration plan to be approved by ComReg prior to the auction, and for this information to be made available to the other bidders.

9.10 Vodafone submits that the proposals for Eir's 2.3 GHz Band Transition do not give realistic incentives to Eir to replace its old RurTel equipment and that ComReg is not giving adequate weight to "ensuring the efficient use of spectrum". Vodafone proposes that:

- i. the appropriate solution would be for ComReg, in advance of the auction, to set a fixed date by which Eir will have ceased the RurTel service; and
- ii. ComReg set prices for any 2.3 GHz Band Transition Licence by reference to the market value revealed in the Proposed Award. Vodafone submits that this would give Eir the correct incentive to use the spectrum efficiently given that a basic justification of the use of spectrum auctions is that market pricing of spectrum will drive its efficient use.

9.11 In addition, Vodafone submits that, absent change in the proposals for Eir's 2.3 GHz Band Transition, Eir will be afforded a significant commercial advantage in bidding for spectrum in the 2.3 GHz Band as it can value full nationwide access to the band whereas others candidates have to value the spectrum as geographically restricted.

9.1.3 Updated Information

9.12 In Section 5.2 of this document, ComReg provides an update on Eir's use of the 2.3 GHz Band for its RurTel service.

9.13 For the Galway RurTel network;

- a) there remain 2 active RurTel customers (down from 4 in December 2019); and
- b) ComReg has written to Eir (in its letter of 2 November 2020)⁸³⁷ stating that it will cease issuing point-to-multipoint renewal licences in the 2.3 GHz band from 31 January 2021 noting the availability of alternative services to these customers.

9.14 For the Donegal RurTel network:

⁸³⁷ See Annex 17 of this Document.

- a) Eir's response of 28 August 2020 indicates that there are 57 active customers (down from 76 customers in December 2019);
- b) Eir's correspondence of 8 October 2020 provides information on Eir's potential migration strategy for each of these 57 customers. In this Eir indicate that of 57 customers:
 - i. 25 had good in-building mobile coverage;
 - ii. 5 had good outdoor mobile coverage;
 - iii. 6 were potentially serviceable by installing mobile repeaters on the RurTel poles (currently out for field survey);
 - iv. 11 should be within mobile coverage as Eir rolls out new sites planned in its mobile network expansion;
 - v. 3 are still being analysed for a potential mobile solution; and
 - vi. 7 have been identified with no existing or planned mobile coverage.
- c) ComReg, in its letter of 2 November 2020, has indicated that it will reply to Eir regarding the Donegal RurTel network in due course.

9.15 Plum has produced an updated co-channel interference (CCI) coordination contour ("coordination area") for this new information, focussing solely on Eir's RurTel Donegal network. ComReg observes that the coordination area now comprises about 6% (285057) of the population.

9.16 Noting the above, and other factors such as the temporary nature of the RurTel coordination area as discussed in Section 5.2 of this document, a 2.3 GHz Fixed Frequency Block (Lower) between 2300 to 2330 MHz is no longer included in the Proposed Award. Instead ComReg's final position is make the 2300 – 2390 MHz spectrum available on a Frequency-Generic Lot basis.

9.1.4 ComReg's assessment of respondents' views

9.17 From the above, ComReg observes that respondents' views relate to Eir's 2.3 GHz Band Transition.

9.18 In relation to Imagine's submission in paragraph 9.9 bullet (i) above, ComReg clarifies that the availability of sufficiently comparable voice services provided by Eir on an alternative platform/s or by alternative providers would be a relevant consideration to inform the end-date of any transitional rights in the 2.3 GHz Band.

9.19 To provide clarity on this in the rules of the Proposed Award, ComReg when finalising the Information Memorandum (the "final IM") will amend paragraph

3.247 bullet 4 of Document 20/32 to read as follows:

- *“the completion of Transition Activities prior to the deadline dates as determined by ComReg in the Transition Plan. ComReg observes that based on current information and noting the rural locations of the existing customers, this could be informed by the ability of the RurTel customers to avail of the services that would be provided via the National Broadband Plan (NBP) **and the availability of sufficiently comparable voice services, provided by Eir on an alternative platform/s or by alternative providers.**” [Proposed amendment in bold text]*

9.20 In relation to Imagine’s submission in paragraph 9.9 bullet (ii) above (requesting publication of a migration plan to address any advantage that Eir might have in bidding for a 2.3 GHz Fixed Frequency Block (Lower)), ComReg:

- a) observes that it has been, and continues to be, actively engaged with Eir on the development of a migration plan for the RurTel network. In relation to the:
 - i. Galway RurTel network, surveys have been carried out by both Eir and ComReg to assess the migration possibilities for the remaining customers. Following this, ComReg wrote to Eir on 2 November 2020 stating that it will cease issuing point-to-multipoint renewal licences in the 2.3 GHz Band from 31 January 2021, noting the availability of alternative services to these customers; and
 - ii. Donegal RurTel network, Eir has carried out a survey for each of the remaining 57 active customers on this network and has provided the results of this migration survey to ComReg. As noted above, ComReg is continuing to engage with Eir on the migration of customers from this network.;
- b) will publish as much detail as possible on the RurTel migration plan when publishing its final Information Memorandum (i.e. in advance of bidders submitting applications to ComReg) and will publish subsequent relevant updates to same, should such information be available; and
- c) notes that the impact of the RurTel network on the Proposed Award has decreased significantly since Document 19/124 such that a 2.3 GHz Fixed Frequency Block (Lower) between 2300 to 2330 MHz is no longer included. Instead this spectrum is to be awarded on a Frequency-Generic Lots basis.

9.21 In relation to Vodafone’s submission in paragraph 9.9 bullet (iii) above (to give realistic incentives to Eir, Vodafone requests ComReg to set a fixed date for migration and to set prices for any 2.3 GHz Band Transition Licence by reference

to the market value revealed in the Proposed Award), ComReg sets out the following.

- 9.22 Firstly, ComReg observes that over the course of this consultation process, Eir has taken actions to migrate customers and decommission parts of the RurTel network, suggesting that the current process is already providing incentives to Eir to migrate customers from the RurTel network. In this regard, ComReg observes that:
- a) the Kerry RurTel network has been fully decommissioned;
 - b) the number of active customers on the Galway RurTel network has reduced to 2 customers (down from 8 on 3 December 2018)⁸³⁸ and that this network is to cease operation no later than 31 January 2021; and
 - c) the number of active customers on the Donegal RurTel Network has reduced to 57 customers (down from 77 on 3 December 2018)⁸³⁹ and that Eir has provided information on the potential migration of each remaining customer.
- 9.23 Secondly, ComReg is actively engaging with Eir to put in place a migration plan for the remaining customers on the RurTel network. In this regard, ComReg is aware that some of these customers are likely to be in difficult to serve areas with no alternative services available, and that the migration plan for such customers can thus take longer to identify, possibly necessitating the use of new spectrum rights of use won in the Proposed Award.
- 9.24 Consequently, whilst ComReg is working towards finalising a migration plan for the RurTel network, and publishing same once available, ComReg cannot set a fixed date for the migration of all RurTel customers at this point in time.
- 9.25 Thirdly, in relation to Vodafone's suggestion to set the price for any 2.3 GHz Band Transition Licence by reference to the market value revealed in the Proposed Award, ComReg is of the view that such an approach is not appropriate to ensure the optimal use of the radio frequency spectrum as the continued migration of customers from Eir's RurTel network has significantly reduced its impact on the Proposed Award such that a 2.3 GHz Fixed Frequency Block between 2300 to 2330 MHz is no longer included. Instead this spectrum is to be awarded on a Frequency-Generic Lots basis.
- 9.26 Given that the updated coordination contour approximately accounts for only 6% of the population of the State, estimating the relevant portion of the market value revealed in the Proposed Award would be complex to implement and subject to

⁸³⁸ See paragraph 6.47 of Document 19/59R.

⁸³⁹ Ibid.

uncertainty and error. For example, it is not clear whether accounting for only 6% of the population would be appropriate since the per capita value of the spectrum may be lower in rural parts of the country than in urban areas (though this is uncertain given the likely range of users).

9.27 Alternatively, “the existing fees set out in the Wireless Telegraphy (Radio Link Licence) Regulations (S.I No. 370 of 2009) but updated to present day prices using the overall CPI” can account for the point to point radio links used in the coordination contour to serve the relevant 6% of population. See Section 9.1.5 below.

9.28 In relation to Vodafone’s submission in paragraph 9.9 bullet (iv) and for the reasons set out above (and in particular the significantly reduced impact of the RurTel network on the Proposed Award), ComReg is of the view that Eir is not being afforded a significant commercial advantage in bidding for spectrum in the 2.3 GHz Band.

9.1.5 Updated fees for a 2.3 GHz Transition Licence

9.29 In paragraphs 8.26 and 8.27 of Document 19/124⁸⁴⁰ ComReg set out its fee proposals for a 2.3 GHz Band Transition Licence, noting that these may need to be suitably adapted “*depending on the level of migration and the impact upon the Proposed Award. For example, if sufficient migration occurred so as to not warrant a frequency-specific lot for the relevant frequencies.*”

9.30 Considering the significantly reduced impact of the RurTel Network on the Proposed Award, and the removal of the 2.3 GHz Fixed Frequency Lot (Lower) between 2300 and 2330 MHz, ComReg is removing the fee proposal set out in the second bullet of paragraph 8.26 of Document 19/124.

⁸⁴⁰ [8.26] *In relation to the spectrum fees for any transitional right of use, and noting the power to impose fees which reflect the need to ensure the optimal use of the radio frequency spectrum, ComReg envisaged setting spectrum fees based on the higher of:*

- *the existing fees set out in the Wireless Telegraphy (Radio Link Licence) Regulations (S.I No. 370 of 2009) but updated to present day prices using the overall CPI; or*
- *the opportunity cost of the RurTel network remaining in the band beyond the commencement of new rights in the band. For example, and assuming a frequency-specific lot for the relevant frequencies, by reflecting the difference between the final prices for any frequency-specific lot and frequency-generic lots in the 2.3 GHz band (or a reasonable approximation of same given the proposed combinatorial nature of the auction proposed).*

[8.27] *In the event of a **partial migration by Eir** in advance of the Proposed Award, ComReg observed that:*

- *the transitional framework identified in respect of no migration above would, in general terms, also be required for those areas not migrated; and*
- ***certain specific measures (e.g. fees) identified above in respect of no migration may need to be suitably adapted depending on the level of migration and the impact upon the Proposed Award. For example, if sufficient migration occurred so as to not warrant a frequency-specific lot for the relevant frequencies.*** [Emphasis added]

- 9.31 The spectrum fees will thus be based solely on the proposal set out in the first bullet of paragraph 8.26 of Document 19/124, being *“the existing fees set out in the Wireless Telegraphy (Radio Link Licence) Regulations (S.I No. 370 of 2009) but updated to present day prices using the overall CPI”*⁸⁴¹.
- 9.32 In relation to calculating the overall CPI change, ComReg proposes to calculate this using the latest CPI data available at the time at which it makes the licensing regulations under the Wireless Telegraphy Act (a draft of which was made available for comment alongside the draft information memorandum (Document 20/32)).
- 9.33 In addition, ComReg observes that a circumstance may arise where Eir wins new rights of use for the spectrum in the 2307 to 2327 MHz range, and that it would only require a 2.3 GHz Band Transition Licence for frequencies in the 2401 – 2421 MHz range. In such circumstances, ComReg is of view that the spectrum fee should be adjusted pro rata (i.e. be reduced by 50%) as only one half of the radio frequencies in the duplex radio link would be licensed in the 2.3 GHz Band Transition Licence.

9.1.6 ComReg’s Final position

- 9.34 In light of the above, ComReg’s final position is to:
- a) adopt the proposals as set out in Section 9.1.2 of Document 19/59R for the **2.1 GHz Band Time Slice 1 Transition**;
 - b) to adopt the proposals as set out in Section 9.2 of Document 19/59R for the **Time Slice 2 Transition**; and
 - c) to adopt the proposals as set out in Section 9.3.2 of that document for **Eir’s 2.3 GHz Band Transition** as updated for fees as outlined in Section 9.1.5 above.
- 9.35 In implementing the above final positions in ComReg’s Decision as set out in Chapter 10 of this document, ComReg has:

⁸⁴¹ In Document 20/32, ComReg indicated that this fee would be €1,060 per point to point link and €4,240 for a point to multi-point radio link (i.e. four (4) times the annual fees (€) for a point to point radio link). This is based on Table 1 of S.I. No. 370 of 2009 where the fee associated with a frequency (1 GHz < F < 17 GHz) and a bandwidth ≤3.5 MHz was indexed to CPI for the period September 2009 to January 2020.

- a) removed all references to a MBSA2 2.1 GHz Band Transition Licence, as this was included in error in the draft decision of Document 19/124⁸⁴²; and
- b) modified paragraph 3.15.13 (requirement to abide by the transition rules) to include Winning Bidders and Existing 2.1 GHz Band Licensees in accordance with paragraph 9.27 of Document 19/59R⁸⁴³.

9.2 Preparatory Licences

9.2.1 Summary of ComReg's view in Document 19/124 and 20/32

- 9.36 In Section 8.5.4 of Document 19/124, ComReg set out its preliminary decision to adopt the preparatory licence proposals as set out in Section 9.4 of Document 19/59R to make preparatory licences available to all winning bidders in the Proposed Award. Winning bidders would be able to apply for a preparatory licence following the completion of the Proposed Award and these licences would operate until the commencement date of new licences.
- 9.37 This would facilitate winning bidders in carrying out preparations to their network to install or test equipment in advance of the commencement date of any new licences issued. However, such licences would not allow any wireless telegraphy transmissions.
- 9.38 Should a winning bidder wish to test or trial its network or a service in advance of the commencement of its spectrum rights, winning bidders could also apply for a Test or Trial licence⁸⁴⁴.
- 9.39 In Chapter 9 of Document 19/124, ComReg set out several draft decisions in its draft decision document in order to implement its preliminary positions on preparatory licences. These are draft decisions: 3.5; 3.6; 3.9; 3.11; and 3.15.16.
- 9.40 In Document 20/32, Section 2.4 ("The MBSA2 Preparatory Licences – Terms and Conditions") sets out the draft rules and procedures to implement these draft decisions and preliminary positions.

9.2.2 Summary of Respondents Views to Document 19/124 and 20/32

- 9.41 No views were submitted on ComReg's proposals for preparatory licences.

⁸⁴² As set out in paragraphs 9.38 to 9.40 of Document 19/59R, ComReg observes that "any such transition activities are likely to be facilitated under the existing 3G licences".

⁸⁴³ [9.27] "Similar to the 2012 MBSA, ComReg proposes that all participants (including existing licensees) in the Proposed Award would agree to abide by the transition rules".

⁸⁴⁴ See www.testandtrial.ie

9.2.3 ComReg's final position

9.42 In light of the above, ComReg's final position is to adopt the preparatory licence proposals as set out in Section 9.4 of Document 19/59R.

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Chapter 10

10 Decision

This chapter sets out a decision document based on the positions set out by ComReg in the preceding chapters and their supporting annexes.

Decision

1. DEFINITIONS AND INTERPRETATION

1. In this Decision, save where the context otherwise admits or requires:

“1800 MHz Band” means spectrum in the range 1710 – 1785 MHz paired with 1805 – 1880 MHz;

“2.1 GHz Band” means spectrum in the range 1920 – 1980 MHz paired with 2110 – 2170 MHz;

“2.1 GHz Band EC Decision” means European Commission Decision 2012/688/EC⁸⁴⁵ as amended by European Commission Decision 2020/667⁸⁴⁶;

“2.1 GHz Band Frequency Generic Lot” means a right of use in respect of a 2 × 5 MHz block of spectrum in the 2.1 GHz Band, with the specific frequencies of such Lots being determined in the assignment stage of the competitive selection procedure described herein;

“2.1 GHz Band Interim A Licence” means a licence of the type set out in draft form in Schedule 1 to the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations;

“2.1 GHz Band Interim B Licence” means a licence of the type set out in draft form in Schedule 1 to the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations;

“2.1 GHz Band Interim Licence and Early Liberalisation Regulations” means the Wireless Telegraphy (Third Generation and GSM Licence (Amendment) and Interim Licensing) Regulations, 202X, as set out in draft form in Annex 2 to the Draft Information Memorandum;

⁸⁴⁵ Commission Implementing Decision of 5 November 2012 on the harmonisation of the frequency bands 1920 – 1980 MHz and 2110 – 2170 MHz for terrestrial systems capable of providing electronic communications services in the Union. (2012/688/EU)

⁸⁴⁶ Commission Implementing Decision (EU) 2020/667 of 6 May 2020 amending Decision 2012/688/EU as regards an update of relevant technical conditions applicable to the frequency bands 1920 – 1980 MHz and 2110 – 2170 MHz.

“2.3 GHz Band” means spectrum in the range 2300 – 2400 MHz;

“2.3 GHz Band ECC Decision” means Electronic Communications Committee Decision 14(02)⁸⁴⁷;

“2.3 GHz Band Fixed Frequency Lot (Upper)” means a right of use in respect of the 1 × 10 MHz block of spectrum from 2390 – 2400 MHz;

“2.3 GHz Band Frequency Generic Lot” means a right of use in respect of a 1 × 5 MHz block of spectrum in the range 2300 – 2390 MHz, with the specific frequencies of such Lots being determined in the assignment stage of the competitive selection procedure described herein;

“2.6 GHz Band” means spectrum in the range 2500 – 2690 MHz;

“2.6 GHz Band EC Decision” means European Commission Decision 2008/477/EC⁸⁴⁸ as amended by European Commission Decision 2020/636/EU⁸⁴⁹;

“2.6 GHz Band FDD Frequency Generic Lot” means a right of use in respect of a 2 × 5 MHz block of spectrum in the range 2500 – 2570 MHz paired with 2620 – 2690 MHz, with the specific frequencies of such Lots being determined in the assignment stage of the competitive selection procedure described herein;

“2.6 GHz Band TDD Fixed Frequency Lot (Lower)” means a right of use in respect of the 1 × 5 MHz block of spectrum from 2570 – 2575 MHz;

“2.6 GHz Band TDD Fixed Frequency Lot (Upper)” means a right of use in respect of the 1 × 5 MHz block of spectrum from 2615 – 2620 MHz;

“2.6 GHz Band TDD Frequency Generic Lot” means a right of use in respect of a 1 × 5 MHz block of spectrum in the range 2575 – 2615 MHz, with the specific frequencies of such Lots being determined in the assignment stage of the competitive selection procedure described herein;

“3.6 GHz Band” means spectrum in the range 3410 – 3435 MHz and 3475 – 3800 MHz;

“3.6 GHz Band Region” means a regional area of the State specified in Schedule 10 of the Wireless Telegraphy (3.6 GHz Band Licences) Regulations 2016 (S.I. No 532 of 2016);

⁸⁴⁷ ECC Decision 14(02) - Harmonised technical and regulatory conditions for the use of the band 2300 – 2400 MHz for Mobile/Fixed Communications Networks (MFCN).

⁸⁴⁸ Commission Decision of 13 June 2008 on the harmonisation of the 2500 – 2690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community. (2008/477/EC)

⁸⁴⁹ Commission Implementing Decision (EU) 2020/636 of 8 May 2020 amending Decision 2008/477/EC as regards an update of relevant technical conditions applicable to the 2500 – 2 690 MHz frequency band.

“700 MHz Duplex” means spectrum in the range 703 – 733 MHz paired with 758 – 788 MHz;

“700 MHz Duplex Frequency Generic Lot” means a right of use in respect of a 2 × 5 MHz block of spectrum in the 700 MHz Duplex, with the specific frequencies of such Lots being determined in the assignment stage of the competitive selection procedure described herein;

“700 MHz EC Decision” means Decision (EU) 2016/687⁸⁵⁰;

“700 MHz EU Decision” means Decision (EU) 2017/899⁸⁵¹;

“800 MHz Band” means spectrum in the range 791 – 821 MHz paired with 832 – 862 MHz”;

“900 MHz Band” means spectrum in the range 880 – 915 MHz paired with 925 – 960 MHz”;

“Authorisation Regulations” means the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations, 2011 (S.I. No. 335 of 2011);

“Award Spectrum” means 700 MHz Duplex Frequency Generic Lots, 2.1 GHz Band Frequency Generic Lots, the 2.3 GHz Band Fixed Frequency Lot (Upper), 2.3 GHz Band Frequency Generic Lots, 2.6 GHz Band FDD Frequency Generic Lots, the 2.6 GHz Band TDD Fixed Frequency Lot (Lower), the 2.6 GHz TDD Band Fixed Frequency Lot (Upper) and 2.6 GHz Band TDD Frequency Generic Lots;

“Base Price” means the price to be paid by a Winning Bidder for the package of Lots won by it in the main stage of the competitive selection procedure described herein;

“Communications Regulation Act 2002” means the Communications Regulation Act, 2002, (No. 20 of 2002), as amended;

“ComReg” means the Commission for Communications Regulation, established under section 6 of the Communications Regulation Act 2002;

“EECC” means Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code;

“Existing 2.1 GHz Band Licence” means a licence issued pursuant to the Wireless Telegraphy (Third Generation and GSM Mobile Telephony Licence) Regulations, 2002

⁸⁵⁰ Commission Implementing Decision (EU) 2016/687 of 28 April 2016 on the harmonisation of the 694 – 790 MHz frequency band for terrestrial systems capable of providing wireless broadband electronic communications services and for flexible national use in the Union.

⁸⁵¹ Decision (EU) 2017/899 of the European Parliament and of the Council of 17 May 2017 on the use of the 470 – 790 MHz frequency band in the Union.

(S.I. No 345 of 2002), as amended by the Wireless Telegraphy (Third Generation and GSM Mobile Telephony Licence) (Amendment) Regulations, 2003 (S.I. No 340 of 2003), or pursuant to the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations, as appropriate;

“Existing 2.1 GHz Band Licensee” means a person holding one, or more, Existing 2.1 GHz Band Licences;

“Existing 2.3 GHz Band Licence” means a licence issued pursuant to the Wireless Telegraphy (Radio Link Licence) Regulations, 2009 (S.I. No. 370 of 2009) by which rights of use are assigned within the frequency range 2307 – 2327 MHz;

“Existing 2.3 GHz Band Licensee” means a person holding one, or more, Existing 2.3 GHz Band Licences;

“Framework Regulations” means the European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011, (S.I. No. 333 of 2011);

“Information Memorandum” means the information memorandum which ComReg intends to publish in due course⁸⁵², and **“Draft Information Memorandum”** means the draft information memorandum published by ComReg on 13 May 2020 under ComReg Document 20/32;

“Lot” means a 700 MHz Duplex Frequency Generic Lot, a 2.1 GHz Band Frequency Generic Lot, the 2.3 GHz Band Fixed Frequency Lot (Upper), a 2.3 GHz Band Frequency Generic Lot, a 2.6 GHz Band FDD Frequency Generic Lot, the 2.6 GHz Band TDD Fixed Frequency Lot (Lower), the 2.6 GHz Band TDD Fixed Frequency Lot (Upper) or a 2.6 GHz Band TDD Frequency Generic Lot, as the case may be;

“MBSA2 Liberalised Use Licence” means a licence of the type set out in draft form in Schedule 1 to the MBSA2 Licence Regulations;

“MBSA2 Licence Regulations” means the Wireless Telegraphy (Liberalised Use and Related Licences in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands) Regulations, 202X, as set out in draft form in Annex 2 to the Draft Information Memorandum;

“MBSA2 Preparatory Licence” means a licence of the type set out in Schedule 3 to the MBSA2 Licence Regulations;

“MBSA2 Spectrum Lease Licence” means a licence of the type set out in draft form in Schedule 2 to the MBSA2 Licence Regulations;

⁸⁵² While the Information Memorandum will detail the processes and procedures that ComReg will employ to implement this Decision, it will not affect the substance of this Decision and, in particular the elements of the competitive selection procedure detailed at 3.15 of this Decision.

“MBSA2 2.3 GHz Band Transition Licence” means a licence of the type set out in Schedule 4 to the MBSA2 Licence Regulations;

“Minister” means the Minister for the Environment, Climate and Communications;

“Bidder” means an applicant who, following consideration of its application by ComReg, has been informed, in accordance with the requirements of the Information Memorandum, that its application is compliant and that it is entitled to participate in the competitive selection procedure described herein;

“RIA” means Regulatory Impact Assessment;

“RSPP Decision” means Decision No 243/2012/EU⁸⁵³;

“Winning Bidder” means a Bidder that wins at least one Lot in the competitive selection procedure described herein; and

“Wireless Telegraphy Act 1926” means the Wireless Telegraphy Act, 1926 (No. 45 of 1926), as amended.

2. DECISION-MAKING CONSIDERATIONS

2. In arriving at this decision in this Chapter 10, ComReg has had regard to all relevant information before it, including:

- i. the contents of, and the materials and reasoning referred to in, as well as the materials provided by respondents in connection with, the below-listed ComReg documents:
 - a) 14/101 (insofar as relevant to this Document 20/122);
 - b) 18/60;
 - c) 18/103;
 - d) 19/59R;
 - e) 19/124;
 - f) 20/21;
 - g) 20/23;
 - h) 20/27;
 - i) 20/32;
 - j) 20/56;
 - k) 20/64;

⁸⁵³ Decision No 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme.

- l) 20/86R;
- m) 20/88;
- n) 20/122
- ii. the consultants' reports commissioned, and the advice obtained by ComReg, in relation to the subject-matter of the documents and materials listed above;
- iii. the powers, functions, objectives and duties of ComReg, including, without limitation those under and by virtue of:
 - o) the Communications Regulation Act 2002, and, in particular, sections 10, 12 and 13 thereof;
 - p) the Framework Regulations, and, in particular, Regulations 13, 16 and 17 thereof;
 - q) the Authorisation Regulations, and, in particular, Regulations 9, 10, 11, 12, 15, 16, 17, 18(1)(c) and 19 thereof;
 - r) the RSPP Decision;
 - s) the 2.1 GHz Band EC Decision;
 - t) the 2.3 GHz Band ECC Decision;
 - u) the 2.6 GHz Band EC Decision;
 - v) the 700 MHz EC Decision;
 - w) the 700 MHz EU Decision;
 - x) the objectives of the EECC;
 - y) Sections 5 and 6 of the Wireless Telegraphy Act, 1926; and
 - z) the applicable Policy Directions made by the Minister under section 13 of the Communications Regulation Act 2002,

and, noting that it has:

- aa) given all interested parties the opportunity to express their views and make their submissions and representations in accordance with Regulation 11 of the Authorisation Regulations and Regulation 12 of the Framework Regulations;
- bb) considered such representations; and
- cc) where necessary, evaluated the matters to be decided, in accordance with ComReg's RIA Guidelines (ComReg Document 07/56a) and the RIA Guidelines issued by the Department of An Taoiseach in June, 2009,

as set out in the various chapters of this Document 20/122 and their supporting annexes.

3. DECISIONS

3. Having had regard to the above considerations, and in exercise of the powers set out in particular in paragraph 2(iii) above, ComReg has decided:

- 3.1 to proceed with the proposed release of the Award Spectrum;
- 3.2 subject to obtaining the consent of the Minister to the making of the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations, to make those regulations under section 6 of the Wireless Telegraphy Act 1926, prescribing relevant matters in relation to a 2.1 GHz Band Interim A Licence, a 2.1 GHz Band Interim B Licence and Existing 2.1 GHz Band Licences, including prescribing the form of the licences concerned, their duration and the conditions and restrictions subject to which they are granted
- 3.3 under section 5 of the Wireless Telegraphy Act 1926, and pursuant to the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations, and upon application properly being made to it and upon payment of the relevant fee/s being made in accordance with the terms of the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations, to grant Three Ireland (Hutchison) Limited a limited number of individual rights of use for radio frequencies, by way of a 2.1 GHz Band Interim A Licence and/or a 2.1 GHz Band Interim B Licence, in respect of the 2.1 GHz Band;
- 3.4 under Regulation 15 of the Authorisation Regulations, and pursuant to the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations, and:
 - 3.4.1 upon application properly being made to it by an Existing 2.1 GHz Band Licensee with existing 2.1 GHz Band rights of use expiring on or before 15 October 2022, to amend the rights and obligations concerning such applicant licensee's Existing 2.1 GHz Band Licence/s as appropriate to comply with the 2.1 GHz EC Decision for the period until 15 October 2022, so as to grant a Liberalised Existing 2.1 GHz Licence/s ("Early Liberalisation Option 1"); and
 - 3.4.2 upon application properly being made to it by an Existing 2.1 GHz Band Licensee with existing 2.1 GHz Band rights of use expiring after 15 October 2022 and upon the payment of the relevant fee (if required) being made, or upon receipt of a binding commitment from the Existing 2.1 GHz Band Licensee to pay the relevant fee, as described in Chapter 4 of this Document 20/122 and which will be further particularised in the Information Memorandum, to amend the rights and obligations

concerning such applicant licensee's Existing 2.1 GHz Band Licence as appropriate to comply with the 2.1 GHz Band EC Decision for the period until 11 March 2027, so as to grant a Liberalised Existing 2.1 GHz Licence ("Early Liberalisation Option 2");

- 3.5 subject to obtaining the consent of the Minister to the making by it of the MBSA2 Licence Regulations, to make those regulations under section 6 of the Wireless Telegraphy Act 1926, prescribing relevant matters in relation to MBSA2 Liberalised Use Licences, MBSA2 Preparatory Licences, MBSA2 Spectrum Lease Licences, and MBSA2 2.3 GHz Transition Licences, including prescribing the form of the licences concerned, their duration and the conditions and restrictions subject to which they are granted;
- 3.6 under section 5 of the Wireless Telegraphy Act 1926, and upon application being properly made to it and upon payment of the relevant fee/s being made in accordance with the Information Memorandum and the MBSA2 Licence Regulations, to grant a limited number of individual rights of use for radio frequencies, by way of MBSA2 Liberalised Use Licences and MBSA2 Preparatory Licences in respect of the Award Spectrum;
- 3.7 to implement band plans, including the relevant guard band/s, for each of the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands as identified in Chapter 5 of this Document 20/122;
- 3.8 to attach conditions to rights of use to a 2.1 GHz Band Interim A Licence and 2.1 GHz Band Interim B Licence as generally described in Annex 5 of this Document 20/122 and which will be further particularised in the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations;
- 3.9 to attach conditions to rights of use to a MBSA2 2.3 GHz Band Transition Licence and Preparatory Licences as generally described in Chapter 9 of this Document 20/122 and which will be further particularised in the MBSA2 Licence Regulations;
- 3.10 to attach conditions to rights of use to the Award Spectrum as generally described in Chapter 8 of this Document 20/122 and which will be further particularised in the MBSA2 Licence Regulations;
- 3.11 to select those parties who will be eligible to be granted MBSA2 Liberalised Use Licence(s) and MBSA2 Preparatory Licence(s) by means of a competitive selection procedure by way of auction the elements of which are particularised below at 3.15 and which will be set out, in consistent terms, in the Information Memorandum;
- 3.12 to make rights of use in respect of the Award Spectrum available on a national

basis⁸⁵⁴;

3.13 to make rights of use in respect of the 700 MHz Duplex, 2.3 GHz and 2.6 GHz Bands available for a maximum term of 20 years and where all such rights of use shall expire absolutely on 30 November 2041 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum)⁸⁵⁵;

3.14 to make rights of use in respect of the 2.1 GHz Band, with the exception of the 2.1 GHz Band Interim A Licence and 2.1 GHz Band Interim B Licence, available for a maximum term of approximately 19 years and 1.5 months and where all such rights of use shall expire absolutely on 30 November 2041 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum)⁸⁵⁶;

3.15 to incorporate into the competitive selection procedure the following elements:

3.15.1 a number of stages including an application stage, a qualification stage, a main stage and an assignment stage, with the outcome of the qualification stage determining whether the procedure moves directly to the assignment stage due to demand not exceeding supply, or whether the main stage is necessary, due to demand exceeding supply;

3.15.2 a main stage, if it occurs, comprising of a combinatorial clock auction;

3.15.3 700 MHz Duplex Frequency Generic Lots being made available in one temporal period from 1 December 2021 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to 30 November 2041 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum);

3.15.4 a 2.3 GHz Band Fixed Frequency Lot (Upper), 2.3 GHz Band Frequency Generic Lots, 2.6 GHz Band FDD Frequency Generic Lots, a 2.6 GHz Band TDD Fixed Frequency Lot (Lower), a 2.6 GHz Band TDD Fixed Frequency Lot (Upper) and 2.6 GHz Band TDD Frequency Generic Lots

⁸⁵⁴ Noting that a coordination zone applies to rights of use in the:

- 2.3 GHz Band Frequency Generic Lots spanning the frequency range 2307 – 2327 MHz, in the coordination area illustrated in Figure 1.7 of Document 20/122b and which may be updated by ComReg as appropriate; and
- 2.6 GHz Band FDD Frequency Generic Lot, 2.6 GHz Band TDD Fixed Frequency Lot (Lower), 2.6 GHz Band TDD Fixed Frequency Lot (Upper) and 2.6 GHz Band TDD Frequency Generic Lot, operating within 1 km of a Primary Aeronautical radar as set out in Annex 13.

⁸⁵⁵ Any delay to the commencement of MBSA2 Liberalised Use Licences due to MBSA2 2.3 GHz Band Transition Licences shall not affect this expiry date.

⁸⁵⁶ Any delay to the commencement of MBSA2 Liberalised Use Licences due to MBSA2 2.3 GHz Band Transition Licences shall not affect this expiry date.

being made available in two “time slices”, namely:

- i. Time Slice 1: From 1 December 2021 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to 11 March 2027 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum); and
- ii. Time Slice 2: From 12 March 2027 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to 30 November 2041 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum);

3.15.5 2.1 GHz Band Frequency Generic Lots being made available in two “time slices”, being:

- i. 2.1 GHz Band Time Slice 1: From 16 October 2022 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to 11 March 2027 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum); and
- ii. Time Slice 2: From 12 March 2027 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum) to 30 November 2041 (or such other date as may be specified by ComReg in, or in accordance with, the Information Memorandum);

3.15.6 in the event of the main stage of the auction proceeding, multiple primary bid rounds, with the auctioneer setting the price in each round for each Lot Category specified in the Information Memorandum, with bidders entitled to bid, subject to detailed rules set out in the Information Memorandum, for packages of Lots at those prices, until supply equals or exceeds demand across all Lot Categories at the round prices or for such other reason as may be set out in the Information Memorandum;

3.15.7 following any such primary rounds, a single, sealed-bid, supplementary round, entitling bidders to submit a number of bids for packages of Lots for which such bidders are eligible to bid, at bid prices of their choosing, all of which will be subject to detailed rules set out in the Information Memorandum;

3.15.8 a requirement that winning bids will be determined by selecting at most one bid from amongst the entirety of bids made by each Bidder in order to maximise the total value of winning bids subject to not allocating more

Lots than available and valuing any unallocated Lots at reserve prices. A price calculation methodology as set out in the Information Memorandum will then be applied to calculate the Base Price on the basis of the opportunity cost of awarding Lots to each Winning Bidder and group of Winning Bidders, but subject to price floors set by these opportunity costs, minimising the total auction revenue;

3.15.9 an assignment stage in which:

- i. Winning Bidders will be required to participate (other than in respect of the 2.3 GHz Band Fixed Frequency Lot (Upper), 2.6 GHz Band TDD Fixed Frequency Lot (Lower) and 2.6 GHz Band TDD Band Fixed Frequency Lot (Upper)) and in which each Winning Bidder can bid for its preferred option/s out of a range of assignment option/s for which it is eligible to bid, such eligibility being determined by the detailed rules set out in the Information Memorandum; and
- ii. all Existing 2.1 GHz Band Licensees will be required to participate to determine the location of their existing 2.1 GHz Band rights of use in Time Slice 1. ComReg will reimburse any reasonable and vouched costs associated with the relocation of existing 2.1 GHz Band rights of use required as a result of the assignment stage which an Existing 2.1 GHz Band Licensee can demonstrate to ComReg's satisfaction would not otherwise have been incurred;

3.15.10 a requirement that winning bids and prices in the assignment stage are determined in accordance with the winner and price determination methodology set out in the Information Memorandum;

3.15.11 spectrum competition caps, which will apply to each Bidder in the competitive selection procedure, and only for the duration of that procedure, as follows:

- i. 70 MHz in aggregate across the 700 MHz Duplex, 800 MHz and 900 MHz Bands, taking into account all existing holdings in these bands at the time of ComReg's receipt of an Application to participate in the procedure; and
- ii. 375 MHz in aggregate across the 700 MHz Duplex, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and 3.6 GHz Bands, taking into account all existing holdings in these bands at the time of ComReg's receipt of an Application to participate in the procedure (with the exception of existing holdings in the 2.3 GHz Band and, in the case of 3.6 GHz Band holdings, the highest

holding in any 3.6 GHz Band Region held by that Bidder), in each of Time Slice 1 and 2;

- 3.15.12 reserve prices and spectrum usage fees (SUFs) for the MBSA2 Liberalised Use Licences described herein, to be determined in accordance with the methodology referred to in Chapter 5 of this Document 20/122 and with the Benchmarking and Minimum Prices Report prepared by DotEcon (Document 19/59b) an update of which, including additional relevant data samples, will be published in due course, where the final reserve prices and SUFs will be set out in the Information Memorandum taking account of any additional relevant data at that time;
- 3.15.13 a requirement that all Winning Bidders, Existing 2.1 GHz Band Licensees and applicants for a MBSA2 Band 2.3 GHz Band Transition Licence to abide by the transition rules as set out in the Information Memorandum;
- 3.15.14 to develop and finalise a transition plan/s in consultation with interested parties in accordance with the transition rules which are more particularly described in Chapter 9 of this Document 20/122 and which will be further particularised in the Information Memorandum;
- 3.15.15 reimbursement of a pro rata proportion of the upfront fee (as determined by the competitive selection process in accordance with the rules set out in the Information Memorandum) and SUFs to a Winning Bidder in the event that the commencement of the rights of use held under its MBSA2 Liberalised Use Licence is delayed as a result of delayed availability of spectrum to which the Licence relates due to circumstances described in the Information Memorandum, including the transition activities of applicable licensees under a transition plan/s;
- 3.16 upon application properly being made to it by Existing 2.3 GHz Band Licensees in accordance with the terms of the Information Memorandum and the MBSA2 Licence Regulations, to consider granting a MBSA2 2.3 GHz Band Transition Licence to such persons in accordance with the positions as set out in Chapter 9 of this Document 20/122, the Information Memorandum and the transition plan;
- 3.17 upon application properly being made to it in accordance with the MBSA2 Licence Regulations, to consider granting a MBSA2 Spectrum Lease Licence; and
- 3.18 to retain its discretion regarding how it might treat any unsold Lots depending on the factual circumstances arising from the competitive selection procedure described herein, save for the decision that unsold Lots will not be considered

for assignment for a reasonable period after the process, and, in any event, will not be assigned for a period of at least 2 years after the competitive selection procedure described herein.

4. STATUTORY POWERS NOT AFFECTED

4.1 Nothing in this document shall operate to limit ComReg in the exercise of its discretions or powers, or the performance of its functions or duties, or the attainment of objectives under any laws applicable to ComReg from time to time.

JEREMY GODFREY

COMMISSIONER

THE COMMISSION FOR COMMUNICATIONS REGULATION

THE 18TH DAY OF DECEMBER 2020

NON-CONFIDENTIAL

Chapter 11

11 Submitting comments and next steps

11.1 Next Steps

- 11.1 Insofar as it might receive correspondence on matters relating to this document, ComReg will publish any relevant and material correspondence received in this regard. Such information will be subject to the provisions of ComReg's guidelines on the treatment of confidential information⁸⁵⁷. Further, some of the material redacted from the document relates to assertions of confidentiality from interested parties. ComReg reserves its right to un-redact certain material from the publication should it be appropriate to do so.
- 11.2 ComReg will, in due course, publish an Information Memorandum setting out the relevant substantive rules set out in Chapter 10 and also the procedures associated with the competitive selection procedure decided upon in the Decision herein.
- 11.3 Subsequently and in advance of accepting applications, and subject to obtaining the required ministerial consent, ComReg will make regulations under the Wireless Telegraphy Acts prescribing relevant matters in relation to the licences to be granted to eligible persons following that award process.
- 11.4 As noted in the Document 20/32, ComReg also intends to hold workshops with interested parties as well as running mock auctions to familiarise bidders with the auction software.

11.2 Envisaged next publications and actions in the Award Process

- 11.5 The start date of the Award Process will be announced with the publication of the Information Memorandum or by notice following the publication of the Information Memorandum. While the Information Memorandum will detail the procedures that ComReg will employ to implement the Decision, it will not affect the substance of the Decision and, in particular, the elements of the competitive selection procedure detailed at 3.15 of the Decision.
- 11.6 While ComReg is unable to give specific dates for each step detailed below,

⁸⁵⁷ Document 05/24.

ComReg envisages that the next steps in this process will be as follows:

- a) Publication of a response to the previously held consultation, such response addressing outstanding and discrete matters relating to the draft information memorandum and the publication of the final Information Memorandum and final Draft Regulations⁸⁵⁸;
- b) The holding of a presentation to allow interested parties to further develop their understanding of the relevant award procedures, processes and tools;
- c) The holding of a question and answer phase;
- d) Publication of the licensing regulations under Wireless Telegraphy Acts (following obtaining the required consent of the Minister);
- e) The submission of applications by interested parties;
- f) The determination by ComReg of the applicants that qualify to become bidders and whether there is a need to hold a main stage / or assignment stage (i.e. an auction):
- g) the holding of mock auction(s) with bidders;
- h) notice to bidders on the start date of the Auction (assuming it is required);
- i) the running of the Auction in accordance with the rules and procedures set out in the Information Memorandum (assuming it is required); and
- j) the award of licences to winning bidders.

⁸⁵⁸ These matters will not affect the substance of this Decision.

Annex: 1 Glossary

Definitions

- A 1.1 The definitions in this glossary shall apply to this document as a whole.
- A 1.2 Terms defined in this consultation paper shall, unless the context otherwise requires or admits, have the meaning set out below.
- A 1.3 Where a term in this glossary is defined by reference to a definition in a section or paragraph elsewhere in this document and an explanation of that term is provided in this glossary, the latter explanation is for convenience only and regard should be had to the appropriate part of the document for the definitive meaning of that term in its appropriate context.
- A 1.4 Any reference to any provision of any legislation shall include any modification re-enactment or extension thereof.

1.4 GHz Band	The frequency range 1427 – 1517 MHz
1.4 GHz Centre Band	The frequency range 1452 – 1492 MHz
1.4 GHz Extension Bands	The frequency ranges 1427 – 1452 MHz and 1492 – 1517 MHz
1800 MHz Band	The frequency range 1710 – 1785 MHz paired with 1805 – 1880 MHz
2.1 GHz Band	The frequency ranges 1920 – 1980 MHz paired with 2110 – 2170 MHz
2.1 GHz Band Interim Licence	Means a licence of the type set out in draft form in Schedule 1 or 2 (of Document 20/32) of the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations
2.1 GHz Band Time Slice 1 Transition	Transition arrangements for the 2.1 GHz Band - in advance of the commencement date for Time Slice 1 in that band

2.3 GHz Band	The frequency range 2300 – 2400 MHz
2.3 GHz TDD Band	Means spectrum in the 2.3 GHz Band
2.3 GHz Band Block	Means a block of spectrum in the 2.3 GHz Band
2.3 GHz Band Fixed Frequency Block (Lower)	Means a 1 × 30 MHz block of spectrum from 2300 – 2330 MHz, the proposed inclusion of which is now removed
2.3 GHz Band Transition Licence	Transition arrangements in respect of Eir's existing RurTel network in the 2.3 GHz Band
2.3 GHz Fixed Frequency Lot (Lower)	Means a 1 × 30 MHz block of spectrum from 2300 – 2330 MHz, the proposed inclusion of which is now removed
2.3 GHz Band Fixed Frequency Block (Upper)	Means a 1 × 10 MHz block of spectrum from 2390 – 2400 MHz
2.3 GHz Band Generic Frequency Block	Means a 1 × 5 MHz block of spectrum in the range 2330 – 2390 MHz
2.6 GHz Band	Means the spectrum in the range 2500 – 2690 MHz
2.6 GHz Band Block	Means the 2.6 GHz Band FDD Generic Frequency Block, 2.6 GHz Band TDD Fixed Frequency Block (Lower), 2.6 GHz Band TDD Fixed Frequency Block (Upper) and 2.6 GHz Band TDD Generic Frequency Blocks
2.6 GHz FDD Band	Means a 2 × 5 MHz block of spectrum in the range 2500 – 2570 MHz paired with 2620 – 2690 MHz

2.6 GHz TDD Band	Means spectrum in the 2.6 GHz Fixed Frequency Block (Lower), 2.6 GHz Fixed Frequency Block (Upper) and 2.6 GHz Band TDD Generic Frequency Blocks
2.6 GHz Band TDD Fixed Frequency Block (Lower)	Means a 1 × 5 MHz block of spectrum from 2570 – 2575 MHz
2.6 GHz Band TDD Fixed Frequency Block (Upper)	Means a 1 × 5 MHz block of spectrum from 2615 – 2620 MHz
2.6 GHz Band TDD Generic Frequency Block	Means a 1 × 5 MHz block of spectrum in the range 2575 – 2615 MHz
2.6 GHz Band	The frequency range 2500 – 2690 MHz
2.6 GHz Duplex	The frequency range 2500 – 2570 MHz paired with 2620 – 2690 MHz
2.6 GHz Duplex Gap	The frequency range 2570 – 2620 MHz
2.7 GHz band	The frequency range 2700 – 2900 MHz
2012 MBSA	2012 MBSA or the MBSA Process refers to the Multi-Band Spectrum Award process the final results of which were announced in ComReg Document 12/131 on 5 December 2012
26 GHz Band	The frequency range 24.25 – 27.5 GHz
3.6 GHz Award	Refers to the award process the final results of which were announced in ComReg Document 17/46 on 1 June 2017
3.6 GHz Band	The frequency range 3400 – 3800 MHz

3.6 GHz Band Liberalised Use Licence	A licence in the form as set out in Schedule 1 of the Wireless Telegraphy (3.6 GHz Band Licences) Regulations 2016 (S.I. No. 532 of 2016)
700 MHz Band	The frequency range 694 – 790 MHz
700 MHz Duplex	The frequency range 703 – 733 MHz paired with 758 – 788 MHz
700 MHz Duplex Block	Means a 2 x 5 MHz block of spectrum in the 700 MHz Duplex.
700 MHz Duplex Gap	The frequency range 733 – 758 MHz
800 MHz Band	The frequency range 790 – 862 MHz
900 MHz Band	The frequency range 880 – 915 MHz paired with 925 – 960 MHz
Auction Format RIA	The Regulatory Impact Assessment as set out in Chapter 7 of this document
Application	An Application to participate in the Award Process
Application Declaration Form	Refers to the declaration form as part of the Temporary Spectrum Management Measures – see paragraph 4 of Part 6 of the application form in Document 20/88a
Assignment Impacts	The nature and quantum of spectrum rights of use to be assigned to winners
Award	Same meaning as the Award Process
Award Risks	As described in Chapter 7 these are: <ul style="list-style-type: none"> 1. Aggregation risks; 2. Substitution risks;

	<ol style="list-style-type: none"> 3. Gaming opportunities; 4. Strategic demand reduction; 5. Inefficiently unsold lots; 6. Bidder information deficits; and 7. Complexity
Auction Format RIA	Chapter 7 of this document
Award Bands	The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz bands
Award Process	The overall process through which it is intended that rights of use of spectrum will be awarded in the Award Bands
Candidate Bands	For the purposes of the Spectrum for Award' & 'Assignment Process RIAs the Candidate Bands are the 700 MHz Duplex, the 1.4 GHz Centre Band, the 2.1 GHz Band, the 2.3 GHz Band and the 2.6 GHz Band
Commitments	Refers to the Merger commitments as identified in Case M.6992 – HUTCHISON 3G UK / TELEFÓNICA IRELAND COMMITMENTS TO THE EUROPEAN COMMISSION
Connectivity Studies	Refers to Documents 18/103, 18/103a, 18/103b, 18/103c and 18/103d
Decision	The decision set out in Chapter 10 of this document.
Divestment Spectrum	<p>With regards to the Merger, this term means:</p> <p>(a) 2 × 5 MHz of 900 MHz spectrum in Time Slice 2 (13 July 2015 to 12 July 2030);</p> <p>(b) 2 × 10 MHz of 1800 MHz spectrum in Time Slice 2 (13 July 2015 to 12 July 2030); and</p>

	(c) 2 x 10 MHz of 2100 MHz spectrum for the remainder of the licence period until 24 July 2022
Draft IM	ComReg's draft Information Memorandum as set out in ComReg Document 20/32
Draft Regulations	The Draft Regulations as set out in Annex 2 of ComReg Document 20/32
Early Liberalisation Regulations	As currently in draft form in Annex 2 of ComReg Document 20/32
Electronic Auction System (EAS)	The system used for running the Award. Specifically, this will be used by bidders to check and submit bids during the assessment stage (where required) and the assignment stage of the Award (both except in exceptional circumstances)
Existing 2.1 GHz Band Licence	Means a licence pursuant to the Wireless Telegraphy (Third Generation and GSM Mobile Telephony Licence) Regulations, 2002 (S.I. No. 345 of 2002), as amended by the Wireless Telegraphy (Third Generation and GSM Mobile Telephony Licence) (Amendment) Regulations, 2003 (S.I. No 340 of 2003), or the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations, as appropriate
Existing 2.1 GHz Band Licensees	Means a person holding one, or more, Existing 2.1 GHz Licences
Existing Operators / MNOs	Existing Operators refers to the existing licensees in the 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 3.6 GHz Bands
Existing Operators (Other)	Means a winning bidder that is a holder of a 3.6 GHz Band Liberalised Use Licence for terrestrial systems capable of providing Electronic Communications Services under the Wireless Telegraphy (3.6 GHz Band Licences) Regulations 2016 (S.I. No. 532 of 2016) and is not an Existing Operator

	Existing Operators (other than an Existing MNO) include only Dense Air Limited and Imagine Communications Ireland Limited, or their successors, in relation to these licences
Exposure Pricing	Refers to the additional information that could be provided to bidders in the course of a Combinatorial Clock Auction (CCA) in terms of the final price a bidder would have to actually pay arising from bids made in the clock rounds
Frequency- Generic Lot(s)	Means a block(s) of spectrum where the specific frequencies of same is determined in the assignment stage of any competitive selection procedure
Frequency- Specific Lot(s)	Means a block(s) of spectrum where the specific frequencies of same is determined prior to any competitive selection
Further Temporary ECS licensing framework	The Wireless Telegraphy (Further Temporary Electronic Communications Services Licences) Regulations 2020 (S.I. No. 407 of 2020) were made on 2 October 2020, with the consent of the Minister for the Environment, Climate and Communications
General Authorisation ⁸⁵⁹	An authorisation for an undertaking to provide an electronic communications network or service under and in accordance with Regulation 4 of the Authorisation Regulations
Information Memorandum	The document (that ComReg intends to publish in due course) which sets out the rules and procedures ComReg intends to employ in conducting the Award Process. While the Information Memorandum will detail the processes and procedures that ComReg will employ to implement the Decision, it will not affect the substance of the Decision and, in particular, the elements of the competitive selection procedure detailed at 3.15 of the Decision
Interim 2.1 GHz A Licence	ComReg's proposal to, upon receipt of an appropriate application from Three, grant it interim 2.1 GHz rights of use – comprised of the frequencies in its existing "A Licence" – which would commence on 25 July 2022 and fully expire on 15 October 2022

⁸⁵⁹ <https://www.comreg.ie/industry/licensing/general-authorisation/>

Interim 2.1 GHz B Licence	ComReg's proposal to upon receipt of an appropriate application from Three, grant it interim 2.1 GHz rights of use – comprised of the frequencies in its existing "B Licence" – which would commence on 2 October 2022 and fully expire on 15 October 2022
Interim Licence Proposal	ComReg's proposal whereby Three would be provided with the option of applying for new interim rights of use in the 2.1 GHz Band for the purpose of aligning the expiry dates of its existing 2.1 GHz licences (comprised of Three's existing "Licence A" and "Licence B" which expire on 24 July 2022 and 1 October 2022 respectively) with Vodafone's existing 2.1 GHz licence which expires on 15 October 2022, such that all three 2.1 GHz Band licences would expire on 15 October 2022
Liberalised Use Licences	Refers to the Liberalised Use Licences in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz frequency bands
MBSA2	Refers to the current consultation process for ComReg's Multi Band Spectrum Award
MBSA2 Liberalised Use Licence	A Licence in the form set out in Schedule 1 of the draft MBSA2 Licence Regulations which will allow a licensee to keep, possess, install, maintain, work and use apparatus in the portion of the Award Spectrum assigned thereunder for terrestrial systems capable of providing ECS subject to the terms and conditions set out therein
MBSA2 Preparatory Licence	A Licence in the form as set out in Schedule 3 of the MBSA2 Licence Regulations, which will allow the licensee to install networks and associated equipment in advance of the commencement date of their MBSA2 Liberalised Use Licence, subject to the terms and conditions set out therein, but will not allow any wireless telegraphy transmissions.
MBSA2 Licence Regulations	Currently in draft form in Annex 2 of ComReg Document 20/32

MBSA2 Spectrum Lease Licence	A Licence in the form as set out in Schedule 2 of the MBSA2 Licence Regulations, which will allow the licensee to keep, possess, install, maintain, work and use apparatus in the portion of the Award Spectrum assigned thereunder for terrestrial systems capable of providing ECS, subject to the terms and conditions set out therein
Merger	Refers to the Merger between Three and O2 in 2014
New Entrants	Means a licensee that is not a licensee in the 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 3.6 GHz Bands
New Entrants (Other)	Means a winning bidder that is not an Existing Operator and which will provide mobile Electronic Communications Services under its MBSA2 Liberalised Use Licence
New Entrants (Mobile)	Means a Winning Bidder that is not an Existing Operator and which will provide Electronic Communications Services other than mobile Electronic Communications Service under its MBSA2 Liberalised Use Licence
NGA	Next Generation Access
NRA	National Regulatory Authority
Other Service Providers	Has the same meaning as Existing Operators (Other)
Outdoor Coverage Map	ComReg's coverage map available at https://coveragemap.comreg.ie/map
Oxera Report	Refers to the Oxera / Real Wireless report in ComReg Document 18/103c
Pricing Impacts	What price should be paid by a winning bidder for rights of use

Price Determination Impacts	Different auction formats have different processes for determining the price that winning bidders have to pay in order to best ensure the efficient assignment of the radio spectrum. In that regard, the price determination process for each auction format could impact bidders in different ways
Primary Bids Round	A round of the main stage during which bidders each have the opportunity to submit a single bid for a package of lots for a bid amount equal to the sum of the round prices associated with each lot within the package of lots upon which it submits a bid
Proposed Award	The proposed award of spectrum rights of use in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands
Proposed Bands	The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands
Proposed Spectrum Competition Caps	Means both the Proposed Sub-1GHz Cap and the Proposed Overall Cap
Proposed Overall Cap	Where the maximum holdings of spectrum is 375 MHz
Proposed Sub-1 GHz Cap	Proposed Sub-1 GHz Cap of 70 MHz
Qualified Bidder	A bidder who has qualified, at the discretion of ComReg, as a bidder to bid on spectrum in the Award Process
RIA	Regulatory Impact Assessment
RurTel	RurTel is a wireless point-to-multipoint telephony solution operating in the frequency range 2307 – 2327 MHz
RurTel Service	This is a service provided by Eir to users using its RurTel network
Spectrum Option	With regard to the Commitments, in order to enable the Upfront MVNO to develop into an MNO, Three must offer it the option to

	acquire, by way of transfer from Three, the rights of use to some or all of the Divestment Spectrum (at the election of Virgin Media)
Spectrum Option Period	The Spectrum Option may be exercised by Virgin Media for a period of ten years commencing from 1 January 2016 and subject to certain conditions. See Section 6.4.3 this Document
Spectrum Access Fee (SAF)	An upfront fee to be paid by a winning bidder for the spectrum assigned to it within the Award Process
Spectrum Usage Fee (SUF)	Annual Fees which a winning bidder must pay in respect of spectrum rights of use assigned in the Award Process
Substitutability	The term can be taken as referring to spectrum bands which can serve the same purpose for interested parties and so those parties are relatively indifferent to switching between those bands in an award process
Temporary ECS licences	The Wireless Telegraphy (Temporary Electronic Communications Services Licences (S.I. No. 122 of 2020),) Regulations 2020 were made on 8 April 2020 with the consent of the Minister for Communications, Climate Action and Environment
Temporary Spectrum Management Measures	Has the same meaning as Temporary ECS licences and Further Temporary ECS licences
Time Slice 1	For lots in the 2.3 GHz Band and 2.6 GHz Band, it is the time period from 1 December 2021 to 11 March 2027 (as may be amended by ComReg). For lots in the 2.1 GHz Band, it is the time period from 16 October 2022 to 11 March 2027 (as may be amended by ComReg)
Time Slice 2	For lots in the 2.3 GHz Band and 2.6 GHz Band, it is the time period from 12 March 2027 to 30 November 2041 (as may be amended by ComReg).

	For lots in the 2.1 GHz Band it is the time period from 12 March 2027 to 30 November 2041 (as may be amended by ComReg)
Time Slices	Refers to Time Slice 1 and Time Slice 2
Time Slice 2 Transition	The Transition arrangements in advance of the commencement date for Time Slice 2 in respect of the 2.1 GHz, 2.3 GHz and 2.6 GHz bands
Transition	Refers to the activities required from existing and new licensees to adjust their respective networks to comply with the outcome of a spectrum award process
Transition Framework	Refers to the Transition arrangements as set out in Chapter 9
Upfront MVNO	With regard to the Merger, this refers to UPC Ireland and now Virgin Media
Winning Bidder	A bidder who is successful in acquiring spectrum in the Award Process

A1.2 European and Governmental Bodies, Regulatory and Standardisation Organisations

3GPP	The 3 rd Generation Partnership Project
ComReg	Commission for Communications Regulation
CEPT	Conférence européenne des Administration des postes et des télécommunications. In English, European Conference of Postal and Telecommunications Administrations
DECC	Department of the Environment, Climate and Communications
EC	European Commission
ECC	Electronic Communications Committee (of CEPT)
ECO	European Communications Office
EU	European Union
IAA	Irish Aviation Authority
ITU	International Telecommunication Union
NBI	National Broadband Ireland
NCSC	National Cyber Security Centre
OGCIO	Office of the Government's Chief Information Officer
RSPG	Radio Spectrum Policy Group

A1.3 Primary and Secondary Legislation

2002 Act	The Communications Regulation Act 2002 (No. 20 of 2002), as amended
2.1 GHz EC Decision / EC Decision 2012/688/EU	European Commission Decision on the harmonisation of the frequency bands 1920 – 1980 MHz and 2110 – 2170 MHz for terrestrial systems capable of providing electronic communications services in the Community
2.1 GHz EC Decision 2020/667/EU	Amends 2.1 GHz EC Decision / EC Decision 2012/688/EU
2.3 GHz ECC Decision / ECC/DEC(14)02	Electronic Communications Committee decision to harmonised technical and regulatory conditions for the use of the band 2300 – 2400 MHz for Mobile/Fixed Communications Networks (MFCN)
2.6 GHz EC Decision / EC Decision 2008/477/EC	European Commission Decision on the harmonisation of the 2500 – 2690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community
2.6 GHz EC Decision 2020/636/EU	Amends 2.6 GHz EC Decision / EC Decision 2008/477/EC
3.6 GHz EC Decision / EC Decision 2014/276/EU	European Commission Decision on amending Decision 2008/411/EC on the harmonisation of the 3400 – 3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community
700 MHz EC Decision / EC Decision 2016/687/EU	European Commission Decision on the harmonisation of the 694 – 790 MHz frequency band for terrestrial systems capable of providing wireless broadband electronic communications services and for flexible national use in the Union

Authorisation Regulations	European Communities (Electronic Communication Networks and Services) (Authorisation) Regulations 2011 (S.I. No 335 of 2011)
Commission Implementing Decision (EU) 2020/636	Commission Implementing Decision (EU) 2020/636 of 8 May 2020 amending Decision 2008/477/EC as regards an update of relevant technical conditions applicable to the 2500 – 2690 MHz frequency band
Commission Implementing Decision (EU) 2020/667	Commission Implementing Decision (EU) 2020/667 of 6 May 2020 amending Decision 2012/688/EU as regards an update of relevant technical conditions applicable to the frequency bands 1920 – 1980 MHz and 2110 – 2170 MHz
Competition Act 2002	Competition Act 2002 (No. 14 of 2002), as amended
Directive 2002/77/EC	A European Commission Directive on competition in the markets for electronic communications networks and services
ECC Decision (13)03	Electronic Communications Committee decision to harmonise the use of the frequency band 1 452-1 492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)
EC Decision 2009/766/EC	European Commission Decision on the harmonisation of the 900 MHz and 1800 MHz frequency band for terrestrial systems capable of providing pan-European electronic communications services in the Community
EC Decision 2011/251/EU	European Commission Decision, amending Decision 2009/766/EC, on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community

EU Decision (EU)2017/899/ EP&C Decision 2017	Decision (EU) 2017/899 of the European Parliament and of the Council of 17 May 2017 on the use of the 470-790 MHz frequency band in the Union
Framework Regulations	European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No 333 of 2011)
RSPP Decision / European Parliament and Council Decision 243/2012/EU	European Parliament and Council Decision establishing a multi-annual radio spectrum policy programme
S.I.	Statutory Instrument
Specific Regulations	Specific Regulations has the same meaning as set out in Regulation 2 of the Framework Regulations
Spectrum Transfer Framework	Refers to the Spectrum Transfer Regulations (S.I. 34 of 2014) and Spectrum Transfer Procedures and Guidelines (ComReg Document 14/11R)
Wireless Telegraphy Act	The Wireless Telegraphy Act 1926 (No. 45 of 1926) as amended

A1.4 Glossary of Technical Terms

3G	Third Generation Mobile System (e.g. UMTS)
AAS	Active Antenna Systems
BB-PPDR	<p>Broadband (BB)</p> <p>Public Protection (PP) radio communication: Radio communications used by responsible agencies and organisations dealing with maintenance of law and order, protection of life and property, and emergency situations</p>

	Disaster Relief (DR) radio communication: Radio communications used by agencies and organisations dealing with a serious disruption of the functioning of society, posing a significant, widespread threat to human life, health, property or the environment, whether caused by accident, nature or human activity, and whether developing suddenly or as a result of complex, long-term processes
BCP	Broadband Connection Points
BEM	A Block-Edge Mask (BEM) <i>“is an emission mask that is defined, as a function of frequency, relative to the edge of a block of spectrum for which rights of use are granted to an operator. It consists of in-block and out-of-block components which specify the permitted emission levels over frequencies inside and outside the licensed block of spectrum, respectively.”</i> (Source Annex to Decision 2012/688/EU)
BER	Building Energy Rating
BTS	Base Transceiver Station
CAGR	Compound Annual Growth Rate
Carrier Aggregation	Aggregation of two or more component carriers in order to support wider transmission bandwidths
CCA	Combinatorial Clock Auction
CCI	Co-channel interference
CMRA	Combinatorial Multi-Round Ascending Auction
CPI	Consumer Price Index
DTT	Digital Terrestrial Television

ECN	Electronic Communications Network (as defined under the Framework Regulations)
ECS	Electronic Communications Service (as defined under the Framework Regulations)
EECC	European Electronic Communications Code
FCP	Final Clock Price
FCS	Fixed Cellular Service
FDD	Frequency Division Duplex
FWA	Fixed Wireless Access
FWO	Fixed Wireless Operators – such as Imagine who are currently assigned 3.6 GHz rights of use
FWALA	Fixed Wireless Access Local Area
GHz	Gigahertz (1 000 000 000 Hertz)
Guard-band	An unused spectrum bandwidth separating channels to prevent interference
GSA	The Global mobile Suppliers Association – an organisation which represents suppliers of equipment and services to the mobile industry
GSM	Global System for Mobile Communications
GSMA	GSM Association – an organisation which represents mobile operators
Hertz	Unit of Frequency
IMS	IP Multimedia Subsystem

IMT	International Mobile Telecommunications
kHz	Kilohertz (1 000 Hertz)
LTE	Long Term Evolution of 3G
LTE Advanced / LTE+	An evolution of LTE having the capability to provide 4G services
M2M	Machine to machine
MBB	Mobile Broadband
MFCN	Mobile/fixed communications networks
MHz	Megahertz (1 000 000 Hertz)
MMDS	Multichannel multipoint distribution system
MNO	Mobile Network Operator
MRC	Minimum Revenue Core
MVNO	Mobile Virtual Network Operator (a mobile operator with no spectrum assignment and with or without network infrastructure)
NBP	National Broadband Plan
NCSS	National Cyber Security Strategy
NDO	Network Densification Operators – such as Airspan who are currently assigned 3.6 GHz rights of use
Native Wi-Fi	Native Wi-Fi technology, allows calls and texts to be made on a device utilising a Wi-Fi connection rather than through the mobile network directly

OTT	Refers to Over The Top applications or services such as Skype, WhatsApp or Netflix
QoS	Quality of Service
RSPP	Radio Spectrum Policy Programme
RSRP	Reference signal receive power
SBCA	Sealed Bid Combinatorial Auction
SCA	Simple Clock Auction
SDR	Strategic Demand Reduction
SDL	Supplementary Downlink
SMRA	Simultaneous Multi Round Auction
SIEC	Significantly Impede Effective Competition
SIP	Session Initiation Protocol
Star 2000	Refers to the Thales Star 2000 aeronautical radar
SUTP	Single User Throughput
TA10-M	Refers to the Thales TA 10M TD aeronautical radar
TDD	Time Division Duplex
TD-LTE	Time Division – Long Term Evolution
TIS	Total Isotropic Sensitivity
TRP	Total Radiated Power
TSR	Telecoms Security Requirements

UMTS	Universal Mobile Telecommunications System
VHF	Very High Frequency
ViLTE	Video over LTE
VoLTE	Voice over LTE
VOIP	Voice Over Internet Protocol
VoWi-Fi	Voice over Wi-Fi
WACC	Weighted Average Cost of Capital
WBB	Wireless broadband
WDMDS	Wideband Digital Mobile Data Services
WRC	World Radiocommunications Conference

A1.5 Glossary of respondents⁸⁶⁰

Eir	Eircom Limited and Meteor Mobile Communications Limited (trading as 'eir' and 'open eir'), collectively referred to as 'eir Group' or 'eir'.
Imagine	Imagine Communications Ireland Limited
Mr. Liam Young	-
Tesco Mobile	Tesco Mobile Ireland Limited
Three	Three Ireland Hutchison Limited

⁸⁶⁰ This list provides the reference used in this document and further details for the entity(s) where known. Not all respondents provided full details of its company name in its response. ComReg has aimed to update the table based on the information available to it, but would welcome clarifications on same.

Vodafone	Vodafone Ireland Limited
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NON-CONFIDENTIAL

Annex: 2 Legal Framework

- A 2.1 The Communications Regulation Act 2002 (as amended by the Communications Regulation (Amendment) Act 2007) (the “2002 Act”), the EU Common Regulatory Framework (including the Framework and Authorisation Directives⁸⁶¹ as transposed into Irish law by the corresponding Framework and Authorisation Regulations⁸⁶²), and the Wireless Telegraphy Acts 1926 to 2009⁸⁶³ set out, amongst other things, powers, functions, duties and objectives of ComReg that are relevant to the management of the radio frequency spectrum in Ireland and to this consultation document.
- A 2.2 Apart from licensing and making regulations in relation to licences, ComReg’s functions include the management of Ireland’s radio frequency spectrum in accordance with ministerial Policy Directions under section 13 of the 2002 Act, having regard to its objectives under section 12 of the 2002 Act, Regulation 16 of the Framework Regulations and the provisions of Article 8a of the Framework Directive. ComReg is to carry out its functions effectively, and in a manner serving to ensure that the allocation and assignment of radio frequencies is based on objective, transparent, non-discriminatory and proportionate criteria.
- A 2.3 This annex is intended as a general guide as to ComReg’s role in this area, and not as a definitive or exhaustive legal exposition of that role. Further, this annex restricts itself to consideration of those powers, functions, duties and objectives of ComReg that appear most relevant to the matters at hand and generally excludes those not considered relevant (for example, in relation to postal services, premium rate services or market analysis). For the avoidance of doubt, however, the inclusion of particular material in this annex does not necessarily mean that ComReg considers same to be of specific relevance to the matters at hand.
- A 2.4 All references in this annex to enactments are to the enactment as amended at the date hereof, unless the context otherwise requires.

⁸⁶¹ Directive No. 2002/21/EC of the European Parliament and of the Council of 7 March 2002 (as amended by Regulation (EC) No. 717/2007 of 27 June 2007, Regulation (EC) No. 544/2009 of 18 June 2009 and Directive 2009/140/EC of the European Parliament and Council of 25 November 2009) (the “Framework Directive”) and Directive No. 2002/20/EC of the European Parliament and of the Council of 7 March 2002 (as amended by Directive 2009/140/EC) (the “Authorisation Directive”).

⁸⁶² The European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No. 333 of 2011) and the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (S.I. No. 335 of 2011) respectively.

⁸⁶³ The Wireless Telegraphy Acts 1926 to 1988 and Sections 181 (1) to (7) and (9) and Section 182 of the Broadcasting Act 2009.

New European Electronic Communications Code

- A 2.5 On 20 December 2018, Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (“EECC”) entered into force.
- A 2.6 The EECC replaces the EU Common Regulatory Framework adopted in 2002 (and amended in 2009) under which ComReg has regulated electronic communications since 2003.
- A 2.7 With some limited exceptions (see Article 124 of the EECC), Member States have until 21 December 2020 to transpose the EECC into national law⁸⁶⁴. Notwithstanding this, in developing its proposals for and taking this Decision concerning the Proposed Award, ComReg has been cognisant that it must refrain from taking any measures liable seriously to compromise the result(s) or objective(s) prescribed by the EECC,⁸⁶⁵ and does not consider that its proposals or its Decision include any such measures. ..
- A 2.8 The DECC is responsible for the transposition of the EECC and ComReg has assisted the DECC in that regard as appropriate.

A2.1 Primary Objectives and Regulatory Principles under the 2002 Act and Common Regulatory Framework

- A 2.9 ComReg’s primary objectives in carrying out its statutory functions in the context of electronic communications are to:
- promote competition⁸⁶⁶;
 - contribute to the development of the internal market⁸⁶⁷;
 - promote the interests of users within the Community⁸⁶⁸;

⁸⁶⁴ With the exception of Articles 53(2), (3) and (4), and Article 54 (See Article 124).

⁸⁶⁵ See for example *Inter-Environnement Wallonie*, [1997] ECR I-7411, at para 45.

⁸⁶⁶ Section 12 (1)(a)(i) of the 2002 Act.

⁸⁶⁷ Section 12 (1)(a)(ii) of the 2002 Act.

⁸⁶⁸ Section 12(1)(a)(iii) of the 2002 Act.

- ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under section 13 of the 2002 Act⁸⁶⁹; and
- unless otherwise provided for in Regulation 17 of the Framework Regulations, take the utmost account of the desirability of technological neutrality in complying with the requirements of the Specific Regulations⁸⁷⁰ in particular those designed to ensure effective competition⁸⁷¹.

A2.1.1 Promotion of Competition

A 2.10 Section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:

- ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector; and
- encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources.

A 2.11 In so far as the promotion of competition is concerned, Regulation 16(1)(b) of the Framework Regulations also requires ComReg to:

- ensure that elderly users and users with special social needs derive maximum benefit in terms of choice, price and quality, and
- ensure that, in the transmission of content, there is no distortion or restriction of competition in the electronic communications sector.

A 2.12 Regulation 9(11) of the Authorisation Regulations also provides that ComReg

⁸⁶⁹ Section 12(1)(b) of the 2002 Act. Whilst this objective would appear to be a separate and distinct objective in the 2002 Act, it is noted that, for the purposes of ComReg's activities in relation to electronic communications networks and services ("ECN" and "ECS"), Article 8 of the Framework Directive identifies "*encouraging efficient use and ensuring the effective management of radio frequencies (and numbering resources)*" as a sub-objective of the broader objective of the promotion of competition.

⁸⁷⁰ The 'Specific Regulations' comprise collectively the Framework Regulations, the Authorisation Regulations, the European Communities (Electronic Communications Networks and Services) (Access) Regulations 2011 (S.I. No. 334 of 2011), the European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulations 2011 (S.I. 337 of 2011) and the European Communities (Electronic Communications Networks and Services) (Privacy and Electronic Communications) Regulations 2011 (S.I. No. 336 of 2011).

⁸⁷¹ Regulation 16(1)(a) of the Framework Regulations.

must ensure that radio frequencies are efficiently and effectively used having regard to section 12(2)(a) of the 2002 Act and Regulations 16(1) and 17(1) of the Framework Regulations. Regulation 9(11) further provides that ComReg must ensure that competition is not distorted by any transfer or accumulation of rights of use for radio frequencies and, for this purpose, ComReg may take appropriate measures such as mandating the sale or the lease of rights of use for radio frequencies.

A2.1.2 Contributing to the Development of the Internal Market

A 2.13 Section 12(2)(b) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at contributing to the development of the internal market, including:

- removing remaining obstacles to the provision of ECN, ECS and associated facilities at Community level;
- encouraging the establishment and development of trans-European networks and the interoperability of transnational services and end-to-end connectivity; and
- co-operating with electronic communications national regulatory authorities in other Member States of the Community and with the Commission of the Community in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of Community law in this field.

A 2.14 In so far as contributing to the development of the internal market is concerned, Regulation 16(1)(c) of the Framework Regulations also requires ComReg to co-operate with the Body of European Regulators for Electronic Communications (“BEREC”) in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of EU law in the field of electronic communications.

A2.1.3 Promotion of Interests of Users

A 2.15 Section 12(2)(c) of the 2002 Act requires ComReg, when exercising its functions in relation to the provision of electronic communications networks and services, to take all reasonable measures which are aimed at the promotion of the interests of users within the Community, including:

- ensuring that all users have access to a universal service;
- ensuring a high level of protection for consumers in their dealings with suppliers, in particular by ensuring the availability of simple and

inexpensive dispute resolution procedures carried out by a body that is independent of the parties involved;

- contributing to ensuring a high level of protection of personal data and privacy;
- promoting the provision of clear information, in particular requiring transparency of tariffs and conditions for using publicly available ECS;
- encouraging access to the internet at reasonable cost to users;
- addressing the needs of specific social groups, in particular disabled users; and
- ensuring that the integrity and security of public communications networks are maintained.

A 2.16 In so far as promotion of the interests of users within the EU is concerned, Regulation 16(1)(d) of the Framework Regulations also requires ComReg to:

- address the needs of specific social groups, in particular, elderly users and users with special social needs, and
- promote the ability of end-users to access and distribute information or use applications and services of their choice.

A2.1.4 Regulatory Principles

A 2.17 In pursuit of its objectives under Regulation 16(1) of the Framework Regulations and section 12 of the 2002 Act, ComReg must apply objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things:

- promoting regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods;
- ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing ECN and ECS;
- safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition;
- promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors

and parties seeking access to diversify the risk of investment, while ensuring that competition in the market and the principle of non-discrimination are preserved;

- taking due account of the variety of conditions relating to competition and consumers that exist in the various geographic areas within the State; and
- imposing ex-ante regulatory obligations only where there is no effective and sustainable competition and relaxing or lifting such obligations as soon as that condition is fulfilled.

A2.1.5 BEREC

A 2.18 Under Regulation 16(1)(3) of the Framework Regulations, ComReg must:

- having regard to its objectives under section 12 of the 2002 Act and its functions under the Specific Regulations, actively support the goals of BEREC of promoting greater regulatory co-ordination and coherence; and
- take the utmost account of opinions and common positions adopted by BEREC when adopting decisions for the national market.

A2.1.6 Other Obligations under the 2002 Act

A 2.19 In carrying out its functions, ComReg is required, amongst other things, to:

- seek to ensure that any measures taken by it are proportionate having regard to the objectives set out in section 12 of the 2002 Act;⁸⁷²
- have regard to international developments with regard to the radio frequency spectrum⁸⁷³; and
- take the utmost account of the desirability that the exercise of its functions aimed at achieving its radio frequency management objectives does not result in discrimination in favour of or against particular types of technology for the provision of ECS.⁸⁷⁴

⁸⁷² Section 12(3) of the 2002 Act.

⁸⁷³ Section 12(5) of the 2002 Act.

⁸⁷⁴ Section 12(6) of the 2002 Act.

A2.1.7 Policy Directions⁸⁷⁵

A 2.20 Section 12(4) of the 2002 Act provides that, in carrying out its functions, ComReg must have appropriate regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to the Commission, in relation to the economic and social development of the State. Section 13(1) of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources (“the Minister”) as he or she considers appropriate, in the interests of the proper and effective regulation of the electronic communications market, the management of the radio frequency spectrum in the State and the formulation of policy applicable to such proper and effective regulation and management, to be followed by ComReg in the exercise of its functions. Section 10(1)(b) of the 2002 Act also requires ComReg, in managing the radio frequency spectrum, to do so in accordance with a direction of the Minister under section 13 of the 2002 Act, while Section 12(1)(b) requires ComReg to ensure the efficient management and use of the radio frequency spectrum in accordance with a direction under Section 13.

A 2.21 The Policy Directions which are most relevant in this regard include the following:

Policy Direction No.3 on Broadband Electronic Communication Networks

A 2.22 ComReg shall in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.

Policy Direction No.4 on Industry Sustainability

A 2.23 ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry’s position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.

Policy Direction No.5 on Regulation only where necessary

A 2.24 Where ComReg has discretion as to whether to impose regulatory obligations, it

⁸⁷⁵ ComReg also notes, and takes due account of, the Spectrum Policy Statement issued by the Department of Communications Energy and Natural Resources in September 2010.

shall, before deciding to impose such regulatory obligations on undertakings, examine whether the objectives of such regulatory obligations would be better achieved by forbearance from imposition of such obligations and reliance instead on market forces.

Policy Direction No.6 on Regulatory Impact Assessment

A 2.25 ComReg, before deciding to impose regulatory obligations on undertakings in the market for electronic communications or for the purposes of the management and use of the radio frequency spectrum or for the purposes of the regulation of the postal sector, shall conduct a Regulatory Impact Assessment in accordance with European and International best practice and otherwise in accordance with measures that may be adopted under the Government's Better Regulation programme.

Policy Direction No.7 on Consistency with other Member States

A 2.26 ComReg shall ensure that, where market circumstances are equivalent, the regulatory obligations imposed on undertakings in the electronic communications market in Ireland should be equivalent to those imposed on undertakings in equivalent positions in other Member States of the European Community.

Policy Direction No.11 on the Management of the Radio Frequency Spectrum

A 2.27 ComReg shall ensure that, in its management of the radio frequency spectrum, it takes account of the interests of all users of the radio frequency spectrum.

General Policy Direction No.1 on Competition (2004)

A 2.28 ComReg shall focus on the promotion of competition as a key objective. Where necessary, ComReg shall implement remedies which counteract or remove barriers to market entry and shall support entry by new players to the market and entry into new sectors by existing players. ComReg shall have a particular focus on:

- market share of new entrants;
- ensuring that the applicable margin attributable to a product at the wholesale level is sufficient to promote and sustain competition;
- price level to the end user;
- competition in the fixed and mobile markets; and
- the potential of alternative technology delivery platforms to support competition

A2.2 Other Relevant Obligations under the Framework and Authorisation Regulations

A2.2.1 Framework Regulations

Regulation 17

A 2.29 Regulation 17 of the Framework Regulations governs the management of radio frequencies for ECS. Regulation 17(1) requires that ComReg, subject to any directions issued by the Minister pursuant to Section 13 of the 2002 Act and having regard to its objectives under Section 12 of the 2002 Act and Regulation 16 of the Framework Regulations and the provisions of Article 8a of the Framework Directive, ensure:

- the effective management of radio frequencies for ECS;
- that spectrum allocation used for ECS and issuing of general authorisations or individual rights of use for such radio frequencies are based on objective, transparent, non-discriminatory and proportionate criteria; and
- ensure that harmonisation of the use of radio frequency spectrum across the EU is promoted, consistent with the need to ensure its effective and efficient use and in pursuit of benefits for the consumer such as economies of scale and interoperability of services, having regard to all decisions and measures adopted by the European Commission in accordance with Decision No. 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the EU.

A 2.30 Regulation 17(2) provides that, unless otherwise provided in Regulation 17(3), ComReg must ensure that all types of technology used for ECS may be used in the radio frequency bands that are declared available for ECS in the Radio Frequency Plan published under Section 35 of the 2002 Act in accordance with EU law.

A 2.31 Regulation 17(3) provides that, notwithstanding Regulation 17(2), ComReg may, through licence conditions or otherwise, provide for proportionate and non-discriminatory restrictions to the types of radio network or wireless access technology used for ECS where this is necessary to:

- avoid harmful interference;
- protect public health against electromagnetic fields;

- ensure technical quality of service;
- ensure maximisation of radio frequency sharing;
- safeguard the efficient use of spectrum; or
- ensure the fulfilment of a general interest objective as defined by or on behalf of the Government or a Minister of the Government in accordance with Regulation 17(6).

A 2.32 Regulation 17(4) requires that, unless otherwise provided in Regulation 17(5), ComReg must ensure that all types of ECS may be provided in the radio frequency bands, declared available for ECS in the Radio Frequency Plan published under Section 35 of the Act of 2002 in accordance with EU law.

A 2.33 Regulation 17(5) provides that, notwithstanding Regulation 17(4), ComReg may provide for proportionate and non-discriminatory restrictions to the types of ECS to be provided, including where necessary, to fulfil a requirement under the International Telecommunication Union Radio Regulations (“ITU-RR”).

A 2.34 Regulation 17(6) requires that measures that require an ECS to be provided in a specific band available for ECS must be justified in order to ensure the fulfilment of a general interest objective as defined by or on behalf of the Government or a Minister of the Government in conformity with EU law such as, but not limited to:

- safety of life;
- the promotion of social, regional or territorial cohesion;
- the avoidance of inefficient use of radio frequencies; or
- the promotion of cultural and linguistic diversity and media pluralism, for example, by the provision of radio and television broadcasting services.

A 2.35 Regulation 17(7) provides that ComReg may only prohibit the provision of any other ECS in a specific radio spectrum frequency band where such a prohibition is justified by the need to protect safety of life services. ComReg may, on an exceptional basis, extend such a measure in order to fulfil other general interest objectives as defined by or on behalf of the Government or a Minister of the Government.

A 2.36 Regulation 17(8) provides that ComReg must, in accordance with Regulation 18, regularly review the necessity of the restrictions referred to in Regulations 17(3) and 17(5) and must make the results of such reviews publicly available.

A 2.37 Regulation 17(9) provides that Regulations 17(2) to (7) only apply to spectrum

allocated to be used for ECS, general authorisations issued and individual rights of use for radio frequencies granted after 1 July 2011. Spectrum allocations, general authorisations and individual rights of use which already existed on 1 July 2011 are subject to Regulation 18 of the Framework Regulations.

- A 2.38 Regulation 17(10) provides that ComReg may, having regard to its objectives under Section 12 of the 2002 Act and Regulation 16 and its functions under the Specific Regulations, lay down rules in order to prevent spectrum hoarding, in particular by setting out strict deadlines for the effective exploitation of the rights of use by the holder of rights and by withdrawing the rights of use in cases of non-compliance with the deadlines. Any rules laid down under this Regulation must be applied in a proportionate, non-discriminatory and transparent manner.
- A 2.39 Regulation 17(11) requires ComReg to, in the fulfilment of its obligations under that Regulation, respect relevant international agreements, including the ITU-RR and any public policy considerations brought to its attention by the Minister.

Regulation 23 on security and integrity and Regulation 24 on implementation and enforcement of Regulation 23

- A 2.40 Regulation 23 provides:

23. (1) Undertakings providing public communications networks or publicly available electronic communications services shall take appropriate technical and organisational measures to appropriately manage the risks posed to security of networks and services. In particular, measures shall be taken to prevent and minimise the impact of security incidents on users and interconnected networks.

(2) The technical and organisational measures referred to in paragraph (1) shall, having regard to the state of the art, ensure a level of security appropriate to the risk presented.

(3) Undertakings providing public communications networks shall take all appropriate steps to guarantee the integrity of their networks, thereby ensuring the continuity of supply of services provided over those networks.

(4) (a) An undertaking providing public communications networks or publicly available electronic communications services shall notify the Regulator in the event of a breach of security or loss of integrity that has a significant impact on the operation of networks or services.

(b) Where the Regulator receives a notification under subparagraph (a), it shall inform the Minister of the said notification and, with the

agreement of the Minister, it shall also, where appropriate, inform the national regulatory authorities in other Member States and ENISA.

(c) Where it is considered that it is in the public interest to do so the Regulator, with the agreement of the Minister, may inform the public in relation to the breach notified under subparagraph (a) or require the undertaking to inform the public accordingly.

(5) The Regulator shall annually submit a summary report to the Minister, the European Commission and EINSa on the notifications received and the actions taken in accordance with paragraph (4).

(6) An undertaking that fails to comply with the requirements of paragraph (4)(a) or (c) commits an offence.

A 2.41 Regulation 24 provides:

24. (1) For the purpose of ensuring compliance with Regulation 23 (1), (2) and (3), the Regulator may issue directions to an undertaking providing public communications networks or publicly available electronic communications services, including directions in relation to time limits for implementation.

(2) The Regulator may require an undertaking providing public communications networks or publicly available electronic communications services to—

(a) provide information needed to assess the security or integrity of their services and networks, including documented security policies, and

(b) submit to a security audit to be carried out by a qualified independent body nominated by the Regulator and make the results of the audit available to the Regulator and the Minister. The cost of the audit is to be borne by the undertaking.

(3) An undertaking in receipt of a direction under paragraph (1) shall comply with the direction.

(4) An undertaking that fails to comply with a direction under paragraph (1) or a requirement under paragraph (2) commits an offence.

A2.2.2 Authorisation Regulations

Decision to limit rights of use for radio frequencies

A 2.42 Regulation 9(2) of the Authorisation Regulations provides that ComReg may grant individual rights of use for radio frequencies by way of a licence where it considers that one or more of the following criteria are applicable:

- it is necessary to avoid harmful interference;
- it is necessary to ensure technical quality of service;
- it is necessary to safeguard the efficient use of spectrum; or
- it is necessary to fulfil other objectives of general interest as defined by or on behalf of the Government or a Minister of the Government in conformity with EU law.

A 2.43 Regulation 9(10) of the Authorisation Regulations provides that ComReg must not limit the number of rights of use for radio frequencies to be granted except where this is necessary to ensure the efficient use of radio frequencies in accordance with Regulation 11.

A 2.44 Regulation 9(7) also provides that:

- where individual rights of use for radio frequencies are granted for a period of 10 years or more and such rights may not be transferred or leased between undertakings in accordance with Regulation 19 of the Framework Regulations, ComReg must ensure that criteria set out in Regulation 9(2) apply for the duration of the rights of use, in particular upon a justified request from the holder of the right.
- where ComReg determines that the criteria referred to in Regulation 9(2) are no longer applicable to a right of use for radio frequencies, ComReg must, after a reasonable period and having notified the holder of the individual rights of use, change the individual rights of use into a general authorisation or must ensure that the individual rights of use are made transferable or leasable between undertakings in accordance with Regulation 19 of the Framework Regulations.

Publication of procedures

A 2.45 Regulation 9(4)(a) of the Authorisation Regulations requires that ComReg, having regard to the provisions of Regulation 17 of the Framework Regulations, establish open, objective, transparent, non-discriminatory and proportionate procedures for the granting of rights of use for radio frequencies and cause any such procedures to be made publicly available.

Duration of rights of use for radio frequencies

A 2.46 Regulation 9(6) of the Authorisation Regulations provides that rights of use for radio frequencies must be in force for such period as ComReg considers appropriate having regard to the network or service concerned in view of the objective pursued taking due account of the need to allow for an appropriate

period for investment amortisation.

Conditions attached to rights of use for radio frequencies

A 2.47 Regulation 9(5) of the Authorisation Regulations provides that, when granting rights of use for radio frequencies, ComReg must, having regard to the provisions of Regulations 17 and 19 of the Framework Regulations, specify whether such rights may be transferred by the holder of the rights and under what conditions such a transfer may take place.

A 2.48 Regulation 10(1) of the Authorisation Regulations provides that, notwithstanding Section 5 of the Wireless Telegraphy Act, 1926, but subject to any regulations under Section 6 of that Act, ComReg may only attach those conditions listed in Part B of the Schedule to the Authorisation Regulations. Part B lists the following conditions which may be attached to rights of use:

- Obligation to provide a service or to use a type of technology for which the rights of use for the frequency has been granted including, where appropriate, coverage and quality requirements.
- Effective and efficient use of frequencies in conformity with the Framework Directive and Framework Regulations.
- Technical and operational conditions necessary for the avoidance of harmful interference and for the limitation of exposure of the general public to electromagnetic fields, where such conditions are different from those included in the general authorisation.
- Maximum duration in conformity with Regulation 9, subject to any changes in the national frequency plan.
- Transfer of rights at the initiative of the rights holder and conditions of such transfer in conformity with the Framework Directive.
- Usage fees in accordance with Regulation 19.
- Any commitments which the undertaking obtaining the usage right has made in the course of a competitive or comparative selection procedure.
- Obligations under relevant international agreements relating to the use of frequencies.
- Obligations specific to an experimental use of radio frequencies.

A 2.49 Regulation 10(2) also requires that any attachment of conditions under

Regulation 10(1) to rights of use for radio frequencies must be non-discriminatory, proportionate and transparent and in accordance with Regulation 17 of the Framework Regulations.

Procedures for limiting the number of rights of use to be granted for radio frequencies

A 2.50 Regulation 11(1) of the Authorisation Regulations provides that, where ComReg considers that the number of rights of use to be granted for radio frequencies should be limited it must, without prejudice to Sections 13 and 37 of the 2002 Act:

- give due weight to the need to maximise benefits for users and to facilitate the development of competition, and
- give all interested parties, including users and consumers, the opportunity to express their views in accordance with Regulation 12 of the Framework Regulations.

A 2.51 Regulation 11(2) of the Authorisation Regulations requires that, when granting the limited number of rights of use for radio frequencies it has decided upon, ComReg does so “...on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate and which give due weight to the achievement of the objectives set out in Section 12 of the 2002 Act and Regulations 16 and 17 of the Framework Regulations.”

A 2.52 Regulation 11(4) provides that where it decides to use competitive or comparative selection procedures, ComReg must, inter alia, ensure that such procedures are fair, reasonable, open and transparent to all interested parties.

Fees for spectrum rights of use

A 2.53 Regulation 19 of the Authorisation Regulations permits ComReg to impose fees for rights of use which reflect the need to ensure the optimal use of the radio frequency spectrum.

A 2.54 ComReg is required to ensure that any such fees are objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose and take into account the objectives of ComReg as set out in Section 12 of the 2002 Act and Regulation 16 of the Framework Regulations.

Amendment of rights and obligations

A 2.55 Regulation 15 of the Authorisation Regulations permits ComReg to amend rights and conditions concerning rights of use, provided that any such amendments may only be made in objectively justified cases and in a proportionate manner,

following the process set down in Regulation 15(4).

A2.3 Other Relevant Provisions

Wireless Telegraphy Act, 1926 (the “1926 Act”)

- A 2.56 Under Section 5(1) of the 1926 Act, ComReg may, subject to that Act, and on payment of the prescribed fees (if any), grant to any person a licence to keep and have possession of apparatus for wireless telegraphy in any specified place in the State.
- A 2.57 Section 5(2) provides that, such a licence shall be in such form, continue in force for such period and be subject to such conditions and restrictions (including conditions as to suspension and revocation) as may be prescribed in regard to it by regulations made by ComReg under Section 6.
- A 2.58 Section 5(3) also provides that, where it appears appropriate to ComReg, it may, in the interests of the efficient and orderly use of wireless telegraphy, limit the number of licences for any particular class or classes of apparatus for wireless telegraphy granted under Section 5.
- A 2.59 Section 6 provides that ComReg may make regulations prescribing in relation to all licences granted by it under Section 5, or any particular class or classes of such licences, all or any of the following matters:
- the form of such licences;
 - the period during which such licences continue in force;
 - the manner in which, the terms on which, and the period or periods for which such licences may be renewed;
 - the circumstances in which or the terms under which such licences are granted;
 - the circumstances and manner in which such licences may be suspended or revoked by ComReg;
 - the terms and conditions to be observed by the holders of such licences and subject to which such licences are deemed to be granted;
 - the fees to be paid on the application, grant or renewal of such licences or classes of such licences, subject to such exceptions as ComReg may prescribe, and the time and manner at and in which such fees are to be paid; and

- matters which such licences do not entitle or authorise the holder to do.

A 2.60 Section 6(2) provides that Regulations made by ComReg under Regulation 6 may authorise and provide for the granting of a licence under Section 5 subject to special terms, conditions, and restrictions to persons who satisfy it that they require the licences solely for the purpose of conducting experiments in wireless telegraphy.

A 2.61 Regulation 10(1) of the Authorisation Regulations provides that, notwithstanding section 5 of the Act of 1926 but subject to any regulations made under section 6 of that Act, where ComReg attaches conditions to rights of use for radio frequencies, it may only attach such conditions as are listed in Part B of the Schedule to the Authorisation Regulations.

Broadcasting Act 2009 (the “2009 Act”)

A 2.62 Section 132 of the 2009 Act relates to the duties of ComReg in respect of the licensing of spectrum for use in establishing digital terrestrial television multiplexes and places an obligation on ComReg to issue:

- two DTT multiplex licences to RTÉ by request (see Sections 132(1) and (2) of the 2009 Act); and
- a minimum of four DTT multiplex licences to the BAI by request (see Sections 132(3) and (4) of the 2009 Act) for the provision of commercial TV content.

Article 4 of Directive 2002/77/EC (Competition Directive)

A 2.63 Article 4 of the Competition Directive provides that:

“Without prejudice to specific criteria and procedures adopted by Member States to grant rights of use of radio frequencies to providers of radio or television broadcast content services with a view to pursuing general interest objectives in conformity with Community law:

- *Member States shall not grant exclusive or special rights of use of radio frequencies for the provision of electronic communications services.*
- *The assignment of radio frequencies for electronic communication services shall be based on objective, transparent, non-discriminatory and proportionate criteria.”*

Radio Spectrum Policy Programme (RSPP)

A 2.64 On 14 March 2012, Decision No 243/2012/EU (the “**RSPP Decision**”) of the European Parliament and Council, gave effect to the first multiannual Radio Spectrum Policy Programme for the strategic planning and harmonisation of the use of spectrum across the EU. The objective of the RSPP is to ensure the functioning of the internal market in the Union policy areas involving the use of spectrum, such as electronic communications, research, technological development and space, transport, energy and audio-visual policies.

A 2.65 Among other things, Article 5 of the RSPP Decision, entitled “Competition”, provides that:

“1. Member States shall promote effective competition and shall avoid distortions of competition in the internal market for electronic communications services in accordance with Directives 2002/20/EC and 2002/21/EC.

They shall also take into account competition issues when granting rights of use of spectrum to users of private electronic communication networks.

2. For the purposes of the first subparagraph of paragraph 1 and without prejudice to the application of competition rules and to the measures adopted by Member States in order to achieve general interest objectives in accordance with Article 9(4) of Directive 2002/21/EC, Member States may adopt, inter alia, measures:

(a) limiting the amount of spectrum for which rights of use are granted to any undertaking, or attaching conditions to such rights of use, such as the provision of wholesale access, national or regional roaming, in certain bands or in certain groups of bands with similar characteristics, for instance the bands below 1 GHz allocated to electronic communication services. Such additional conditions may be imposed only by the competent national authority;

(b) reserving, if appropriate in regard to the situation in the national market, a certain part of a frequency band or group of bands for assignment to new entrants;

(c) refusing to grant new rights of use of spectrum or to allow new spectrum uses in certain bands, or attaching conditions to the grant of new rights of use of spectrum or to the authorisation of new spectrum uses, in order to avoid the distortion of competition by any assignment, transfer or accumulation of rights of use;

(d) prohibiting or imposing conditions on transfers of rights of use of spectrum, not subject to national or Union merger control, where such transfers are likely to result in significant harm to competition;

(e) amending the existing rights in accordance with Directive 2002/20/EC where this is necessary to remedy ex post the distortion of competition by any transfer or accumulation of rights of use of radio frequencies.

3. Where Member States wish to adopt any measures referred to in paragraph 2 of this Article, they shall act in conformity with the procedures for the imposition or variation of such conditions on the rights of use of spectrum laid down in Directive 2002/20/EC.

4. Member States shall ensure that the authorisation and selection procedures for electronic communications services promote effective competition for the benefit of citizens, consumers and businesses in the Union.”

NON-CONFIDENTIAL

Annex: 3 Information on harmonisation status, equipment availability, award status in Europe, and spectrum availability

A 3.1 For the Proposed Band, and the spectrum bands previously considered in the consultation process, this annex sets out information on:

- the harmonisation status of each band;
- equipment availability;
- award status in Europe; and
- the availability of radio spectrum in Ireland.

NON-CONFIDENTIAL

A3.1 Harmonisation status of spectrum bands

A 3.2 The tables below provide information on the international harmonisation status of the each of the spectrum bands.

Band	ECC Decision	EC Decision	Other
700 MHz Duplex Band	ECC Decision 15(01) (March 2015)	EC 2016/687	UHF Band EP&C 2017/899
2.1 GHz Band	ECC Decision (06)01 (Revised March 2019)	EC 2012/688 amended by EU 2020/667	
2.3 GHz Band	ECC Decision (14)02 (June 2014)	--	--
2.6 GHz Band	ECC Decision (05)05 (Revised July 2019)	EC 2008/477 amended by EU 2020/636	EP&C 243/2012

Band	ECC Decision	EC Decision	Other
700 MHz Duplex Gap & Guard Bands	ECC Decision 15(01) (March 2015)	EC 2016/687	UHF Band EP&C 2017/899
1.4 Centre Band	ECC Decision (13)03 (Revised March 2018)	EC 2015/750 as amended by EU 2018/661	--
1.4 Extension Bands	ECC Decision (17)06 (November 2017)	EC 2015/750 as amended by EU 2018/661	--
2.1 GHz Unpaired	-- ⁸⁷⁶	--	--
26 GHz Band	ECC Decision (18)06 (Revised October 2018)	EU 2019/784 amended by EU 2020/594	Directive (EU) 2018/1972

⁸⁷⁶ Regarding harmonisation of the 2.1 GHz Unpaired Band, ECC Decision (06)01 facilitated the use of MFCN in the band, and this was later amended by ECC Decision (15)02, which then harmonised the Unpaired Band for Direct Air-to-Ground Communications. However, ECC Decision (15)02 was later withdrawn by ECC (18)01. <https://www.ecodocdb.dk/download/0bc97406-7dbd/ECCDec1801.pdf>.

A3.2 Equipment availability

A 3.3 The following tables provide an update of the number of 4G and 5G devices identified by the Global mobile Suppliers Association (GSA) (<https://gsacom.com/>) as being capable of operating in each band as of 30 September 2020. The data presented in Document 19/124 represented relevant GSA data as of November 2019.

Band ⁸⁷⁷	4G devices Nov 2019	4G devices Sept 2020	5G devices Nov 2019	5G devices Sept 2020
700 MHz Duplex (B28, FDD) (n28, FDD)	2,098	2,826	12	99
2.1 GHz (B1, FDD) (n1, FDD)	8,905	10,302	11	159
2.3 GHz (B40, TDD) (n40, TDD)	5,479	6,276	3	25
2.6 GHz (B7, FDD) (n7, FDD)	9,351	10,528	9	76
(B38, TDD) (n38, TDD)	4,156	4,875	4	44
(B41, TDD) (n41, TDD)	4,164	5,003	36	206

Band ⁸⁷⁸	4G devices Nov 2019	4G devices Oct 2020	5G devices Nov 2019	5G devices Oct 2020
700 MHz Duplex Gap & Guard Bands (B67, SDL)	--	--	--	--
800 MHz (B20, FDD) (n20, FDD)	6,305	7,293	9	52
900 MHz (B8, FDD) (n8, FDD)	5,617	6,831	6	58
1.4 GHz Centre (B32, SDL)	123	214	--	--
1.4 GHz Extensions (B75, B76 SDL) (n75, n76 SDL)	--	--	--	1
1.8 GHz (B3, FDD) (n3, FDD)	10,735	12,180	11	138
3.6 GHz (B42, TDD) (n77, TDD)	279	410	24	153

⁸⁷⁷ All the bands presented in this table are identified as such by the 3GPP. Also, provided in parenthesis below is the 4G and 5G band number assigned by the 3GPP to each band. At this time, the GSA does not provide any figures for devices capable of operating in bands B67, B75, B76.

⁸⁷⁸ Ibid

Band ⁸⁷⁸		4G devices Nov 2019	4G devices Oct 2020	5G devices Nov 2019	5G devices Oct 2020
(B43, TDD)	(n78, TDD)	205	320	39	232
26 GHz	(n 258, TDD)	--	--	--	6
	(n257, TDD)			5	16

A3.3 Status of awards in Europe

A 3.4 The following table shows the status of awards since circa 2010 in nineteen European countries for the bands under consideration in the proposed award⁸⁷⁹.

European Country	700 MHz Duplex	700 MHz SDL	1.4 GHz Centre	1.4 GHz Extension	2.1GHz	2.3 GHz	2.6 GHz	26 GHz
Austria	✓	--	✓	✓	✓	✓	✓	✓
Belgium	✓	--	✓	✓	✓	--	✓	--
Czech Republic	✓	--	--	--	✓	--	✓	--
Denmark	✓	✓	✓	✓	✓	✓	✓	✓
Finland	✓	--	--	--	✓	--	✓	✓
France	✓	--	--	--	✓	--	✓	--
Germany	✓		✓	--	✓	--	✓	✓
Hungary	✓	--	--	--	✓	--	✓	--
Italy	✓	--	✓	--	✓	--	✓	✓
Netherlands	✓	--	✓	--	✓	--	✓	--
Poland	--	--	--	--	--	--	✓	--
Portugal	✓	--	--	--	✓	--	✓✓	--
Romania	✓	✓	✓	--	--	--	✓✓	--
Slovakia	✓	--	--	--	--	--	✓	--
Slovenia	✓	✓	✓	✓	✓	✓	✓	✓
Spain	✓	✓	--	--	--	--	✓	--
Sweden	✓	--	--	--	--	✓	✓	--
Switzerland	✓	✓	✓	✓	✓	--	✓	--

⁸⁷⁹Information is sourced from Cullen International (www.cullen-international.com) (a pay subscription website) unless otherwise stated.

United Kingdom	✓	✓	✓	--	--	✓	✓	--
	Awarded / Ongoing = ✓		Proposed = ✓	Undecided or No Info. = --				

A3.4 Radio spectrum availability in Ireland

A 3.5 This table sets out information on the availability of the spectrum bands under consideration in Ireland.

Band	Licensing status
700 MHz Duplex	RTÉ migrated its DTT services out of this band by 4 March 2020. Further Temporary ECS licences and a renewal licence have been assigned to the three MNOs, Meteor, Three and Vodafone. These licences expire on 7 January 2021, and the renewal licences expire on 1 April 2021.
700 MHz Duplex Gap & Guard Bands	RTÉ migrated its DTT services out of this band by 4 March 2020. Some spectrum in this band may be required for BB-PPDR services.
1.4 GHz Centre Band	Unused.
1.4 GHz Extension Bands	Various, including fixed links used by broadcasters, An Garda Síochána, Fire Service, and Electricity Supply Board Networks (ESBN). Licences are annually renewable. As of 30 June 2020, there were 78 fixed links in this band - down from 92 in October 2019.
2.1 GHz Band ⁸⁸⁰	<p>Meteor - expires on 11 March 2027:</p> <ul style="list-style-type: none"> ○ 1935-1940 / 2125-2130 MHz ○ 1940-1945 / 2130-2135 MHz ○ 1945-1950 / 2135-2140 MHz <p>Three A Licence – expires on 24 July 2022:</p> <ul style="list-style-type: none"> ○ 1920-1925 / 2110-2125 MHz ○ 1970-1975 / 2160-2165 MHz ○ 1930-1935 / 2120-2125 MHz <p>Three B Licence - expires on 1 October 2022:</p> <ul style="list-style-type: none"> ○ 1965–1970 / 2155–2160 MHz ○ 1925-1930 / 2115-2120 MHz

⁸⁸⁰ Licence details viewable at: <https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/mobile-licences/>.

Band	Licensing status
	<ul style="list-style-type: none"> ○ 1975-1980 / 2165-2170 MHz <p>Vodafone - expires on 15 October 2022:</p> <ul style="list-style-type: none"> ○ 1950-1955 / 2140-2145 MHz ○ 1955-1960 / 2145-2150 MHz ○ 1960-1965 / 2150-2155 MHz <p>Further Temporary ECS licences and a renewal licence have been assigned to the three MNOs, Meteor, Three and Vodafone. These licences expire on 7 January 2021 and the renewal licences expire on 1 April 2021.</p>
2.1 GHz Unpaired Band	Three's licence in the range 1910–1915 MHz expires on 1 October 2022.
2.3 GHz Band	<p>Mostly unused.</p> <p>Eir holds 28 licences which span the frequency range: 2307-2327, this is used to provide rural telephone services (RurTel). The locations of these are mostly in Co Donegal with limited use in Co. Galway. ComReg has notified to Eir that licences for Galway will not be renewed from 31 January 2021.</p>
2.6 GHz Band	<p>Unused</p> <p>Coexistence considerations with Aeronautical radars above 2690 MHz</p>
26 GHz Band	<p>There is 1458 MHz of unused spectrum in the 26 GHz Band in the ranges 24250 – 24549 MHz / 25445 – 25557 MHz / 26453 – 27500 MHz.</p> <p>In terms of used spectrum:</p> <ul style="list-style-type: none"> • Fixed Wireless Access Local Area - licensed under SI 79 of 2003 as amended, in the frequency ranges 24605 – 24745 MHz / 25613 – 25753 MHz; • Individual P2P licences - licensed under SI 370 of 2009, in the frequency ranges 25277 – 25445 MHz / 26285 – 26453 MHz; and • ComReg awarded spectrum rights of use for 26 GHz National Block Licences in the frequency range 24745 – 25277 MHz / 25753 – 26285 MHz (see Document 18/53). Licences, which issued on foot of that award under S.I. 158 of 2018, will run for 10 years from their commencement date.

Annex: 4 Final RIA: 'Spectrum for Award' & 'Assignment Process'

A4.1 Introduction

- A 4.1 This Annex sets out ComReg's final regulatory impact assessments in relation to: (1) which bands should be included in the Proposed Award and (2) what form of award process should be used.
- A 4.2 ComReg initially consulted on a range of bands that could potentially be made available in Document 14/101 – Spectrum award – 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands.
- A 4.3 In light of submissions from stakeholders, ComReg proceeded with a separate award of the 3.6 GHz bands.
- A 4.4 Accordingly, in this Annex, ComReg considers which of the 700 MHz Duplex, 1.4 GHz Centre Band, 2.1 GHz Band, 2.3 GHz Band and 2.6 GHz Band should be included in the Proposed Award.
- A 4.5 The second RIA in this Annex considers whether the Proposed Award should be assigned by way of an auction or should, to some extent, incorporate some form of administrative assignment,
- A 4.6 In Annex 6 of Document 19/124, and considering responses received to Document 19/59R and other more recent information, ComReg updated its draft RIAs on:
- which, if any, of the 700 MHz Duplex, 1.4 GHz Centre Band, 2.1 GHz Band, 2.3 GHz Band and 2.6 GHz Band should be included in the Proposed Award (the updated draft 'Spectrum for Award' RIA); and
 - in light of the preferred option arising from the above RIA, how best to assign the rights of use in the relevant band(s) (the updated draft 'Assignment Process' RIA).
- A 4.7 In Chapter 3 of Document 19/124, having considered the responses to Document 19/59R, and ComReg's updated draft 'Spectrum for Award' RIA and its assessment against its other relevant statutory functions, objectives and duties, ComReg proposed to include the 700 MHz Duplex, the 2.1 GHz Band, the 2.3 GHz Band and the 2.6 GHz Band in the Proposed Award and to make available all relevant spectrum rights in the Proposed Bands using an open appropriate auction format.

- A 4.8 Taking account of the views of respondents to Documents 19/124, 20/32, 20/56 and 20/78 and other relevant updated information, this Annex sets out ComReg's final 'Spectrum for Award' and 'Assignment Process' RIAs, and its assessment of ComReg's preferred option against its relevant statutory functions, objectives and duties.

A4.2 RIA Framework

- A 4.9 In general terms, a RIA is an analysis of the likely effect of a proposed new regulation or regulatory change, and, indeed, of whether regulation is necessary at all. A RIA should help identify the most effective and least burdensome regulatory option and should seek to establish whether a proposed regulation or regulatory change is likely to achieve the desired objectives, having considered relevant alternatives and the impacts on stakeholders. In conducting a RIA, the aim is to ensure that all proposed measures are appropriate, effective, proportionate and justified.

Structure of a RIA

- A 4.10 As set out in ComReg's RIA Guidelines⁸⁸¹, there are five steps in a RIA. These are:

- Step 1: Identify the policy issues and identify the objectives.
- Step 2: Identify and describe the regulatory options.
- Step 3: Determine the impacts on stakeholders.
- Step 4: Determine the impacts on competition.
- Step 5: Assess the impacts and choose the best option.

- A 4.11 In the following sections, ComReg identifies the specific policy issues to be addressed and relevant objectives for the Proposed Award (i.e. Step 1 of the RIA process). This results in the identification of two fundamental policy issues which are then considered in two separate RIAs following Steps 2 to 5 above of ComReg's RIA process.

- A 4.12 Before moving on to Step 1 of the RIA, ComReg first makes some relevant observations below on the stakeholders involved and on ComReg's approach to Steps 3 and 4.

⁸⁸¹ See Document 07/56a – Guidelines on ComReg's approach to Regulatory Impact Assessment – August 2007.

Identification of stakeholders and approach to Steps 3 and 4

A 4.13 The focus of Step 3 is to assess the impact of the various regulatory options on stakeholders. Stakeholders consist of two main groups:

- i. consumers (for the purposes of this RIA, consumers include both business and residential consumers), and
- ii. industry stakeholders.

A 4.14 There are several key industry stakeholder groups in relation to the matters considered in this chapter:

- a) existing service providers who have spectrum rights of use in the bands being considered for inclusion in the award (2.1 GHz licensees⁸⁸²);
- b) Mobile Virtual Network Operators (MVNOs);
- c) parties who currently provide services using other spectrum rights (licensed or licence-exempt) for whom the spectrum being considered for inclusion in the Proposed Award may be of interest to satisfy existing and potential demand (e.g. mobile network operators (MNOs) or fixed wireless access operators (FWA operators); and
- d) potential New Entrants who do not currently provide any services using radio spectrum in the State. This group may include companies that are already otherwise engaged in the electronic communications sector in the State, in other Member States or further afield (New Entrants). The focus of Step 4 is to assess the impact on competition of the various regulatory options available to ComReg. In that regard, ComReg notes that it has various statutory functions, objectives and duties which are relevant to the issue of competition.

A 4.15 Of themselves, the RIA Guidelines and the RIA Ministerial Policy Direction⁸⁸³ provide little guidance on how much weight should be given to the positions and views of each stakeholder group (Step 3), or the impact on competition (Step 4). Accordingly, ComReg has been guided by its statutory objectives which it is obliged to seek to achieve when exercising its functions. ComReg's primary statutory objectives in managing the radio frequency spectrum, as outlined in Annex 2, include:

- the promotion of competition;

⁸⁸² Meteor Mobile Communications Ltd, Three Ireland Hutchison Limited, Vodafone Ireland Limited.

⁸⁸³ See Policy Direction Number 6 outlined in Annex 2.

- contributing to the development of the internal market; and
- the promotion of the interests of users within the Community.

A 4.16 In this document, ComReg has adopted the following structure in relation to Step 3 and Step 4 – the impact on industry stakeholders is considered first, followed by the impact on competition, followed by the impact on consumers. This order does not reflect any assessment of the relative importance of these issues but rather reflects a logical progression. In particular, a measure which safeguards and promotes competition should, in general, impact positively on consumers. In that regard, the assessment of the impact on consumers draws substantially upon the assessment carried out in respect of the impact on competition.

A4.3 Identify the policy issues and identify the objectives (Step 1)

Policy issues

A 4.17 As consulted upon in this consultation process, several bands could reasonably be considered for inclusion in the Proposed Award (the Candidate Bands⁸⁸⁴) including:

- a) Bands which are currently unused in Ireland and for which long-term rights of use could be made available:
 - i. The 2.6 GHz Band is unused and available for use.⁸⁸⁵
 - ii. The 2.3 GHz Band is largely unused and available for use.⁸⁸⁶
 - iii. The 1.4 GHz Centre Band is available for use.
 - iv. The 700 MHz Duplex Band is now unused and available for the provision of ECS/WBB services as Digital Terrestrial Television (DTT) services have now migrated from this band since 4 March 2020.
- b) Bands in which rights of use are due to expire after the Proposed Award and long-term rights of use would be available from that point. Existing rights of use in the 2.1 GHz Band begin to expire in 2022. For example,

⁸⁸⁴ In this RIA the “Candidate Bands” are the 700 MHz Duplex, 1.4 GHz Centre Band, 2.1 GHz, 2.3 GHz and 2.6 GHz bands.

⁸⁸⁵ Licences issued in the 2.6 GHz Band for MMDS expired in full on 18 April 2016.

⁸⁸⁶ There are currently 28 licences issued to Eir in the 2.3 GHz Band under S.I. 370 of 2009 (Radio Links) and all licences are within the frequency range 2307 – 2327 MHz.

- i. Three's "A licence" expires on 24 July 2022, and its "B Licence" expires on 1 October 2022;
- ii. Vodafone's rights of use expire on 15 October 2022; and
- iii. Eir's rights of use expire on 11 March 2027.

A 4.18 All rights of use for bands included in this Proposed Award will be available for long term assignment.

A 4.19 ComReg is of the view that there are two primary policy issues to be considered in the Proposed Award:

- a) which, if any, of the above bands should be included in the Proposed Award; and
- b) in light of (a) how best to assign rights of use in the Proposed Award.

A 4.20 In relation to (a), for the reasons set out below, ComReg is of the view that there are certain bands, namely the 2.6 GHz and 700 MHz Duplex bands, which are clearly suitable for inclusion in the Proposed Award (see further details below and noting that these bands are favoured for inclusion by the respondents to Document 18/60, Document 19/59R and Document 19/124)⁸⁸⁷ and that there is therefore no need to consider their inclusion separately in this RIA. Instead, this RIA only considers the potential inclusion of the other Candidate Bands noted above alongside the 2.6 GHz and 700 MHz Duplex bands in the Proposed Award.

2.6 GHz Band

A 4.21 ComReg believes that there are good reasons for including the 2.6 GHz Band in the Proposed Award. In particular:

- it is harmonised at both EU and CEPT level, with the 2.6 GHz EC Decision requiring that all Member States designate and subsequently make available on a non-exclusive basis the 2.6 GHz Band for terrestrial systems capable of providing ECS;
- there is a very strong device ecosystem for this band (see Annex 3);

⁸⁸⁷ In response to Document 20/56, Eir suggested that the 700 MHz Band could be assigned in a separate award process. Three in its response to Document 20/78 submits that the award of the 700 MHz band separately (as suggested by Eir) is preferable to proceeding with the current Combinatorial Clock Auction (CCA) format. These views are assessed in Chapter 3 of this document and considered in the '700 MHz Duplex' section below.

- it is widely used in other Member States for the provision of WBB including International Mobile Telecommunications (IMT)⁸⁸⁸;
- it is available for immediate assignment; and
- all respondents to Document 18/60 and six respondents to Document 19/59R supported the inclusion of this band.⁸⁸⁹ Further, no respondents to Document 19/124, Document 20/32, Document 20/56 or Document 20/78 disagreed with the inclusion of the 2.6 GHz Band.

A 4.22 Therefore, ComReg is of the view that the 2.6 GHz Band is suitable for inclusion in the Proposed Award, particularly when combined with the 700 MHz Duplex, and should therefore be included in all options discussed in this RIA.

700 MHz Duplex

A 4.23 The 700 MHz Duplex is the only Candidate Band capable of providing wide area coverage that is available for release in the Proposed Award.⁸⁹⁰ It is highly complementary to the 2.6 GHz Band (and other Candidate Bands) as its inclusion provides interested parties with the opportunity to obtain rights of use to coverage and capacity spectrum in the same award which also provides greater opportunities for new entry. In addition:

- the 700 MHz Duplex has been harmonised for providing WBB ECS⁸⁹¹;
- the 700 MHz Duplex is available in Ireland;⁸⁹² and

⁸⁸⁸ The 2.6 GHz Band is the second most used spectrum band for LTE and LTE-Advanced services worldwide (count of networks using each spectrum band to deliver commercial services). Source: LTE Frequency Bands Worldwide – January 2019 Global mobile Suppliers Association – GSA.

⁸⁸⁹ All respondents to Document 18/60 and six respondents to Document 19/59R supported the inclusion of this band and no views to the contrary were received in response to Document 19/124, Document 20/32, Document 20/56 or Document 20/78.

⁸⁹⁰ The 1.4 GHz Centre Band offers similar propagation characteristics to sub-1 GHz spectrum, when paired with low frequency spectrum (such as 700 MHz spectrum). This additional capacity would supplement a basic coverage layer provided by spectrum below 1GHz. However, this band does not provide wide area coverage in its own right.

⁸⁹¹ See Chapter 2 and Annex 5 of Document 19/124 as to why ComReg is of the preliminary view that it would not be appropriate to reserve 700 MHz Duplex spectrum for use for BB-PPDR.

⁸⁹² In that regard, ComReg notes that the Minister for Communications, Climate Action and Environment in a letter of entrustment to RTE to provide for the migration of Broadcasting Services from the 700 MHz band noted that “*The timely release of this spectrum is a matter of national importance as its subsequent use for mobile broadband services will assist in delivery of improved network coverage and speed particularly in rural areas.*”

<https://www.dccae.gov.ie/en-ie/communications/publications/Pages/Migration-from-700-MHz-Spectrum-Band.aspx>

- as of September 2020, the GSA identified 2,826 4G devices and 99 5G devices⁸⁹³ capable of operating in this band⁸⁹⁴.

A 4.24 Further, and subsequent to the publication of Document 14/101, ComReg commissioned Frontier Economics to conduct a Cost Benefit Analysis (“Frontier CBA”) on the release of the 700 MHz Duplex.⁸⁹⁵ This analysis concluded that the network cost savings to all MNOs (should they secure such spectrum in an award) to be of the order of €89 million in the base case scenario and between €50m and €150m, respectively, in the low and high demand scenarios, arising due to the network cost savings of requiring fewer base stations. This would also improve the performance of networks⁸⁹⁶, ultimately to the benefit of consumers.

A 4.25 The Frontier CBA also described wider economic and societal benefits that would likely result from the assignment of the band, including consumer welfare benefits in the form of improved and/or lower cost services and increased demand for mobile services stimulated by greater network capacity. For example, an Oxera Report commissioned by ComReg and published in November 2018 notes that from mid-2020, the commercial extension of a mobile network is likely to switch to a focus on extending higher-speed connectivity (e.g. minimum 30 Mbit/s population coverage) partly because 700 MHz Duplex rights of use become available, which will also more readily enable three-band Carrier Aggregation⁸⁹⁷ (a key technology that will reduce the cost of extending high-speed connectivity).^{898,899,900} In effect, these gains could not be realised absent the assignment of 700 MHz Duplex rights of use and no additional alternative rights of use are currently available to support such potential gains.

⁸⁹³ GSA – GAMBoD – LTE devices. (<https://gsacom.com/gambod/>).

⁸⁹⁴ Note that this figure has increased since the publication of Document 19/124R, where the GSA in November 2019 reported that 2,098 devices were available in the 700 MHz Duplex, (Band 28).

⁸⁹⁵ Frontier Economics, ‘A cost benefit analysis of the change in use of the 700 MHz radio frequency band in Ireland’, published June 2015.

<https://www.comreg.ie/publication/a-cost-benefit-analysis-of-the-change-in-use-of-the-700-mhz-radio-frequency-band-in-ireland/>

⁸⁹⁶ 700 MHz Duplex spectrum could be used to increase network performance in two different ways.

- it may enable larger blocks of contiguous sub-1GHz spectrum which could be used to significantly increase performance; and
- operators could increase performance in parts of their networks by increasing capacity, and thereby reducing utilisation.

⁸⁹⁷ Carrier Aggregation of 2 × 10 MHz of 700MHz spectrum, 2 × 10 MHz of 800 MHz spectrum, and 2 × 10 MHz of 900 MHz spectrum.

⁸⁹⁸ Section 5.5.1, Oxera, ‘Future mobile connectivity in Ireland’, Published November 2018.

<https://www.comreg.ie/publication/future-mobile-connectivity-in-ireland/>

⁸⁹⁹ The anticipated switch to 30 Mbit/s connectivity is also a product of the fact that the costs of providing 3 Mbit/s coverage for the last few percentage points of population rises exponentially. Given this, an MNO would be able to cover a significant proportion of the population with 30 Mbit/s for the same cost as expanding 3 Mbit/s coverage to the last few percentage points of population.

⁹⁰⁰ Three’s views in relation to carrier aggregation are assessed separately in Chapter 8 of this document in relation to coverage.

A 4.26 All respondents previously expressed support for the inclusion of the 700 MHz Band in the Proposed Award⁹⁰¹. However, more recently:

- Eir submits in response to Document 20/56 and Document 20/78 that ComReg should consider auctioning the 700 MHz Band on its own in order to reduce complexity and address Three's concerns regarding the potential for asymmetric pricing; and
- Three submits in response to Document 20/78 that the assignment of the 700 MHz Band could be done in a separate stage within the award or as a separate process altogether.

A 4.27 As discussed in Chapter 3 of this document, and noting the benefits of including complementary spectrum in the same award process as discussed below in the 'Impact on Competition' section, ComReg is of the view that assigning 700 MHz rights of use in a separate sequential award is not a viable or plausible option for this RIA as assigning complementary (and substitutable) spectrum in a single award rather than in one or more sequential awards has several well-established benefits for competition and consumers. ComReg notes that the 700 MHz Band is the only coverage spectrum available for the Proposed Award and is an important source of synergies that is important in determining the efficient assignment of spectrum.

A 4.28 It encourages competition both within the award and downstream. It increases the ability of award participants to express a full suite of preferences, thereby enhancing the efficiency of the award outcome which, in turn, has a positive impact on competition. If spectrum in different bands is substitutable or complementary, the demand for spectrum in a particular band (and the value placed on this spectrum) may be affected by the availability and price of spectrum in other bands. For example, in an open award process, bidders can observe the relative prices of spectrum in different bands and change valuations and consequent demand for spectrum across those bands in response to these emerging relative prices.

A 4.29 Making available complementary spectrum in the same award also provides an opportunity for bidders to express any synergy value between lots. Where complementarity exists between lots, the value of a standalone lot may be substantially lower than the value of the lot when included with other complementary lots. Bidders participating in a sequential award where such lots

⁹⁰¹ See paragraph 3.21 of Document 19/59R, "*The seven respondents who commented on this band (Dense Air, Eir, ESNB, Imagine, JRC, Three, Vodafone) all agreed with ComReg's preliminary view to include the 700 MHz Duplex in the Proposed Award.*"

See paragraph 3.13 of Document 19/124, "*In relation to the 700 MHz Duplex, 2.3 GHz and 2.6 GHz bands, all six respondents [Dense Air, Eir, Ericsson, Mr. Liam Young, Three and Vodafone)] agreed with ComReg's proposals to include these bands in the award.*"

are sold separately may be unable to express their full value for the combination of lots in the first auction, when they are unaware of the competition they may be facing for the complementary lot (i.e. aggregation risk). As discussed in Chapter 3 of this document, this may result in bidders being inefficiently assigned spectrum rights of use in some but not all its preferred bands.

A 4.30 Therefore, ComReg is of the view that the 2.6 GHz and 700 MHz Duplex bands are clearly suitable for joint inclusion in the Proposed Award and should therefore be included in all options discussed in this RIA.

A 4.31 Considering the above, ComReg is of the view that the two primary policy issues to be addressed are:

- a) whether to include the 1.4 GHz Centre Band, 2.1 GHz Band and/or 2.3 GHz band (Candidate Bands) with the 2.6 GHz and 700 MHz Duplex bands in the Proposed Award (the “**Spectrum for Award RIA**”); and
- b) in light of (a) how best to assign rights of use in the Proposed Award (the “**Assignment Process RIA**”).

A 4.32 These two important policy issues, while related, are sequential in nature and are each in turn considered under Steps 2 to 5 of the RIA process below. However, before doing so, it is relevant to note the objectives ComReg is seeking to achieve with the Proposed Award.

Objectives

A 4.33 The focus of this RIA is to assess the impact of the proposed measure(s) (see regulatory options below) on industry stakeholders, and on competition and consumers. In that way, it allows ComReg to identify and implement the most appropriate and effective means to assign spectrum rights of use, while still allowing ComReg to achieve its objectives of:

- assigning liberalised rights of use in the 700 MHz Duplex and 2.6 GHz Band in line 700 MHz EC Decision (EU 2016/687)) and 2.6 GHz EC Decision (2008/477/EC);
- assigning liberalised rights of use in one or more the Candidate Bands, if appropriate, in line with relevant EC Decisions;
- promoting competition and ensuring that there would be no distortion or restriction of competition in the electronic communications sector;
- encouraging efficient investment in infrastructure, promoting innovation and ensuring the efficient use and effective management of the radio frequency spectrum;

- providing further clarity on the likely availability of spectrum for release in other relevant bands; and
- promoting the economic development of the State and electronic communications sector.

A 4.34 ComReg also aims to design and carry out this assignment process in accordance with its broader statutory objectives (set out in Annex 2), including, but not limited to, the promotion of competition in the electronic communications sector.

A 4.35 ComReg's other overarching objectives are to contribute to the development of the internal market and to promote the interests of users within the Community. ComReg also notes that, in achieving its objectives, its aim is to choose regulatory measures which maximise the benefits for consumers in terms of price, choice and quality.

A4.4 The 'Spectrum for Award' RIA

A 4.36 As noted above, ComReg is of the view that the 2.6 GHz and 700 MHz Duplex bands are suitable for inclusion in the Proposed Award and should therefore be included in all the options discussed in this RIA. For ease of reference, the 2.6 GHz and 700 MHz Duplex bands are hereafter referred to as the "**Primary Bands**". Accordingly, this RIA assesses each of the remaining Candidate Bands in terms of the impact their inclusion, or otherwise, with the Primary Bands would have on stakeholders, competition and consumers. ComReg then forms a view on which bands, if any, should be included with the Primary Bands in the Proposed Award.

Identify and describe the regulatory options (Step 2)

A 4.37 An assessment of the Primary Bands and each of the remaining Candidate Bands together leads to many potential individual options. However, ComReg notes that it is unnecessary to assess each and every potential combination of bands as a separate option for the purposes of this RIA, because the arguments for and against including each Candidate Band with the Primary Bands is essentially the same for any other potential combination of that Candidate Band with other Candidate Bands. Therefore, following Option 1 (i.e. inclusion of the Primary Bands only) each subsequent option involves the addition of a particular Candidate Band with the Primary Bands.

A 4.38 Considering the preceding discussion, and having regard to responses received to Document 18/60, Document 19/59R, Document 19/124, Document 20/32, Document 20/56 and Document 20/78 ComReg has identified the following regulatory options for consideration in this RIA:

- **Option 1** - Assign rights of use for 700 MHz Duplex and 2.6 GHz Band only.
- **Option 2** - Include the 2.3 GHz Band in any award process assigning rights of use in the 700 MHz Duplex and 2.6 GHz Band.
- **Option 3** - Include the 2.1 GHz Band in any award process assigning rights of use in the 700 MHz Duplex and 2.6 GHz Bands.
- **Option 4** - Include the 1.4 GHz Centre Band in any award process assigning rights of use in the 700 MHz Duplex and 2.6 GHz Bands.

Impact on industry stakeholders, competition and consumers (Steps 3 and 4)

A 4.39 The focus of this section of the RIA is to assess the impact of the regulatory options on:

- i. industry stakeholders (being existing stakeholders and potential New Entrants);
- ii. competition; and
- iii. consumers.

A 4.40 Prior to carrying out this analysis, ComReg first briefly sets out some background information concerning developments in the demand for spectrum in Ireland.

Demand for spectrum

A 4.41 Consumer demand for mobile broadband has grown significantly in recent years. Total mobile data traffic has grown over 19 times⁹⁰² since the 2012 Multi-Band Spectrum Award (2012 MBSA) when 3G was expanded across the country using UMTS 900 and 4G was launched in Ireland.

A 4.42 Further, mobile data usage over the past 2 years has been in line with a mobile data traffic forecast provided by Frontier Economics which forecast that demand for mobile data would grow at an average of 32% per year up to 2022.⁹⁰³ These studies were commissioned by ComReg to enable better network planning by operators and assist stakeholders to keep pace with consumer demand for

⁹⁰² ComReg Quarterly Key Data Reports – 2013 – Q3 2020. Part of this growth is likely due to the increased demand arising from the COVID-19 pandemic. See paragraph A4.48 below.

⁹⁰³ The growth in mobile data usage is higher than forecast in recent quarters which is again likely due to the increased demand arising from the COVID-19 pandemic. Growth in mobile data usage from Q3 2019 to Q3 2020 was 49%. Prior to this spike in demand usage was in line with the forecast, for example, from Q4 2018 to Q4 2019 growth was 33%.

services⁹⁰⁴ (Document 18/35).

A 4.43 Frontier observed that there are many factors increasing demand for data including that:

- devices are becoming increasingly sophisticated;
- consumers are using more heterogeneous and sophisticated software and applications on their devices;
- broadband networks are increasingly used by consumers to watch content that would previously have been transmitted over traditional TV networks; and
- business applications continue to drive demand.

A 4.44 These drivers are all described in more detail in Section 2.2 of the Frontier Report on meeting consumers' connectivity needs.⁹⁰⁵

A 4.45 Demand for spectrum exists to satisfy requirements in both rural and urban areas, and a mix of spectrum bands is typically required for optimal network configuration and where possible to facilitate new entry. While mid frequency spectrum offers greater capacity use when compared to low frequency spectrum, the latter offers substantial coverage benefits and is more cost-effective in providing 'capacity in the coverage layer' for mobile data services. The 700 MHz Duplex is likely to be central to providing mobile coverage in rural areas and along terrestrial routes where the capacity requirements are typically less. Ireland is one of the most rural countries in the EU 28⁹⁰⁶ and the 700 MHz Duplex is likely to be of most interest in Ireland in terms of providing or improving mobile coverage, given that its strong propagation qualities support more cost-effective approaches to the coverage of distributed and rural populations.⁹⁰⁷

A 4.46 Capacity is also likely to be an issue in urban and suburban areas where populations are becoming increasingly concentrated. Population growth is projected to be greatest in and around the major cities and Dublin in particular. For example, since the 2012 MBSA, the population of Dublin has grown by around 100,000⁹⁰⁸ and is forecast to grow by a further 495,000 in the period up to 2036.⁹⁰⁹ Further, and prior to the COVID-19 restrictions, around 90,000 persons (net) travelled to work in Dublin from outside and another 70,000 (net)

⁹⁰⁴ Implementing Action 33 of the Mobile Phone and Broadband Taskforce, see <https://www.comreg.ie/publication/mobile-data-traffic-forecast-in-ireland>.

⁹⁰⁵ Meeting Consumers' Connectivity Needs a report from Frontier Economics, Document 18/103b.

⁹⁰⁶ Section 4.1.1 Document 18/35, Mobile Data Traffic Forecast in Ireland, published 27 April 2018.

⁹⁰⁷ See Section 2.4, Document 18/103c 'Future Mobile Connectivity in Ireland a report from Oxera Consulting LLP, with Real Wireless Ltd.'

⁹⁰⁸ Census 2016.

⁹⁰⁹ CSO, 2019. Regional Population Projections 2017-2036.

travel to work into the other cities from outside areas. The five urban areas combined accounted for 41% of all daytime workplace destinations (excluding mobile workers).⁹¹⁰ This increasing density of population, particularly in urban areas, will put pressure on the capacity of existing networks, whether mobile or fixed.

- A 4.47 MNOs and FWA operators together have significant spectrum portfolios with 750 MHz⁹¹¹ currently assigned for WBB in Ireland. However, given the mobile data forecasts described earlier, additional spectrum rights across different bands are likely to be required in the future, and respondents to this consultation process have indicated as much (see discussion in Chapter 3 of Document 19/59R for example). Considering the above characteristics and developments, demand for suitable radio spectrum in Ireland is likely to be high.
- A 4.48 Furthermore, the COVID-19 pandemic has resulted in the provision of voice and data services becoming more important to the day to day life and working arrangements of many people, with these services being used extensively to stay in contact with relatives and friends and to remote work and learn from home. While the recent spike in usage (as identified in Document 20/86R)⁹¹² may be temporary, it could nevertheless lead to a more long-term change in social and work activities that may require more mobile data usage (and the spectrum that supports it) than would have been the case absent the pandemic.
- A 4.49 ComReg sets out below a comparative analysis of each of the four regulatory options outlined above, in terms of their impact on stakeholders, competition and consumers.

Impact on Industry Stakeholders

- A 4.50 As noted above, industry stakeholders can be broadly split between those operators that are currently active in the electronic communications sector and potential New Entrants to the electronic communications sector in the State.
- A 4.51 ComReg notes that each of the regulatory options below involves additional spectrum being made available for assignment to existing operators or New Entrants. Therefore, before assessing each of the options, ComReg sets out below the main reasons why operators, all else being equal, would prefer options which make additional spectrum rights of use available.

⁹¹⁰ Census of Population 2016 – Profile 6 Commuting in Ireland.

⁹¹¹ Not including temporary rights of use.

⁹¹² Document 20/86R, 'COVID-19 Temporary Spectrum Management Measures - Further temporary spectrum rights in the 700 MHz, 2.1 GHz and 2.6 GHz Bands', published 18 September 2020.

Benefits of additional spectrum to stakeholders

Fixed Wireless

- A 4.52 While the Candidate Bands above 1 GHz are often used for the provision of capacity on mobile networks, these bands can also be used by a fixed wireless network to deliver coverage and capacity⁹¹³. For example, Plum notes:

"the CPE antennas used in fixed networks are also directional and are mounted externally, typically on a rooftop or other elevated position. Once again the antenna gain leads to an increase in the tolerable path loss, but there is also a further benefit in that there is a much higher probability of a line of sight path between the base station and antenna than would be the case for a mobile network, where user terminals are often shielded by buildings, trees and other clutter. This means that a reliable service can be provided over much larger distances than would be the case for a mobile network, especially in an urban or suburban environment".⁹¹⁴

- A 4.53 In terms of the coverage range for the Candidate Bands, propagation path loss increases with the frequency. While there are propagation differences between the 2.1 GHz Band, 2.3 GHz Band⁹¹⁵ and 2.6 GHz Band, these are not significant and are typically treated as being equivalent for network planning studies.⁹¹⁶
- A 4.54 The addition of any of these bands would give additional capacity and coverage benefits to existing FWA operators. For example, based on its previous analysis, Plum⁹¹⁷ recommended that 100 MHz⁹¹⁸ is necessary to provide a high speed (30 Mbit/s or more) broadband service with similar contention levels to existing cable services and a similar infrastructure density to existing wireless services. The 2.3 GHz Band provides FWA operators with the opportunity to increase existing holdings closer to or beyond 100 MHz and compete to a greater extent with

⁹¹³ For example, DotEcon notes that frequencies above 1 GHz may be attractive for fixed wireless providers, for which capacity and throughput can be achieved using bands with larger amounts of contiguous spectrum. See Chapter 2 of Document 19/59a.

⁹¹⁴ Document 15/140d - Technical advice by Plum Consulting concerning potential rights of use in the 3.6 GHz band Updated Report 3: Analysis of the potential spectrum requirements for NGA services (p53).

⁹¹⁵ FDD assignments can cover a wider coverage area. Assuming the same transmit power, the main reason for reduced coverage is that the uplink device power is used part of the time for TDD but continuously for FDD.

⁹¹⁶ Report ITU-R M.2292-0 (12/2013) - Characteristics of terrestrial IMT-Advanced systems for frequency sharing/ interference analyses – Table 3.

⁹¹⁷ Document 15/75, A Report for ComReg, Technical advice concerning potential sub-national rights of use in the 3.6 GHz band. Report 3: Analysis of the potential spectrum requirements for NGA services.

⁹¹⁸ The 100 MHz is based on a model using an infrastructure density comparable to one of today's mobile cellular networks, and Plum state that this amount of spectrum utilising LTE-A could serve up to 30% of all broadband subscribers in a typical suburban area and up to 50% of all subscribers in more rural areas.

existing fixed line services.

A 4.55 Download requirements for FWA broadband services are significantly higher per user compared to mobile. For example, monthly data usage per FWA is around 224 GB per month compared to around 12.4 GB and 52 GB for smartphone and dongles, respectively.⁹¹⁹ In February 2019, Imagine announced plans to deploy approximately 325 sites and provide fixed wireless services across large parts of the country.⁹²⁰ Therefore, depending on FWA subscriptions in a particular area, the need for additional spectrum for such purposes could increase in the future.

Mobile and Fixed Wireless

A 4.56 Assigning available substitutable spectrum in a single award rather than in one or more sequential awards would, among other things, better facilitate the planning of spectrum portfolios to address growth in data traffic and, in turn, enhanced services by successful participants in the Proposed Award. Operators typically have three options when increasing capacity on their networks:

1. deploy more spectrum on existing base stations;
2. add more base stations thereby increasing the geographic reuse of spectrum; and/or
3. increase spectrum efficiency (i.e. increasing the throughput capacity of each MHz of spectrum).

A 4.57 Increased spectral efficiency is generally achieved through on-going technological advancements and operators are generally dependent on equipment manufacturers and handset upgrades to provide for same.⁹²¹ More generally, the capacity available to provide MBB services depends on the amount of spectrum assigned to an operator and the number of base stations in its network. Once the existing capacity is fully used, operators must, in the absence of suitable additional spectrum, add more base stations to their network to address congestion.⁹²² This allows radio spectrum to be reused in multiple

⁹¹⁹ See ComReg Quarterly Key Data Portal. Available at <https://www.comreg.ie/industry/electronic-communications/data-portal/>

⁹²⁰ <https://www.irishtimes.com/business/technology/imagine-plans-300m-wireless-broadband-network-1.3792296?mode=sample&auth-failed=1&pw-origin=https%3A%2F%2Fwww.irishtimes.com%2Fbusiness%2Ftechnology%2Fimagine-plans-300m-wireless-broadband-network-1.3792296>

⁹²¹ As technology standards are improved and refined the effective capacity of different technologies improves. However, even if new LTE releases are deployed in the network there may be a lag in the user adoption of handset technology with the latest LTE releases. Therefore, operators typically do not rely on such developments to increase capacity, particularly in the short run.

⁹²² This is done by deploying more radio towers/antennas and shrinking the reach of each tower by reducing the radiated power of its radio transmissions. This allows radio spectrum to be reused for multiple simultaneous transmissions within the geographic area. Thus, by subdividing cells, the amount of traffic that a Hz of spectrum can carry within an overall geographic area (measured by bps/km²) is increased.

smaller cells within the cell area of the original cell.

- A 4.58 However, the construction of base stations deploying more radios and antennas as well as extending additional backhaul links to new sites is expensive and typically costs substantially more (in the order of multiples) than adding additional spectrum rights to existing base stations.⁹²³ Therefore, depending of course on the relative cost of spectrum in a competitive award, operators are likely to prefer the release of additional spectrum in order to reduce costs of providing additional capacity. Further, with advances in radio technology, including the use of higher bandwidth channels (such as the 2 × 20 MHz channels available with LTE) and the use of carrier aggregation, having a larger spectrum holding allows an operator to offer higher headline speeds and sustain higher actual speeds.⁹²⁴
- A 4.59 The release of additional bands also provides greater opportunity for carrier aggregation across bands which makes more efficient use of spectrum by combining two or more bands into a single channel. Carrier aggregation can combine spectrum both within a single band and across multiple bands. The resulting higher peak data rates give users a richer mobile broadband experience and improved service coverage.

Option 1 v Option 2 (inclusion of the 2.3 GHz Band with the Primary Bands)

- A 4.60 While stakeholders are likely to be in favour of Option 1, some stakeholders may also prefer the inclusion of the 2.3 GHz Band considering the benefits of additional spectrum as outlined above. ComReg first sets out information on the band and then assesses how that information would likely inform the views of stakeholders:
- a) the inclusion of the 2.3 GHz Band (and other bands) would provide additional spectrum but also more contestable spectrum to different potential users;
 - b) the inclusion of the 2.3 GHz Band would provide the opportunity to acquire additional TDD (unpaired) spectrum rights to address asymmetric traffic flows and more effectively manage increased capacity from end users.⁹²⁵ For example:

⁹²³ For example, the estimate networks costs in the Oxera Report (Document 18/103c Section A.2.4.10) indicates a difference in capex costs. For a new site the estimated capex cost is €250,000, compared to €10,500 for upgrading a site.

⁹²⁴ The actual speeds depend upon several factors including the device capability, the network capability, the network capacity available (and congestion) and the RF quality of the connection.

⁹²⁵ The use of TDD spectrum provides operators the flexibility to adjust its uplink-downlink ratio to account for more downlink capacity once any uplink requirements are satisfied in line with traffic asymmetry. This flexibility is not available with FDD.

- i. overall average traffic asymmetry ratio (Uplink (UL)/ Downlink (DL)), which is currently dominant (from 1/4 to 1/9) in favour of DL is expected to increase in favour of DL (from 1/7 to 1/10 or more) due to growing demand for audio-visual content⁹²⁶; and
 - ii. the 2.3 GHz Band could be used to deliver extra capacity primarily in the DL direction for more densely populated areas providing better flexibility for operators.
- c) unlike Supplementary Downlink (“SDL”)⁹²⁷ bands, 2.3 GHz TDD spectrum can accommodate both uplink and downlink, and can be used, independently of other frequencies;
 - d) of the 137 smartphones tested by ComReg as part of its handset testing⁹²⁸, 92 handsets support the 2.3 GHz Band, including the most popular Apple and Samsung devices;
 - e) the technical conditions for the 2.3 GHz Band are harmonised in Europe by CEPT and there are significant deployments outside of Europe⁹²⁹ resulting in availability of equipment and a strong device ecosystem⁹³⁰;
 - f) beamforming is of particular interest for LTE-TDD because the same frequency is used in the downlink and uplink, whereas FDD requires two separate communications channels. The 2.3 GHz Band is the lowest frequency band suitable for highest capacity 8T8R (8 Transmit 8 Receive) beamforming^{931 932}; and
 - g) the EC has drafted an implementing decision based on CEPT Report 55. However, the adoption of this decision was deferred, and the matter has yet to be revisited by the ECs Radio Spectrum Committee.

A 4.61 ComReg outlines below the views expressed by stakeholders and the likely preferences of other stakeholders considering the above.

⁹²⁶ ITU, 2015. https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2370-2015-PDF-E.pdf

⁹²⁷ SDL is a mobile broadband system, which by means of base station transmitters in a network uses unpaired spectrum in the downlink direction to provide supplemental downlink capacity, where the downlink resource is constrained due to the asymmetry in data usage.

⁹²⁸ Mobile Handset Performance – Data, Document 18/82, published 19 September 2018.
Mobile Handset Performance – Voice, Document 19/110, published 11 December 2019.

⁹²⁹ Including China, the Asia Pacific region, Africa and Australia.

⁹³⁰ As of September 2020, the GSA identify that the 2.3 GHz Band (Band 40) has 6,276 devices available. Source: <https://gsacom.com/>

⁹³¹ <https://www.huawei.com/en/press-events/news/2017/10/Huawei-5G-Oriented-Full-Band-4T4R>

⁹³² Award of the 2.3 and 3.4 GHz spectrum bands Annexes to the statement, Ofcom.

MNOs

- A 4.62 ComReg notes that, in response to Document 18/60, Three and Vodafone supported the inclusion of the 2.3 GHz Band in the Proposed Award.⁹³³ However, Eir did not agree and submitted that consideration of this band should be put on hold until an EC implementing decision on technical harmonisation had been adopted.
- A 4.63 In relation to Eir's view, ComReg notes that the lack of an EC harmonisation decision should not be a significant concern given deployments outside of Europe. Indeed, the band already has a significant device presence on the Irish market. ComReg notes that, more latterly, Eir agreed with the inclusion of the 2.3 GHz band in its responses to Document 19/59R and Document 19/124. No further objections to the inclusion of this band were raised by the three MNOs in response to Documents 19/124, 20/32, 20/56 or 20/78.

FWA operators

- A 4.64 ComReg notes that, in response to Document 18/60 and Document 19/59R, Imagine supported the inclusion of the 2.3 GHz Band in the Proposed Award and has not commented on it further in later consultations
- A 4.65 ComReg considers that it is also reasonable to take the view that FWA operators generally are likely to prefer the inclusion of the 2.3 GHz Band because:
- a) it would provide 100 MHz of additional suitable LTE-TDD⁹³⁴ spectrum, which could be used in addition to 3.6 GHz LTE-TDD and/or 2.6 GHz TDD spectrum;
 - b) the 2.3 GHz Band would be considered an important 'coverage band' in the provision of fixed wireless services which is likely to be able to provide additional capacity benefits and end user benefits due to the suitability of the band for beamforming in the future; and
 - c) it would provide for the possibility of carrier aggregation⁹³⁵ with the

⁹³³ Vodafone supports the inclusion of the 2.3 GHz Band as it is a sufficiently close substitute to rights of use in the 2.6 GHz Band and also sufficiently complementary to rights of use in the 700 MHz Duplex.

⁹³⁴ Of importance has been the development and take up of TD-LTE designed to maximise the use of spectrum in the most efficient way to deliver higher bandwidth services. Derived from fixed wireless protocols and standards, TD-LTE uses the same channel for downloading and uploading data where the spectrum resources are assigned proportionally to reflect and cater for normal broadband usage where the primary requirement is downloading data.

⁹³⁵ Carrier aggregation is a key feature of LTE-Advanced (LTE-A) which enables carriers at multiple frequencies to be used together to provide improved data rates for users of 4G networks.

3.6 GHz Band⁹³⁶ and/or 2.6 GHz Band in the future⁹³⁷ for MNOs and Fixed Wireless operators.

New Entrants/Other Operators

- A 4.66 The assignment of 700 MHz Duplex and 2.6 GHz rights of use under Option 1 would facilitate potential new entry to the mobile telecommunications market by providing a spectrum portfolio suitable for both cost-effective wide-area coverage and capacity in higher density areas. New entrants are also likely to prefer the inclusion of the 2.3 GHz Band because the availability of more substitutable spectrum in the same award increases the opportunity for a New Entrant to be assigned rights of use.
- A 4.67 Other operators would also likely prefer the inclusion of the 2.3 GHz band. For example, Dense Air (which obtained rights of use in the 3.6 GHz Award) has used 2.3 GHz Band LTE-TDD small cell and small cell backhaul solutions in conjunction with mobile operators⁹³⁸ outside Ireland, and its outdoor 4G LTE-Advanced base station equipment all support the 2.3 GHz Band.⁹³⁹ In its submission to Document 19/59R, Dense Air supports the inclusion of the 2.3 GHz band.
- A 4.68 In light of the above, industry stakeholders have expressed a preference for, or would likely prefer the inclusion of, the 2.3 GHz band in the Proposed Award.

Option 1 v Option 3 (Inclusion of 2.1 GHz Band with the Primary Bands)

- A 4.69 ComReg acknowledges the concerns expressed by some respondents on the perceived complexity of including the 2.1 GHz Band in the Proposed Award. These were considered separately in Chapter 5 of Document 19/59R and Chapter 4 of Document 19/124, with the issues germane to perceived complexity concerns assessed more generally in Chapters 6 and 7 of same. Further, in Chapter 4 of this document, ComReg provides a further assessment of the matters relevant to the 2.1 GHz Band and the views of respondents are assessed therein. The following analysis focuses upon more general considerations concerning the potential inclusion of the 2.1 GHz Band and should be read in the

⁹³⁶ <https://www.ericsson.com/en/news/2017/4/australian-achievement-nbn-hits-record-in-gigabit-lte>

⁹³⁷ More generally, operators are likely to prefer carrier aggregation of bands with similar propagation characteristics. Carrier aggregation of bands with similar propagation characteristics offer better and more consistent quality of service for a given level of coverage because there is less likely to be a coverage mismatch between bands leading to inconsistent quality of service and lower speeds at cell edge, as the impact of one or more of higher frequency bands falls out of coverage. Carrier aggregation of certain bands can be an effective means of overcoming poor speeds for users located at cell edge. The 2.1 GHz Band, 2.3 GHz Band and 2.6 GHz Band are likely to be relevant in this regard.

⁹³⁸ <https://www.airspan.com/press-release/afrimax-vodafone-group-deploys-airspans-lte-network-architecture-in-zambia/>

⁹³⁹ <https://www.airspan.com/airharmony/>

context of the discussion and specific proposals for the 2.1 GHz Band in Chapter 4.

A 4.70 While stakeholders are likely to support Option 1, some stakeholders (MNOs⁹⁴⁰, but also FWA operators⁹⁴¹) may also prefer the inclusion of the 2.1 GHz Band given the benefits of additional spectrum described above. In that regard, the 2.1 GHz Band is currently used with the 800 MHz, 900 MHz and 1800 MHz bands to provide mobile services, and could therefore be considered highly complementary to the 700 MHz Duplex, given the similarities between the 700 MHz Duplex and the 800 MHz and 900 MHz bands.

A 4.71 The 2.1 GHz Band is likely to be primarily of interest to existing 2.1 GHz licensees (i.e. MNOs) who therefore form the focus of the discussion below.

MNOs

A 4.72 The 2.1 GHz Band is one of two bands (the other being in the 900 MHz band (for UMTS)) currently used to provide 3G services. MNOs are likely to continue operating 3G services, before refarming the band to enable provision of 4G (as evidenced by the recent use of the bands for 4G services on a temporary basis⁹⁴²) and/or 5G services, and therefore more likely continue to require the band for the provision of 3G services beyond licence expiry (Vodafone's and Three's licences expire in 2022). For example:

- a) 2G and 3G networks are still required to deliver voice calls across the country;
- b) 3G networks are required to provide data services where 4G services are not currently provided; and
- c) many consumers still have 3G handsets⁹⁴³.

A 4.73 However, this requirement is lessening, and MNOs are likely to repurpose 2.1 GHz rights to provide 4G and ultimately 5G services over the duration of any new 2.1 GHz Band rights of use. For example:

- in relation to (a), the introduction of VoLTE will reduce the need for 3G networks to provide voice. Vodafone has already implemented VoLTE

⁹⁴⁰ For example, in their submissions to Document 19/59R, Vodafone and Three support the inclusion of the 2.1 GHz Band, while Eir does not support its inclusion. Similarly, in response to Document 19/124 Eir does not support the inclusion of the 2.1 GHz band.

⁹⁴¹ For example, Imagine expresses support for the inclusion of the 2.1 GHz Band.

⁹⁴² As part of the COVID-19 Temporary Spectrum Management Measures as discussed in Chapter 2 of this document, ComReg decided to temporarily make the 2.1 GHz Band available on a liberalised basis.

⁹⁴³ By the end of Q3 2020, 61.9% of mobile subscribers were categorised as 4G network users, 31.5% were using 3G networks with the remaining 6.6% of subscribers using 2G networks only.

while Three and Eir have announced their intention to rollout VoLTE⁹⁴⁴;

- in relation to (b), the continued rollout of 4G services by all operators will reduce the reliance on 3G networks for data over time; and
- in relation to (c), while 3G still accounts for around 31.5% of all subscriptions, this has fallen from nearly 70% in 2014⁹⁴⁵, allowing such customers to be migrated from 3G to 4G.

A 4.74 Further, 3G services are also provided using 900 MHz spectrum and so MNOs enjoy some flexibility in the provision of 3G based services. It is likely that current 3G spectrum will gradually be repurposed to provide 4G and 5G⁹⁴⁶ services as the above developments intensify, with 3G networks likely retiring over the duration of any new 2.1 GHz rights of use. For example,

- KPN in the Netherlands recently announced its intention to shut down 3G mobile voice/data network services by January 2022⁹⁴⁷.
- Telenor started phasing out 3G networks in 2019.⁹⁴⁸
- EE in the UK has re-farmed some of its 2.1 GHz spectrum to provide 5 band carrier aggregations in certain areas.⁹⁴⁹
- 3 Denmark is planning to close down 3G services by end-2020⁹⁵⁰.

A 4.75 However, 3G services will not end overnight. Rather, the reliance on such networks will reduce over time and across different geographic areas. The inclusion of the 2.1 GHz Band in the Proposed Award would provide operators with additional flexibility to evolve their networks in line with market developments and technology rollouts. For example, additional rights of use beyond expiry would allow repurposing to occur at a pace consistent with market developments (i.e. any operator that did not win additional rights of use would have to

⁹⁴⁴ <https://www.irishtimes.com/business/retail-and-services/revenue-slips-10-at-mobile-operator-three-1.3176901>

⁹⁴⁵ ComReg Quarterly Key Data Portal.

⁹⁴⁶ ECC has tasked ECC PT1 to review the existing ECC Decisions for the 2.1 GHz (ECC Decision (06)01) with a view to adapting the harmonised regulatory framework in these existing frequency bands to account for 5G. ECC PT1 has conducted technical analysis for the 2.1 GHz Band in Draft ECC Report 298. <https://cept.org/ecc/topics/spectrum-for-wireless-broadband-5g>

⁹⁴⁷ <https://overons.kpn.nl/nieuws/2018/kpn-gaat-in-2022-stoppen-met-3g-netwerk>

⁹⁴⁸ <https://www.teliacompany.com/en/news/news-articles/2g-and-3g-networks-to-retire--norway-first-out/>
<https://www.commsupdate.com/articles/2020/03/17/tt-netvaerket-to-gradually-phase-out-3g-from-april-2021/>

⁹⁴⁹ <https://rethinkresearch.biz/articles/five-carrier-aggregation-sees-ee-refarming-3g-spectrum-for-lte/>

⁹⁵⁰ <https://www.telecompaper.com/news/3-denmark-to-set-up-over-200-more-masts-in-2020-as-it-switches-off-3g-prepares-for-5g--1324867>

significantly reduce the capacity of its 3G networks on expiry).

A 4.76 Given the above, all MNOs agree that 2.1 GHz rights of use need to be assigned significantly in advance of the expiry of existing licences:

- In its response to Document 18/60, Vodafone submitted that if the issues around complexity can be resolved, it would favour including the 2.1 GHz Band in the Proposed Award. In its responses to Document 19/59R and Document 19/124 Vodafone again supported the inclusion of the 2.1 GHz Band in the Proposed Award;
- In its response to Document 18/60 Eir favoured new 2.1 GHz rights of use but considered it may be inappropriate for the 2.1 GHz Band to be included in the Proposed Award, particularly if it were based on an auction⁹⁵¹ (see Assignment Option 2B below). In its response to Document 19/59R, Eir did not support the inclusion of the 2.1 GHz Band. Instead Eir favours an alternative assignment approach as discussed under Assignment Option 2B below. Eir expressed similar reservations in its response to 19/124; and
- In its response to Document 18/60 Three favoured new 2.1 GHz rights that would be assigned through an administrative award process directly to MNOs (see Assignment Option 2B below). In its response to Document 19/59R, Three agreed with many aspects of ComReg's award proposals including the inclusion of the 2.1 GHz Band in the award. In its responses to Documents 19/124 and 20/56 Three supported the use of an auction process for assigning all spectrum in the award (including the 2.1 GHz band) though it expressed concerns primarily in relation to interim rights of use (which are assessed in Annex 5 of this document).

A 4.77 More generally, other stakeholders would likely consider the 2.1 GHz Band as substitutable for the 2.3 GHz Band and 2.6 GHz Bands as it has comparable propagation characteristics and can provide additional capacity (or coverage).

A 4.78 Therefore, except for Eir and subject to concerns regarding award complexity being appropriately addressed (see Chapter 4 of this document), industry stakeholders would, on balance, likely prefer that the 2.1 GHz Band be included in the Proposed Award.

Option 1 v Option 4 (Inclusion of 1.4 GHz Centre Band with the Primary

⁹⁵¹ In that regard, Eir submitted that "near term investment in the band would be deterred if future use of this spectrum is determined by an auction, and an existing operator's investments to date would be written off if it is driven out of the spectrum".

Bands)

- A 4.79 While stakeholders are likely to be in favour of Option 1, some stakeholders may also prefer the inclusion of the 1.4 GHz Centre Band considering the benefits of additional spectrum described above. ComReg first sets out information on the band and then assesses how that information would likely inform the views stakeholders.

Use of Band

- A 4.80 The 1.4 GHz Centre Band is harmonised for the use of SDL which, as the name suggests, aims to provide additional downlink capacity to networks where the downlink resource is constrained due to asymmetry in data flows. As this band has no uplink capabilities, it needs to be used alongside another band/s and as such would be complementary to it.
- A 4.81 The 1.4 GHz EC Decision allows the potential for the 1.4 GHz Centre Band to obtain a similar coverage footprint as sub-1 GHz spectrum bands when paired with low frequency spectrum such as the 700 MHz Duplex and 800 MHz⁹⁵², where this additional capacity would supplement a basic coverage layer provided by spectrum below 1 GHz. While specific information on the deployments of SDL networks is limited, it appears initially that the band would be used as a complement to coverage bands such as the 800 MHz band and then at a later point to the 1800 MHz Band, 2.6 GHz Band, 2.1 GHz Band, 900 MHz Band and 3.6 GHz Band⁹⁵³. As noted below, the number of devices that have this SDL capability is likely to be limited in Ireland today compared to the availability of devices to use the other Candidate Bands.

Device support of the 1.4 GHz Centre Band

- A 4.82 There are currently 230 (December 2020) devices capable of operating in 1.4 GHz Centre Band.⁹⁵⁴ These devices are not all currently available in Ireland and some of the devices that are available are expensive, high-end devices. While the increase in new devices indicates the development of a device ecosystem, operators are unlikely to be able to effectively use this band to any significant degree until a critical mass of users can receive the frequency on their device.

⁹⁵² This arises because the uplink, which is the limiting factor for coverage, is only carried on the low frequency, while the 1.4 GHz frequency is only used for the downlink. The 1.4 GHz EC Decision allows that the in block EIRP can be increased from 68 dBm/5MHz for specific deployments, for example for the aggregated use of spectrum within the 1.4 GHz band and spectrum in lower frequency bands.

⁹⁵³ ETSI TS 136 101 release 12 identified that inter band carrier aggregation is supported between the 800 MHz Band (Band 20) and the 1.4 GHz Centre Band (Band 32). In more recent releases other bands that can be carrier aggregated with the 1.4 GHz Centre Band have been added: Release 14: 1800 MHz band (Band 3), 2.6 GHz Band (Band 7), Release 15: 2.1 GHz (Band 1), 900 MHz (Band 8), and 3.6 GHz Band (bands 42 and 43).

⁹⁵⁴ GSA – GAMBoD – LTE devices (<https://gsacom.com/gambod/>)

A 4.83 In that regard, ComReg has tested handsets currently available on the Irish market in order to replicate the mobile user experience by measuring the receive performance for data and the antenna sensitivity patterns of mobile handsets. Across various tests conducted between June 2017⁹⁵⁵ and December 2020⁹⁵⁶ 137 smartphones available on the Irish market were tested.

A 4.84 A further analysis of these 140 handsets (137 smartphones) shows the following.

- 128 handsets support the 2.6 GHz Band;
- 93 handsets support the 2.3 GHz Band; and
- 31 handsets support the 1.4 GHz Centre Band.

A 4.85 This assessment shows that both the 2.3 GHz Band and 2.6 GHz Band are well supported across smartphones currently available on the market. In particular, both bands are supported across Samsung and Apple devices which account for around 72% of the smartphone market.⁹⁵⁷ Devices that do not support these bands tend to be older generation 'pay as you go' devices that are typically associated with low data users. However, the availability of handsets which support the 1.4 GHz Centre Band is much lower.

Support for 1.4 GHz Centre Band on existing base stations

A 4.86 ComReg understands from an assessment of the apparatus specified in MNO licences that the base station equipment (base transceiver station and antennas) are primarily multi-band and cover existing bands, such as the 800 MHz, 900 MHz, 1800 MHz, and 2.1 GHz bands, but also the 700 MHz Duplex, 2.6 GHz Band, and to a lesser extent the 2.3 GHz Band. However, existing base station equipment does not appear to cover the 1.4 GHz Centre Band. If so, an operator assigned 1.4 GHz Centre Band rights would therefore likely need to install additional/new specialised antenna equipment in order to use such rights.⁹⁵⁸

Harmonisation of the band

A 4.87 While the 1.4 GHz Centre Band is harmonised for use as SDL in Europe, as outlined in Chapter 3 of Document 19/59R, the 1.4 GHz Band (i.e. the Centre Band and the Extension Bands) is also standardised on both a TDD and FDD basis for both LTE and 5G standards⁹⁵⁹.

⁹⁵⁵ See Document 18/05, Document 18/78, Document 18/82, Document 18/109, Document 19/67 and Document 19/110.

⁹⁵⁶ See Document 20/121, published 14 December 2020.

⁹⁵⁷ Mobile Consumer Experience, Document 19/101, slide 43.

⁹⁵⁸ <https://www.kathrein.com/en/solutions/mobile-communication/products/antennas-accessories/outdoor-antennas/>

⁹⁵⁹ <http://www.3gpp.org/>

A 4.88 ComReg outlines below the views expressed by stakeholders and the likely preferences of other stakeholders in light of the above.

MNOs

A 4.89 First, and as identified in Chapter 3 of Document 19/59R, Eir and Vodafone disagreed with ComReg's proposal in Document 18/60 to exclude the 1.4 GHz Centre Band, whereas Three agreed with the proposed exclusion of this band. The reasons informing these views, and ComReg's assessment of same, were set out in Chapter 3 of Document 19/59R and are not repeated here. In their responses to Document 19/59R, neither Vodafone nor Three argue for the inclusion of the 1.4 GHz Band in the Proposed Award while Eir was silent on this matter in its response to Document 19/59R. No further views on the inclusion of the 1.4 GHz Centre Band were made in subsequent consultations.

A 4.90 Second, while stakeholders are generally likely to prefer additional substitutable spectrum in the same award process, there is some uncertainty as to whether any rights awarded would be used efficiently in the years following the Proposed Award.

A 4.91 In relation to the latter issue, and as noted earlier, existing base station equipment would not appear to cater for the 1.4 GHz Band. If so, the process of upgrading sites to include 1.4 GHz Centre Band capability is unlikely to happen prior to the rollout of other Candidate Bands as operators would presumably prefer to capitalise on the more ready deployment of the other Candidate Bands. In its Mobile Termination Rate consultations and draft model, ComReg observed that an asset life of 8 years is used for base station equipment.⁹⁶⁰ Therefore, depending on the asset life of existing base station equipment, it could be a number of years before operators would be incentivised to upgrade such assets to make use of 1.4 GHz Centre Band rights.

A 4.92 Further, some operators may wish to defer assignment of the 1.4 GHz Centre Band rights of use if they do not have an immediate need as this would allow them to observe developments and make preparations for any future award. This would allow operators to deploy using rights of use assigned in the other bands in the first instance, and which are largely compatible⁹⁶¹ with their existing networks (i.e. no significant equipment upgrades are required), and then assess the need for 1.4 GHz Centre Band spectrum. In the meantime, in order to increase capacity on its network, an MNO would likely use the 2.3 GHz and 2.6 GHz Bands which can be of immediate use on a significant portion of existing base stations.

⁹⁶⁰ Decision Price Control Obligations for Fixed and Mobile Call Termination Rates, Document 19/48.

⁹⁶¹ Depending on the particular operator and base station, existing equipment may not be compatible with 2.3 GHz in certain areas.

- A 4.93 Finally, even if MNOs upgraded their networks to support the 1.4 GHz Centre Band, it is only supported on certain handsets. Such handsets have only recently become available and are generally high-end expensive models that typically can only be used with the 800 MHz Band. Further, while consumer handsets typically tend to be around 2-3 years old, around 10% are over 5 years old.⁹⁶² Assuming all new phones on the market would have 1.4 GHz Centre Band capability, it will likely take at least 3 years of handset churn until a sufficient number of subscribers have compatible devices and over 5 years until all areas, particularly rural areas, are capable of benefiting from the band to any significant degree. It would take longer again before all consumer handsets compatible with the 1.4 GHz Band could operate alongside the full range of spectrum holdings (i.e. bands other than 800 MHz). In that regard, Three and Vodafone both agree that it is preferable to wait until more clarity is available regarding take-up and standardisation of the 1.4 GHz Band.
- A 4.94 Alternatively, MNOs may prefer to include the 1.4 GHz Centre Band and/or other SDL spectrum in the Proposed Award. At least 40 MHz of rights of use (1.4 GHz Centre Band) is available for assignment.⁹⁶³ Stakeholders may prefer to be assigned rights of use as part of this award in order to guard against capacity constraints that may arise in the future or in the event of significant delays in re-farming the 1.4 GHz Extension Bands. For example, Eir in its response to Document 18/60 indicated that it would prefer the inclusion of SDL spectrum more generally by including the 1.4 GHz Centre Band and the 700 MHz Duplex Gap.⁹⁶⁴

FWA operators

- A 4.95 Fixed Wireless operators are likely to be indifferent regarding the inclusion of the 1.4 GHz Centre Band. In this regard, ComReg notes that Imagine, in its response to Document 18/60, favoured ComReg's proposal not to include the 1.4 GHz Centre Band in the Proposed Award.
- A 4.96 While the 1.4 GHz Centre Band has recently been added by 3GPP to be carrier aggregated with the 3.6 GHz band, it is likely to take time before fixed wireless equipment becomes available. Given the current rollout plans of existing Fixed Wireless Providers, the 1.4 GHz Centre Band is unlikely to be of any real benefit in the short to medium term. Additionally, it does not offer any uplink possibilities which is likely to be more important for FWA operators given the higher upload requirement from fixed broadband services.

⁹⁶² 2019 Mobile Consumer Experience Survey, Document 19/101, slide 45.

⁹⁶³ <https://gsacom.com/gambod/> report as per September 2020 that there are 202 devices in band 32 increasing from 83 in May 2018.

⁹⁶⁴ In response to Document 19/124, Eir did not raise any further issues with ComReg's proposal not to include the 1.4 GHz Band in the Proposed Award.

A 4.97 Further, the available capacity (40 MHz) is relatively small and any rights of use assigned to FWA operators would in turn likely be small (if a band-specific spectrum cap were applied). While the 1.4 GHz Centre Band has the potential to offer a similar coverage footprint to a sub-1 GHz deployment⁹⁶⁵ this is currently only possible when paired with low frequency spectrum, such as the 700 or 800 MHz band, which may be less relevant to FWA operators given the typical network configuration for fixed wireless as described above.⁹⁶⁶ Pairing with 3.6 GHz would provide additional capacity within the coverage area of the 3.6 GHz spectrum but not beyond this.

Other Operators/New entrants

A 4.98 The 1.4 GHz Centre Band would likely be a low priority for potential New Entrants. While a New Entrant would be able to rollout a new network and provision for 1.4 GHz Centre Band from the outset, consumer handsets would still lag significantly behind and the earliest of those handsets are only compatible when the 1.4 GHz Centre Band is used in conjunction with the 800 MHz band (which is not available to a New Entrant). A potential New Entrant's priority would be to obtain a mixture of coverage and performance bands, noting that the 1.4 GHz Centre Band can only be used with existing rights of use.

A 4.99 Other operators such as Dense Air are unlikely to be interested in the 1.4 GHz Centre Band. In response to Document 18/60, Dense Air noted that it is not focused on "macro" bands such as the 700 MHz and the 1.4 GHz Centre Band. For example, the 1.4 GHz Centre Band is not operational on its outdoor⁹⁶⁷ or Pico⁹⁶⁸ base station equipment. However, Dense Air did indicate that it preferred the inclusion of the 1.4 GHz Band in the Proposed Award. In response to Document 19/59R, Dense Air repeated its view that the "macro" bands like 700 MHz and 1.4 GHz are best utilised by Ireland's existing MNOs.

A 4.100 Considering the responses received to Document 18/60, Document 19/59R, Document 19/124, Document 20/32, Document 20/56 and Document 20/78, stakeholders are likely to have contrasting views on the inclusion of the 1.4 GHz Centre Band. Notwithstanding, the inclusion or otherwise would not appear to significantly benefit or compromise any individual operators network plans. For example, while Vodafone in its response to Document 18/60 would prefer to

⁹⁶⁵ This arises because the uplink, which is the limiting factor for coverage, is only carried on the low frequency, while the 1400 MHz frequency is only used for the downlink. The 1.4 GHz EC Decision allows that the in block EIRP can be increased from 68 dBm/5MHz for specific deployments, for example for the aggregated use of spectrum within the 1.4 GHz band and spectrum in lower frequency bands.

⁹⁶⁶ While not implausible, DotEcon are of the view that there is unlikely to be demand from fixed wireless operators for the 700 MHz Band as the limited amount of contiguous spectrum in the sub-1 GHz bands makes it less attractive for providing services that require higher capacity links.

⁹⁶⁷ <https://www.airspan.com/airharmony/>.

⁹⁶⁸ <https://www.airspan.com/wp-content/uploads/2017/02/AirSynergy-Product-Spec-Sheet.pdf>

include 1.4 GHz Centre Band in this award, it noted that the band is not a high priority and its value is less than other bands.

Impact on Competition

- A 4.101 Before assessing each of the options under this heading, ComReg sets out some relevant information below on the interaction between spectrum awards and competition.
- A 4.102 A key objective in designing and carrying out this award process is to encourage the efficient use and ensure the effective management of the radio frequency spectrum in order to promote competition and maximise the benefits for consumers in terms of price, choice and quality. In that regard, ComReg briefly explains how the release of additional spectrum rights in the same award typically encourages efficient assignment and use of spectrum which, in turn, should promote competition on the relevant downstream markets to the benefit of consumers. The impact on consumers is assessed separately after this section.
- A 4.103 There are important competition and efficiency reasons for including substitutable and complementary spectrum in the same award process. Where demand for spectrum in different bands is interdependent (substitutable and/or complementary), a joint award for such spectrum reduces the risk of an award participant being assigned rights of use in some but not all of its preferred bands, and provides an opportunity for different types of award participants (with potentially different intended uses and technologies), including potential New Entrants, to participate in an award.
- A 4.104 It increases the ability of award participants to express a full suite of preferences, thereby enhancing the efficiency of the award outcome which, in turn, has a positive impact on competition. If spectrum in different bands are substitutable or complementary, the demand for spectrum in a particular band (and the value placed on this spectrum) may be affected by the availability and price of spectrum in other bands. For example, in an open award process, bidders can observe the relative prices of spectrum in different bands and change valuations and consequent demand for spectrum across those bands in response to these emerging relative prices. Even a sealed bid award can provide for an efficient outcome if bidders express their preferences over a sufficiently large number of packages so that all combinations of lots that might potentially be relevant in the efficient assignment are included.
- A 4.105 The ability of operators to compete for different packages of spectrum promotes competition in downstream markets as they are likely to have different requirements across the various bands and would be able to differentiate themselves from rivals downstream, to a greater or lesser extent, depending on

the rights of use that are ultimately assigned. As a result, depending on whether additional bands are included may affect the efficiency of the assignment across bidders. Providing a mix of interdependent bands in the same award also increases competition within the award as bidders with similar use cases are likely to compete for the same spectrum bands across different quantities.

- A 4.106 An appropriate mix of spectrum across different bands provides flexibility to adapt to changes in, among other things, technologies, demand from end-users and market developments. As noted by DotEcon in Document 19/59a, access to additional spectrum should tend to reduce the long-run marginal costs to MNOs of expanding network capacity, which in turn should have pro-competitive benefits that are passed on to consumers.⁹⁶⁹ This has clear advantages in terms of promoting spectrum use and related services, and in turn intensifying competition in downstream markets. It also provides a good opportunity to acquire significant bandwidth of contiguous spectrum and therefore promote entry and the development of new services for consumers. This benefit is particularly pronounced given the growth in consumer demand for wireless data services and the consequent increased demand for wireless broadband spectrum.
- A 4.107 In contrast, where substitutable or complementary spectrum is awarded in separate and consecutive award processes, operators' valuations of spectrum in different bands would necessarily be based on the expected price of substitutable and complementary spectrum to be awarded in subsequent processes, rather than the actual valuation (if assigned in the same award). However, there is a real risk that bidders would be appreciably wide of the mark in terms of their expected valuations as they would be based on the expected price and availability of substitutable and complementary spectrum to be awarded in the future. If expectations regarding future prices or availability are incorrect then a sequential process may lead to an inefficient assignment of spectrum.
- A 4.108 This is likely to have impacts on downstream competition if a bidder's expectations about price and consequently the type and quantum spectrum it would receive in a future award are incorrect. If a bidder's ability to compete in downstream markets is dependent on spectrum assigned across different bands, which are awarded sequentially, then there is a risk that bidders who would have been able to deliver a particular set of services for a given mix of spectrum cannot because its views on what it would have been assigned across different awards was incorrect.
- A 4.109 The appropriate release of harmonised spectrum bands in the past has proven to be successful in promoting competition and facilitating the delivery of services

⁹⁶⁹ DotEcon Report, Document 19/59a, p 38.

to end-users. It also lowers the risk of artificial scarcity in an award where substitutable and complementary spectrum bands are available for release. As there is demand to use this spectrum for the provision of more advanced WBB services, leaving it to remain fallow for a period of time without clear reason would, ostensibly at least, not be an efficient use of that spectrum and would not therefore promote competition in the WBB sector.

A 4.110 Finally, the joint award of interdependent spectrum would increase the potential for new entry on account of the mix of spectrum above and below 1 GHz and the increased supply of contestable spectrum rights.

Option 1 v Option 2 (Inclusion of 2.3 GHz Band with the Primary Bands)

A 4.111 In light of the above discussion, ComReg is of the preliminary view that the inclusion of 2.3 GHz Band would promote competition both within the Proposed Award and in downstream broadband markets. In summary:

- a) all frequencies are available for release at the time of the Proposed Award;
- b) the band is likely to be of interest to a wide range of interested parties (i.e. MNOs, FWA operators and other operators):
 - i. it has similar propagation characteristics to the 2.6 GHz Band and other Candidate bands and is harmonised for WBB or MFCN services;
 - ii. it provides TDD spectrum that can be used to account for asymmetric traffic flows;
 - iii. there is a large existing ecosystem of handsets and existing network equipment can accommodate 2.3 GHz Band to a greater or less extent; and
 - iv. additional TDD rights are likely to be of interest to FWA operators;
- c) its inclusion would provide more contestable spectrum for incumbents and New Entrants and would provide increased opportunities for bidders to compete and switch between various spectrum bands, promoting competition during the Proposed Award; and
- d) its inclusion would encourage new entry and promote competition between operators acquiring a portfolio of spectrum.

A 4.112 Accordingly, ComReg is of the view that the inclusion of the 2.3 GHz Band in the Proposed Award would have a positive impact on competition. Further, this view

would not change by virtue of whether any of the other Candidate Bands were also included in the Proposed Award.

Option 1 v Option 3 (Inclusion of 2.1 GHz Band with the Primary Bands)

- A 4.113 In general terms, the inclusion of the 2.1 GHz Band would provide similar benefits to competition as the inclusion of the 2.3 GHz Band as described above.
- A 4.114 The inclusion of the 2.1 GHz Band would also allow for the timely determination of the future of this band beyond the expiry of existing licences. As noted above, the 2.1 GHz Band is currently used to provide 3G services (including some 4G services on a temporary basis) across the State. Assuming that future rights of use in this band are assigned by means of an auction process rather than an administrative procedure (see the 'Assignment Process' RIA below), if either Vodafone or Three were assigned no or reduced 2.1 GHz rights of use in an award process they would have less than two years to address any transition activities arising from same, and to consider network upgrades to 4G more generally.
- A 4.115 Alternatively, new rights in the 2.1 GHz Band could be assigned in a separate award process following the Proposed Award (the former of which would also require a detailed consultation process in advance of this separate award process⁹⁷⁰). In this scenario, ComReg firstly observes that there presumably would remain the potential for Vodafone and/or Three to be assigned no or reduced 2.1 GHz rights. However, as the consultation process for this separate award may not conclude until close to the expiry of existing licences in 2022, there would likely be less time before licence expiry for measures to be undertaken by an existing licensee to adjust their network to the outcome of this separate award (including obtaining no spectrum or less spectrum than presently held).
- A 4.116 In contrast, the inclusion of the 2.1 GHz Band in the Proposed Award would also allow MNOs to better plan the rollout of LTE 2100 by providing earlier certainty around what 2.1 GHz rights they would have in the long term. In that context, any rollout of LTE 2100 prior to 2022 (Three and Vodafone) without visibility of their long term 2.1 GHz holdings may involve significant investment uncertainty and could result in inefficient investments.
- A 4.117 In that regard, the inclusion of 2.1 GHz Band would promote efficient investment and innovation in new and enhanced infrastructures by providing MNOs with earlier visibility around what 2.1 GHz rights they will have in the long term.

⁹⁷⁰ ComReg has statutory obligations to appropriately consult on any such award process which would mean that any such award process would unlikely take place significantly in advance of current licence expiry dates.

A 4.118 Accordingly, ComReg is of the view that the inclusion of the 2.1 GHz Band in the Proposed Award would, on balance, have a positive impact on competition. Further, this view would not change by virtue of whether any of the other Candidate Bands were also included in the Proposed Award.

Option 1 v Option 4 (Inclusion of 1.4 GHz Centre Band with the Primary Bands)

A 4.119 The inclusion of the 1.4 GHz Centre Band would, ostensibly at least, provide similar benefits to competition as the inclusion of the 2.3 GHz Band as described above. However, there are several issues that distinguish the 1.4 GHz Centre Band from other Candidate Bands in terms of suitability for inclusion in the Proposed Award. These have already been set out in detail earlier but are summarised below for convenience.

A 4.120 For example, it is questionable whether the 1.4 GHz Centre Band is suitable for release at this time. In particular, there is uncertainty over a number of issues that could result in the inefficient assignment and use of the band, thereby reducing competition and benefits to consumers, including:

- a) It is unlikely that operators would realistically use the 1.4 GHz Centre Band to any great extent in the years following the Proposed Award⁹⁷¹. For an operator to effectively use additional spectrum it requires both base stations and end user devices to transmit and receive the relevant frequencies:
 - i. in the period following 2020 there is likely to be limited base station equipment or end user devices to facilitate the efficient use of the 1.4 GHz Centre Band;
 - ii. operators are likely to focus on the deployment of other spectrum bands first, noting that the other Candidate Bands are widely deployed globally by networks and are deployed across a large number of handsets; and
 - iii. In the absence of sufficient demand for this band, one could artificially stimulate demand by making it available at a relatively low minimum price. However, this could result in the premature award of spectrum rights which may inefficiently displace or restrict valuable future uses.

A 4.121 Conversely, there would appear to be several reasons for delaying the release of this band. For example:

⁹⁷¹ Further, ComReg understands that current antenna systems are not designed / optimised to operate in the 1.4 GHz Band. As such, dedicated equipment may be needed.

- a) operators should be in a better position to use the 1.4 GHz Centre Band to deliver services as:
- i. 1.4 GHz Centre Band capability can be added to existing networks in line with the end of the asset life of existing equipment; and
 - ii. user devices will have greater 1.4 GHz Centre Band capability as consumers replace older devices over time;
 - iii. the proposed inclusion of the 2.3 GHz Band (100 MHz) and the 2.6 GHz Band (190 MHz) should be sufficient to satisfy any capacity constraints⁹⁷² that may arise in the medium term, and the absence of the 1.4 GHz Centre Band would be unlikely to create any artificial scarcity concerns that could compromise competition in the Proposed Award;
- b) it would be difficult to determine appropriate rollout obligations to ensure the efficient use of the spectrum given uncertainty about when user and base station equipment is likely to be rolled out to sufficient levels.

A 4.122 In light of the above, ComReg is of the view that, while the 1.4 GHz Centre Band is available for use and a device ecosystem is beginning to develop, effective management of the radio frequency spectrum in order to promote competition would be better facilitated by not including the 1.4 GHz Centre Band in the Proposed Award. Instead, competition would be better served by including the band in a separate and subsequent award process.

Impact on Consumers

A 4.123 It can be assumed that what is good for competition is, in general, good for consumers because increased competition between wireless service providers brings benefits to customers in terms of price, choice and quality of services.

A 4.124 As outlined above, consumer demand for WBB has grown significantly in recent years and is expected to continue growing over the coming years. The spectrum bands under consideration in this RIA are all suitable for the provision of such services which should increase consumer welfare. ComReg notes that each of the options assessed below involve additional spectrum being made available for assignment to existing operators or potential New Entrants. In that regard, ComReg sets out below the main reasons why consumers would likely benefit

⁹⁷² Noting also that the assignment of the 700 MHz Duplex, while particularly suited for rural deployments, would provide additional capacity wherever it's deployed in addition to the other bands already providing capacity.

from the assignment of additional spectrum rights of use.⁹⁷³

Benefits of additional spectrum to consumers

- A 4.125 The avoided costs from using additional spectrum instead of rolling out additional base stations to meet rising demand for mobile broadband should lead to lower prices. In competitive markets, it is expected that network cost savings would partly be passed onto consumers in the form of improved and/or lower cost services.
- A 4.126 The cost of improving network performance (e.g. increasing average user speeds) without new spectrum may be so high that it is unprofitable to attempt to do so. Hence, the speeds and quality of service that an operator offers in practice are likely to be partly determined by how much spectrum rights of use it acquires. The deployment of additional spectrum enables considerably higher user data rates and supports a greater number of users, all of which will substantially enhance the user experience. This includes faster download speeds and the ability to support a greater number and variety of users. These benefits are consistent across all options below that assign additional rights of use.

Option 1 v Option 2 (Inclusion of 2.3 GHz Band with the Primary Bands)

- A 4.127 As noted above, the inclusion of the 2.3 GHz Band in the Proposed Award would, on balance, have a positive impact on competition, which in turn should benefit consumers. There are other reasons why the addition of this band should benefit consumers. For example, the benefits to consumers in terms of higher quality and speeds as described above.
- A 4.128 In addition to the benefits of additional capacity for MNOs, the 2.3 GHz Band provides a large amount of contiguous spectrum suitable for providing fixed wireless services across a large area. For example, like the 3.6 GHz Band, the 2.3 GHz Band might be viewed as a 'performance' band for fixed wireless services, increasing the availability of suitable spectrum for fixed wireless operators and increasing the prospects of new entry.
- A 4.129 The band also provides increased opportunity for operators to manage asymmetric data flows in the future. High quality and high-resolution audio-visual services are important drivers for increased downlink data rates, whereas user generated content, including sharing of social media and/or video calling is the main driver for increased uplink data rates.
- A 4.130 Smartphones are increasingly becoming 'creation' devices that upload or share

⁹⁷³ Subject to appropriate competition caps.

content with other users. Features such as high-quality cameras⁹⁷⁴ for video and photos along with sophisticated software and hardware capabilities allow digital processing and advanced online gameplay⁹⁷⁵ all of which use uplink capacity. Similarly, users are uploading information from mobile devices to cloud services and sharing photos via social networks making upload capacity increasingly important on a per GB basis even if the downlink/uplink ratio is increasing. Therefore, consumers are likely to favour options which provide operators with flexibility in terms of network configuration, where it is needed, as this would likely lead to improved performance of applications/services which require additional uplink capacity.

A 4.131 In light of the above, ComReg is of the view that including the 2.3 GHz Band in the Proposed Award would, on balance, be more beneficial for consumers.

Option 1 v Option 3 (Inclusion of 2.1 GHz Band with the Primary Bands)

A 4.132 As noted above, the inclusion of the 2.1 GHz Band in the Proposed Award should, on balance, have a positive impact on competition, which in turn should benefit consumers. Importantly, as noted earlier, the inclusion of the 2.1 GHz Band in the Proposed Award would, compared to a separate and subsequent award, provide MNOs with earlier certainty about future 2.1 GHz holdings and thus a longer period to reorganise their 3G networks in a timely manner prior to the expiry of existing rights of use. This would facilitate operators liberalising 2.1 GHz rights of use earlier than would otherwise be the case giving MNOs the choice to deploy more advanced technologies to cater to changing consumer demands.

A 4.133 In light of the above, ComReg is of the view that including the 2.1 GHz Band in the Proposed Award would, on balance, be more beneficial for consumers.

Option 1 v Option 4 (Inclusion of 1.4 GHz Centre Band)

A 4.134 The inclusion of the relatively small 1.4 GHz Band in the Proposed Award is unlikely to have much if any impact on stakeholders or competition. Conversely, there appear to be good reasons for delaying the release of this band in terms of encouraging the efficient use and ensuring the effective management of the radio frequency spectrum. On that basis, ComReg is of the view that excluding the 1.4 GHz Centre Band from the Proposed Award and instead assigning it in a

⁹⁷⁴ For example, triple-camera systems which enable ultra-wide footage are becoming a feature of smartphones ". Apple recently released the iPhone 11 with three scales: ultra-wide, wide and standard, which can be chosen while using Apple's Camera app.

⁹⁷⁵ The data requirements for games can often be significant as uplink and downlink will have to be synced with unnoticeable latency to ensure appropriate performance. The uplink requirements are likely to increase as games become cloud based in the future. For example, Microsoft are developing a game streaming network to unlock console gaming on any device and the service will work across Xbox, PCs, or phones.

<http://telecoms.com/490215/microsofts-cloud-gaming-ambitions-set-to-further-test-network-capacity/>

separate future award process is, on balance, more beneficial for consumers.

Preferred Option - 'Spectrum for Award' RIA: (Step 5)

A 4.135 In light of the above, ComReg is of the view that including the 700 MHz Duplex, 2.6 GHz Band, 2.3 GHz Band and 2.1 GHz Band in the Proposed Award (i.e. Options 2 and 3 together) ("Award Bands") is the preferred option in terms of the impact on stakeholders, competition and consumers.

A4.5 The 'Assignment Process' RIA

A 4.136 As noted earlier, Step 1 of the RIA (Policy Issues and Objectives) is common to both the 'Spectrum for Award' RIA and the 'Assignment Process' RIA.

A 4.137 Before setting out the specific options under review in this RIA, ComReg first sets out some background information regarding different ways in which spectrum rights can be assigned and some key characteristics of these assignment mechanisms. ComReg does not favour any one process for assigning new rights of use of spectrum as a matter of principle; it decides the most appropriate process in each individual case. In this regard, there are two main ways by which to award new rights of use.

1. **Administrative Assignment:** the regulator determines who obtains spectrum, how much they obtain and the location of the frequencies within the band, and the price paid; or
2. **Competitive market mechanism:** the interaction of bidders during the award determines who wins the spectrum and the price paid, subject to objective and transparent rules set *ex ante* by the regulator (e.g. an auction).

A 4.138 Each process will typically have its particular advantages and disadvantages and one process may, on balance, be found to be the most suitable in light of the particular factual matrix, including the characteristics of the spectrum to be assigned, the types of rights of use to be awarded and the anticipated demand for the spectrum.

Background Information

A 4.139 An administrative assignment can take many forms depending on the specific issues that need to be addressed. For example, it could:

- involve the administrative grant of spectrum to certain operators (such as incumbents), the reservation of spectrum for certain groups (such as New Entrants) or the reservation of spectrum for other purposes;

- involve a comparative award (or “beauty contest”) if there are particular objectives in mind;
- take the form of an extension or renewal of an existing licence or an administrative assignment of spectrum to particular operators, for a particular period of time; or
- involve simple granting of licences where uses are not incompatible, for instance in relation to point to point links.

A 4.140 Administrative approaches are likely to be most beneficial where there is no excess demand for spectrum. Administrative awards, however, rely on the regulator making decisions, with the intention of promoting the efficient use of spectrum, where such decisions could be made with significant information asymmetries. This approach raises concerns when dealing with valuable spectrum rights of use for which there is likely to be excess demand that regulators may pick the incorrect technologies, services or licensees.

A 4.141 In contrast, spectrum auctions are designed to incentivise bidders to express their willingness to pay for spectrum rights and aims to assign the available rights of use of spectrum to the bidders who value it the most. An appropriately designed auction extracts information regarding bidders’ willingness to pay for the rights of use of spectrum thereby enabling an assignment to the bidders who value the spectrum most.

A 4.142 By ensuring that those bidders who value the spectrum the most obtain the rights being offered, auctions should result in an efficient outcome in terms of assignment.⁹⁷⁶ Using an auction to assign spectrum rights of use for which demand is likely to exceed supply mitigates the risk of the regulator making incorrect decisions, as a result of not having access to all relevant information, which could have long standing negative effects on the relevant market/s. Moreover, auctions provide a transparent and non-discriminatory mechanism to allocate rights of use of spectrum relatively quickly and this mitigates the risk of prolonged challenges to the outcome of the allocation process.

A 4.143 Auction formats however are silent on the type of services that should be provided by the winning bidders. Where spectrum for award that is currently being used to provide certain existing services is assigned to a different operator who utilises the spectrum to provide unrelated services, there is a risk that consumers reliant on existing services would be left unserved. Where this occurs additional measures to protect consumers may be necessary (e.g. transition

⁹⁷⁶ Each bidder’s valuation of spectrum should be dependent on the value it believes it can derive from the use of the spectrum and is therefore a good proxy for the overall economic value likely to be generated from such use.

measures).

A 4.144 ComReg has previously expressed views on the assignment of spectrum rights by auction or administrative award.⁹⁷⁷ As noted in Section 4.4.1 of Document 19/59R, ComReg has identified a number of outcomes⁹⁷⁸ that a regulator would need to determine in any spectrum award *irrespective of the assignment format adopted*:

1. Which electronic communications networks/services, using which technologies, are going to be the ones most likely to provide the greatest end-consumer benefits over the proposed duration of the rights being awarded?
2. Which of all the interested providers of the ECN/ECS (and using potentially different technologies) identified in (1) are going to be the ones most likely to provide the greatest end-consumer benefits over the duration of the rights being awarded and should, therefore, be issued said rights?
3. Determination of the quantum of spectrum rights in each of the proposed bands that should be assigned to each provider identified in (2).
4. Determination of which part of the band those spectrum rights identified in (3) should be located.

A 4.145 The award outcomes are less relevant where demand is unlikely to exceed supply over the duration of the rights being awarded. Administrative assignments are likely to be appropriate in such circumstances as each of the award outcomes can be established through the demands of interested parties. In this situation, there is less risk of the regulator assigning the spectrum in a manner which would result in its inefficient use, since all competing requirements can be provided for.

A 4.146 However, where demand is potentially greater than supply, ComReg, in an administrative assignment process, would have to make an administrative determination on each of the award outcomes listed above. ComReg is of the view that demand for the new rights of use in one or more of the proposed bands is likely to exceed supply given the discussion in the Spectrum for Award RIA (under the heading 'Demand for Spectrum').

⁹⁷⁷ Chapter 3, Document 14/101, ComReg (2014) 'Spectrum Award – 2.6GHz Band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz Band; Chapter 3 of Document 15/70, ComReg (2015) 'Consultation on Proposed 3.6 GHz Band Spectrum Award'; and Chapter 3 of Document 15/140, ComReg (2015) 'Response to consultation and draft decision on proposed 3.6 GHz band spectrum award' (page 32).

⁹⁷⁸ Readers are referred to Section 3.3 of Document 15/140 for a detailed discussion on each of the award outcomes.

Identifying the options

A 4.147 In light of the above, there are two broad non-mutually exclusive regulatory options available to ComReg in terms of assigning rights of use in the 700 MHz Duplex, 2.6 GHz Band, 2.3 GHz Band and the 2.1 GHz Band:

- assign some or all spectrum rights of use by administrative assignment; and/or
- assign some or all spectrum rights by way of auction.

A 4.148 The responses to Document 18/60 and the subsequent NERA Report (commissioned by Three), along with the responses to Document 19/59R, express the view that it is appropriate to consider both an auction and/or an administrative assignment as an assignment process for the Proposed Award. Further, two distinct categories of administrative assignment have been suggested with a further iteration provided by Eir in response to Document 19/59R.

A 4.149 **First**, NERA submits in relation to the 2.1 GHz Band that, in its view, there is a strong case for an administrative award of 2.1 GHz rights directly to MNOs with 2 × 20 MHz assigned directly to each operator. ComReg considers this proposal under Assignment Option 2B below. Similarly, Eir suggests that 2 × 15 MHz of spectrum in the 2.1 GHz Band be directly assigned to each of the three MNOs with the remainder assigned by way of auction.

A 4.150 **Second**, Eir submits in its response to Document 18/60 that, in its view, it is time to move away from CCA formats to another format, more reflective in its view of what it considers to be a more mature market. In that regard, it highlights the experience in France where the regulator agreed to extend spectrum licences (“*giving up future income*”) to MNOs for ten years in return for firm commitments to enhance 4G coverage⁹⁷⁹. ComReg notes several pertinent points in relation to the French award that could inform a potential option in this RIA:

- the award procedure was a beauty contest open to any interested market player. The procedure was the result of an agreement between

⁹⁷⁹ The main obligations for the new licensees in the French award are to improve and increase access to mobile networks: to cover areas with no or very poor coverage and to enable access to mobile broadband everywhere. The tender document also included specific obligations to improve mobile connectivity on main roads, from regional railway connections and indoor. Applicants could also propose additional coverage commitments in the 1800 MHz and 2 GHz bands. Source: Cullen International.

the French government and the mobile operators in January 2018⁹⁸⁰
⁹⁸¹;

- coverage obligations applied to licences that were due to expire in the period up to 2021 and 2024⁹⁸²:
 - 900 MHz (2 × 30 MHz)⁹⁸³ – obligation to increase density of 900 MHz sites to enhance availability of voice and SMS services;
 - 1800 MHz (2 × 65 MHz)⁹⁸⁴ - coverage of main roads and regional railway connections and applicants could include additional commitments for commuting trains; and
 - 2 GHz bands (2 × 90 MHz)⁹⁸⁵ - commitments to improve indoor mobile coverage and/or to provide fixed broadband services in remote areas; and
- Only the four existing MNOs applied for licences.

A 4.151 ComReg notes that the only rights of use available for reassignment in Ireland are 2.1 GHz rights of use. However, it is unlikely that Eir is referring to this band with respect to improving 4G coverage. Alternatively, it would appear that Eir may be suggesting that rights of use to the 700 MHz Duplex should be assigned to the MNOs in return for certain unspecified coverage obligations. ⁹⁸⁶ ComReg observes that proposed obligations would appear to be of an ‘Interventionist’ nature and considers this proposal under Assignment Option 2A below.

A 4.152 In light of the above, ComReg considers that three regulatory options are available to it

- a) **Assignment Option 1:** Assignment of all available spectrum using a competitive, open, transparent auction format; or

⁹⁸⁰ <https://www.cullen-international.com/product/documents/FLTEFR20180005>

⁹⁸¹ If more than four applicants (number of MNOs) had qualified for a band, the selection would have been based on:

- a single round sealed bid auction for the 900 MHz band;
- commitments for better coverage inside trains for the 1800 MHz band; and
- commitments for better indoor coverage for the 2 GHz band.

⁹⁸² <https://www.cullen-international.com/product/documents/FLTEFR20180005>

⁹⁸³ Free Mobile has 2 × 10 MHz rights of use until 2030.

⁹⁸⁴ Free Mobile has 2 × 15 MHz rights of use until 2030.

⁹⁸⁵ Orange, SFR and Free all have 2 × 10 MHz rights of use expiring in 2030.

⁹⁸⁶ DotEcon (Document 18/103d) distinguish between precautionary and interventionist coverage obligations:

- Precautionary coverage obligations - where the obligations do not exceed the levels of coverage that might be expected anyway from well-functioning competition between network operators;
- Interventionist coverage obligations - which can be expected to constrain the commercial choices of network operators and force coverage in excess of competitively determined levels

b) **Assignment Option 2:** Assignment of some or all available spectrum band by administrative assignment. In particular:

- i. **Assignment Option 2A:** Administrative assignment of 2 × 10 MHz of 700 MHz Duplex rights of use in return for interventionist coverage obligations.
- ii. **Assignment Option 2B:** Administrative assignment of 2 × 20 MHz of 2.1 GHz rights of use to incumbent licensees in return for fees that reflect the market value.
- iii. **Assignment Option 2C:** Administrative assignment of 2 × 15 MHz of 2.1 GHz rights of use to incumbent licensees and assignment of 2 × 15 MHz using a competitive, open, transparent auction format.

A 4.153 ComReg notes that each of the above options is not mutually exclusive and that the overall preferred option could involve one or more of the above options.⁹⁸⁷ In that regard, ComReg assesses each option individually and comes to a view on the overall preferred option at the end of this RIA.

A 4.154 The following sections of the 'Assignment Process' RIA consider the impact of the regulatory options on:

- i. industry stakeholders (being existing operators and potential New Entrants);
- ii. competition, and
- iii. consumers.

Determining the impact on industry stakeholders

A 4.155 There are several key industry stakeholders in relation to the matters considered in this chapter:

- a) existing mobile operators (Vodafone, Three and Eir);
- b) existing FWA operators including:
 - i. licensees with spectrum rights of use in the 3.6 GHz Band (e.g. Imagine);

⁹⁸⁷ For example:

- Assignment Option 1 only (i.e. assign all rights of use by auction);
- Assignment Option 1 and Assignment Option 2B (i.e. assign rights of use to 2.1 GHz administratively and the remaining rights of use by auction)
- Assignment Options 1 and Assignment Option 2A (i.e. assign rights of use to 700 MHz Duplex administratively and the remaining rights of use by auction)

- ii. parties which currently provide fixed wireless services using other licensed (10.6 GHz) or unlicensed (5.8 GHz) spectrum;
- c) other providers (small cell operators e.g. Dense Air⁹⁸⁸); and
- d) potential New Entrants (e.g. an MNO or MVNO, or FWA operator).

Impact on stakeholders

A 4.156 A stakeholder that submitted an award proposal is likely to prefer the option that most closely reflects that proposal. Otherwise, it is reasonable to conclude that stakeholders are likely to prefer an option which would offer the greatest amount of contestable spectrum (to provide the greatest chance of obtaining spectrum rights). ComReg assesses each of the 3 regulatory options in turn below.

MNOs

A 4.157 MNOs have submitted a variety of different views in relation to the assignment process for the Proposed Award.

A 4.158 Vodafone supports the use of an auction as the most appropriate assignment process for this award. For example, it recently noted "*in principle the assignment of spectrum through open transparent auction processes has facilitated the roll-out of competitive mobile networks and we believe (will) be the best solution to meet customer demand for increased capacity and new technologies in the future.*"⁹⁸⁹ Similarly, in response to Document 18/60, it generally expressed support for an auction to assign rights of use to the bands under assessment, and in its response to Document 19/59R, it supported the use of an auction for the 2.1 GHz Band at this time. In its response to Document 19/124 Vodafone agrees with the use of an auction for the assignment of spectrum rights of use.

A 4.159 Vodafone could prefer a form of administrative assignment if sufficient rights of use were assigned to it, however, it is unlikely to prefer Assignment Option 2A because such an assignment would retain the existing asymmetry of sub-1 GHz holdings between it and Three until 2030 at the earliest (when existing licences in the 800 MHz and 900 MHz Bands expire). In contrast, the competition caps proposed (see Chapter 6) would provide Vodafone with the opportunity to be assigned 2 × 15 MHz 700 MHz Duplex compared with 2 × 10 MHz for Three under Assignment Option 1. Accordingly, an administrative assignment of 2 × 10 MHz rights of use would deny Vodafone the opportunity to reduce the existing sub 1 GHz spectrum asymmetry vis-à-vis Three. Given its stated preference for an auction, Vodafone would likely prefer Option 2C to Option 2A because Option

⁹⁸⁸ Dense Air provides wireless-based solutions for both 'network densification' and 'network extension' by providing 'Small Cells as a Service'.

⁹⁸⁹ Response to Document 18/74 – Draft Spectrum Strategy Statement.

2C involves an auction for some of the 2.1 GHz rights of use.

A 4.160 Therefore, in line with its stated views, Vodafone is likely to prefer the assignment of all available spectrum using a competitive, open, transparent auction format as this would provide it and other operators with an opportunity to access all available spectrum rights of use.

A 4.161 In response to Document 18/74, Three expressed support in general for the use of auctions. However, it cautioned that the auction mechanism and rules must be chosen to suit the award, and that ComReg should “*start from fresh*” and consider all options for the award mechanism. Similarly, in recent correspondence submitted with its commissioned NERA Report, Three also expressed support for the use of auctions but expressed a view that ComReg should switch to what it considers to be a simpler, better adapted format (see Chapter 7 for discussion on auction format). ComReg notes the following:

- a) in relation to the 2.1 GHz Band, Three would likely support Assignment Option 2B given it commissioned the NERA Report. Although, it should be noted that in response to Documents 19/124 and 20/56, Three also agrees with the use of an auction process.
- b) in response to Document 19/59R, Three suggests that a cap of 2 × 10 MHz 700 MHz should apply to the Proposed Award. Therefore, Three may prefer an administrative assignment of 2 × 10 MHz of 700 MHz Duplex rights of use under Option 2A (meaning it would retain its sub 1 GHz spectrum advantage over Vodafone until 2030 at the earliest);
- c) however, Assignment Option 2A would also involve interventionist obligations. In that regard, ComReg notes Three’s view that onerous coverage obligations should be a separate and distinct stage from the assignment of spectrum.⁹⁹⁰ In particular, Three’s NERA Report expressed caution against attaching onerous obligations as this would create artificial scarcity of “clean” spectrum and may distort bidding across the whole auction.

A 4.162 Overall, it would appear that Three would support a combination of Assignment Options:

- a) The assignment of 700 MHz, 2.3 GHz and 2.6 GHz rights of use through Option 1 (Auction) with 2.1 GHz assigned through Options 2B or 2C (administrative assignment); or

⁹⁹⁰ Three Nera Report Briefing Note to ComReg 15 January 2019.

- b) The assignment of 2.3 GHz and 2.6 GHz rights of use through Option 1 (Auction) with 700 MHz and 2.1 GHz administratively assigned through Option 2A and 2B/2C; or
- c) The assignment of all rights of use using an auction, noting that Three would have concerns about the features of any such auction (See Chapter 7 for further discussion of same).

A 4.163 Eir provided a variety of views which differ depending on the band in question; however, it would appear to favour the administrative assignment of the 2.1 GHz Band for the following reasons:

- in relation to the 700 MHz Duplex, Eir would prefer Assignment Option 2A as this best reflects its submission to Document 18/60;
- in relation to Assignment Option 2B, in its response to Document 18/60, Eir submitted that *“ComReg must ensure that spectrum holdings in the 2100MHz band are equalised so that no operator is allowed to maintain an unfair advantage in access to spectrum that will distort competition”*.
- Eir provided updated views in response to Document 19/59R and suggests that a more proportionate approach would be to directly assign 2 × 15 MHz of the 700 MHz Duplex to Eir, Three and Vodafone, with the remaining spectrum available for the Proposed Award.
- Eir’s updated views in response to Document 19/124 are that it has *“no issue in principle with eligibility for licences in the 700 MHz, 2.3 GHz and 2.6 GHz bands being determined by means of a competitive selection procedure”*.⁹⁹¹

A 4.164 Overall, it would appear that Eir would prefer a combination of all Assignment Options (i.e. Assignment Option 1 and Assignment Option 2A and Assignment Option 2C).

Fixed Wireless Providers

A 4.165 Assignment Option 2B is unlikely to be favoured by FWA operators as it would assign spectrum rights of use directly to incumbent MNOs. While Imagine expressed some tentative support for Option 2A, FWA operators would likely be at a disadvantage to incumbent mobile operators who may be better placed to deliver the interventionist mobile coverage obligations envisaged under that

⁹⁹¹ Although Eir does propose auctioning the 700 MHz in a separate auction process in its response to Document 20/56.

option.

- A 4.166 FWA operators would likely prefer Assignment Option 1 over Assignment Option 2A, 2B or 2C as it would provide for the assignment of all available spectrum rights on a service and technology neutral basis and would give all operators an equal opportunity to access spectrum. The administrative award of some, or all, of the Proposed Bands to MNOs would exclude other providers (e.g. FWA operators) or reduce the quantum of spectrum available to FWA operators and could cause the cost of any residual spectrum rights of use to artificially increase.
- A 4.167 In that regard, Imagine would appear to prefer Assignment Option 1, This is consistent with the views expressed in its response to Document 19/59R, where it notes that “*to administratively assign such spectrum to MNOs exclusively would exacerbate the already significant distortion that exists in the market with a very substantial quantum of national spectrum already in the hands of mobile phone service operators*”. Further, in response to 18/60, Imagine (a FWA operator) submitted that a CCA is a suitable mechanism for the auction and assignment of the proposed bands given the recent experience of the CCA auction process for the 3.6 GHz band.⁹⁹² Furthermore, in its response to Document 19/124 Imagine agrees with the proposed assignment process to make available all relevant spectrum rights in the Proposed Bands using an open appropriate auction format (i.e. Assignment Option 1) and remained of the view that a CCA is a suitable mechanism for the auction and allocation of this spectrum in response to Document 20/56.
- A 4.168 Therefore, ComReg remains of the view that FWA Operators would likely prefer Assignment Option 1 (Auction) and an administrative assignment would only be considered by FWA Operators if such an assignment included FWA operators.

New Entrants/Other operators

- A 4.169 Potential New Entrants would likely prefer an assignment process which best facilitates new entry (which could be either an administrative assignment or auction). While potential New Entrants would likely prefer a reservation of spectrum made solely for New Entrants, they may, depending on the options available, also prefer an open, transparent competitive award format for all available spectrum. In terms of the four regulatory options, New Entrants are likely to prefer Assignment Option 1, as they would be given an equal opportunity to access spectrum according to their valuation of the spectrum, as expressed by their willingness to pay (i.e. there would not be any direct assignments to incumbent operators).

⁹⁹² Imagine response to Document 18/60.

Impact on competition

A 4.170 The impact on competition is assessed at two levels which are interconnected:

- competition within the award process, where bidders/applicants compete with each other in order to be assigned spectrum rights; and
- downstream retail competition between winning bidders and other market participants in affected downstream markets. The promotion of competition at this level is a primary goal of the Proposed Award because competition at the retail level is ultimately what drives consumer benefits, in terms of price, quality and choice of the relevant services.

Competition within the award process

A 4.171 At a general level, subject to the award process preventing highly asymmetric outcomes (to safeguard downstream retail competition), the more intense the competition in an award process (e.g. through a greater the level of participation), the higher the likelihood that the spectrum usage rights will be awarded to those operators that value it the most. Such operators are the most incentivised to use the spectrum efficiently and compete vigorously in the downstream retail market(s).

Administrative assignment

A 4.172 ComReg assesses Assignment Options (Option 2A, 2B and 2C) below.

Assignment Option 2A, Assignment Option 2B and Assignment Option 2C

A 4.173 First, any form of assignment which excludes certain users from participating in the award process reduces the level of competition within it. The more extensive the restriction, in terms of the possible assignment outcomes which it precludes, the more likely it is that the actual optimal assignment outcome is precluded from arising. Indeed, the request for a reservation of the band or sub-set of a band for a particular use/user in the first place suggests that more than one type of user might have participated in the award absent such reservation and/or there is an unwillingness to pay the fees that may have arisen from a more open award process.

A 4.174 Assignment Option 2 would result in restrictions in terms of possible recipients of spectrum rights of use, given that rights of use would be assigned directly to incumbent MNOs (noting that a less extensive restriction would be to allocate to a particular use). In particular, Assignment Option 2B would exclude all other

potential bidders for rights of use in the 2.1 GHz band, including New Entrants⁹⁹³, FWA operators and/or small cell providers:

- a) under Assignment Option 2B, 2.1 GHz rights of use would be assigned directly to the three MNOs and there would be no competition to determine the most efficient use(s), user(s) or quantum of spectrum allocated to each⁹⁹⁴. Any competition between bidders would be limited to determining frequency positions within the band. For example, Three is currently positioned at opposite⁹⁹⁵ ends of the band and a reduction in rights of use to facilitate an increase of 2 x 5 MHz in the other two MNOs would likely result in preferences between bidders for different positions with the band; and
- b) under Assignment Option 2C, the majority (9 of 12 lots) of 2.1 GHz rights of use would be assigned directly to the three MNOs with the remainder available for auction. While this option provides for the auction of some rights of use, the administrative assignment prior to an auction would likely distort incentives that could lead to inefficient outcomes as discussed below.
- c) under Assignment Option 2A, 700 MHz Duplex rights of use would also be assigned directly to operators who are assessed as best placed to deliver interventionist mobile coverage obligations. MNOs would hold significant advantages under such an assessment (given the existing rollout of mobile networks) and obligations would likely be limited to the three MNOs. Further there would be little competition to determine the most efficient use(s), user(s) or quantum of spectrum assigned to each. There could be some limited competition for additional coverage commitments in return for additional

⁹⁹³ In the French award, if more than four applicants (number of MNOs) qualified for a band, the selection would have been based on:

- a single round sealed bid auction for the 900 MHz band;
- commitments for better coverage inside trains for the 1800 MHz band; and
- commitments for better indoor coverage for the 2 GHz band.

⁹⁹⁴ Further, the quantum of spectrum allocated between the MNOs would be fixed (i.e. split equally) where (i) symmetric holdings are not required for effective competition (see Competition Caps Chapter 6), (ii) it may be more efficient for some MNOs to hold more or less spectrum as differences in quantum may allow an operator to adopt differentiated strategies/services (e.g. a small operator with a relatively large amount of spectrum in a band/s to provide higher speeds/capacity so as to grow market share).

⁹⁹⁵ Three currently holds existing rights of use in the 2100 MHz band for the provision of 3G services. This situation arose following the acquisition by Three Group of Telefonica Ireland in 2014. Three is licenced to use 6 blocks in total, however they are divided into two groups of three at opposite ends of the band, given the spectrum blocks in Three's 2.1 GHz licence were not contiguous with the spectrum blocks in Telefonica's licence.

spectrum above a minimum requirement.⁹⁹⁶ In terms of frequency locations, any competition for specific positions within the 700 MHz Band would likely be marginal as new rights of use in a “greenfield” spectrum band are unlikely to generate significant competition for positions in the band;

- d) In relation to other forms of administrative assignment, the lack of transparent procedures in an administrative award limits the extent of competition within the award. Specifically:
- i. applicants may be unable to respond to specific commitments made by competing applicants and even where they can, the potential lack of effective objective selection criteria may make it difficult for competing applicants to determine the effectiveness of the offers (in terms of the outcome) they make; and
 - ii. applicants may be exposed to substitution risks and be unable to increase or decrease their requirements in response to alternative rival requirements, particularly where some applicants may be indifferent between one or more bands. In this way competition between bands and during the award would be restricted.

A 4.175 Further, the administrative assignment of some or all of one or more bands could reduce competition for other bands that would be available in open competition. For example, suppose a potential New Entrant had a minimum package requirement of 2 × 5 MHz - 700 MHz Duplex; 2 × 10 MHz - 2.1 GHz Band; 2 × 10 MHz - 2.6 GHz Band; and 2 × 10 MHz - 2.3 GHz Band. Under Assignment Option 2A or Assignment Option 2B, a New Entrant would be unable to acquire sub-1 GHz rights of use and may not compete for any of the remaining rights of use that would have been subject to open competition. In effect, MNOs would likely benefit the most from the administrative assignment of rights of use in the 700 MHz Duplex given its incumbency advantages for delivering interventionist coverage obligations over an appropriate period. Even where a New Entrant could apply under an administrative assignment process, it would be difficult for such an entrant to meet with interventionist coverage obligations in the 700 MHz Duplex in the absence of an existing network.

A 4.176 In relation to fees, under Assignment Option 2A, the assignment of 700 MHz Duplex rights of use would be provided in return for interventionist coverage obligations. However, under Assignment Option 2B, Three suggests that the

⁹⁹⁶ In the French award, applicants could include additional commitments for commuting trains using 2.1 GHz Band. Applicants could also propose during the beauty contest commitments to improve indoor mobile coverage and/or to provide fixed broadband services in remote areas.

price be set at market value. In that regard, it would be difficult for ComReg to make an accurate assessment of a market price that reflects the opportunity cost of the spectrum rights. This is exacerbated by the fact that usage fees, if any, prescribed under Assignment Options 2A or 2B would be unlikely to encourage licensees to return unused or underused spectrum if they did not reasonably reflect the opportunity cost of the reserved use. Therefore, absent a suitable fee structure (which would be difficult to design appropriately), there is a real risk that fees are not set at a level which ensures the efficient use of spectrum and, in turn, promotes competition.

A 4.177 In addition, whereas auctions rely on binding bids to elicit credible information from bidders as to the value they attach to spectrum as a basis for an efficient outcome, no such incentives for truthful revelation exist in the case of an administrative award. This is because parties involved would have an incentive to overstate the services delivered (and/or the value of same) from the use of the spectrum. In that context, ComReg prefers winners of spectrum rights to seek to use them efficiently based on economic incentives, rather than by potentially having to resort to sanctions/litigation to compel compliance with commitments made in seeking an administrative assignment. Moreover, if spectrum rights have been assigned at below the “*opportunity cost*”, there may have been some other bidders who would have been prepared to pay more. This could be inefficient as the spectrum is not assigned at the highest value amongst alternative uses.

A 4.178 Any administrative determination of fees is not straightforward, and could lead to inefficient use and or distortions to competition since:

- a) prices that are set too low could lead to unfair competition with others who are paying more for their similar rights of use of spectrum; or
- b) prices that are set too high could lead to scarce spectrum (a valuable public resource) being unused, or under-used.

A 4.179 Further, the administrative determination of fees could lead to disputes where licensees disagree with the level of fees set administratively by the regulator. For example:

- a) EE challenged Ofcom’s 2015 decision to set new annual licence fees in the UK. The Court of Appeal quashed Ofcom’s decision and, as a result, fees reverted back to a lower level which had applied for many years⁹⁹⁷; and
- b) In light of the above ruling, Vodafone lodged legal proceedings against Ofcom to reclaim the fees it considers have been overpaid. A

⁹⁹⁷ <https://www.ft.com/content/6ab98d6a-cf85-11e7-b781-794ce08b24dc>

ruling in the High Court in May 2019 found in favour of Vodafone against Ofcom over the issue.⁹⁹⁸

A 4.180 In relation to Eir's suggestion, that under Option 2C, the auction price of the three 2.1 GHz lots could be used as a reference point for pricing the administratively assigned lots, ComReg notes that this would not be appropriate. The competitive award of three lots when twelve lots are available would be unlikely to establish fees that would encourage the efficient use of the spectrum and would be open to a number of distortions depending on the demand for the spectrum.

A 4.181 For example, in the event, that only MNOs were interested in the remaining three 2.1 GHz lots:

- a) it would provide the MNOs with incentives to keep the price of the auction spectrum low because the price in the auction for three lots would determine the price of the nine administratively assigned lots.
- b) there could be reduced competition for the three remaining lots if the administratively assigned lots were sufficient to satisfy demand for one or more bidders.
- c) the value bidders have for three incremental 2.1 GHz lots could be lower having already been assigned 2 × 15 MHz. It is unlikely that this lower price would be reflective of the value of lots already assigned administratively.
- d) any lower price for 2.1 GHz spectrum would distort competition for other substitutable bands (assigned by auction) by providing MNOs with additional resources (which under normal competition they would not have) to compete against other operators and potential New Entrants.

A 4.182 Alternatively, if bidders other than MNOs competed for the remaining three lots:

- a) the residual spectrum could be at a higher price to reflect the opportunity cost of the spectrum in that award and to reflect the artificial reduction in supply caused by the reservation. This would impose a price above the opportunity cost for all bidders, including MNOs.
- b) it would create incentives for MNOs not to compete for additional lots with other bidders given the impact this would have on the price for the administratively assigned lots (i.e. MNOs may strategically

⁹⁹⁸ <https://www.ft.com/content/e4a22ff4-78be-11e9-be7d-6d846537acab>

reduce demand resulting in the assignment of one or more lots to a potentially less efficient user at a lower price).

- A 4.183 More generally, MNOs would have agreed to be administratively assigned rights of use for a 20-year period without knowing the price of that spectrum because the administrative assignment of rights of use to incumbents would occur before the auction of the remaining rights of use.
- A 4.184 In relation to interventionist coverage commitments associated with Assignment Option 2A, ComReg discusses, in detail, its views in relation to appropriate coverage obligations in Chapter 8. ComReg observes that Assignment Option 2A would appear to involve a symmetric obligation across all three operators given Eir's suggestion of 2×10 MHz each. However, as noted by DotEcon⁹⁹⁹, applying interventionist coverage obligations symmetrically could reduce participation and competition in spectrum awards. Among other things, there may be operators (either existing MNOs, potential New Entrants, or FWA operators) unable to meet such an obligation and, if so, imposing the obligation on all potential bidders might prevent some parties participating altogether when it might have been socially optimal for them to be awarded spectrum. Alternatively, an administrative award with a symmetric obligation (where one operator is provided 2×10 MHz in return for coverage commitments) might not be favoured by certain MNOs if only one operator would be assigned rights of use directly with the remainder assigned by auction.
- A 4.185 Further, because there is a limited field of potential suppliers of coverage (i.e. existing MNOs), this would likely weaken competition and lead to sub-optimal coverage outcomes. In particular, the administrative procurement of coverage would require the regulator to assess the costs associated with providing coverage and there would be significant questions about the extent to which each operator would be capable of extending services to a determined level. Such an assessment across competing operators would require, at a minimum, detailed information about existing networks and expectations about how such operators would rollout services in the future. For example, bidders may have different net costs of providing additional coverage where smaller networks may be less able to partially offset the costs of improved coverage or quality of service. In that regard, some bidders may be better able to meet coverage requirements than others, leading to reduced competition and potentially poor value for money in the provision of better coverage.
- A 4.186 It would therefore be very difficult for the regulator to make an accurate assessment of what additional coverage would be required above what would be delivered on a commercial basis and there is a risk that spectrum would be

⁹⁹⁹ Coverage obligations and spectrum awards a report from DotEcon Ltd, Document 18/103d, Section 2.6.

assigned inefficiently if coverage obligations were not met. This approach also creates perverse incentives by creating a risk of applicants exaggerating future business cases to boost their chances of being assigned spectrum directly. In this way, certain operators could be able to distort competition within the award and gain additional rights of use that are not reflected in underlying efficiency and ability to deliver additional coverage efficiently.

Assignment Option 1 (Auction)

A 4.187 Auctions typically take a service and technology neutral approach allowing all credible bidders to compete for the same spectrum rights. As such, they can be beneficial in terms of:

- a) removing the burden on the regulator to make complex judgements (based on incomplete/imperfect information) in relation to assigning the spectrum and the suitable level of fees. In particular, auctions are better at eliciting relevant information about the value (and efficient assignment) of the spectrum that is likely not available to the regulator, e.g. the value that different undertakings place on those rights of use, in light of the potential different uses (and networks/technologies for same) and business cases for same etc., over the lifetime of the rights of use;
- b) incentivising bidders to reveal information about their preferences and valuation of spectrum through their willingness to pay also enables rights of use to be assigned to the bidders who value them most, and who are, in turn, sufficiently incentivised to use the spectrum most efficiently and compete vigorously in the downstream retail market/s';
- c) ensuring that all potential acquirers of the spectrum rights can compete on an equal basis for all available spectrum, and not artificially based on any measures designed to favour incumbency for example;
- d) promoting competition during the award and allowing bidders to switch back and forth across complementary and/or substitutable bands in response to the evolution of prices and valuations of other bidders. In that regard, it is desirable to allow bidders to switch between different bands as the award process progresses as the choices made by bidders are not static and likely vary depending on the choices made by other bidders.
- e) allowing the market to determine the specific frequency assignments for each winning bidder, which should promote efficient assignments

based on information about bidders' preferences that would otherwise not be available to the regulator. In that regard, ComReg notes that in previous similar awards, preferences existed across different parts of the bands as evidenced by the assignment bids received (26 GHz band – 2017¹⁰⁰⁰, 3.6 GHz band – 2016¹⁰⁰¹ and 2012 MBSA¹⁰⁰²).

A 4.188 In relation to fees, where demand for spectrum is likely to be greater than supply, the use of a market mechanism for assignment¹⁰⁰³ (such as a well-designed auction with prices set based on opportunity cost¹⁰⁰⁴) can help to:

- a) establish the efficient assignment of spectrum amongst bidders, based on bidders' willingness to pay (which can be expected to reflect the economic value they are able to generate);
- b) establish the opportunity costs of the assignment, setting suitable spectrum usage fees at a level that represents market value (and could be considered fair) and encourages the winning bidder(s) to utilise the spectrum more efficiently, including incentivising the return of unused or underused spectrum to the regulator; and
- c) significantly reduce the risk of subsequent challenges on the level of fees required to provide for optimal use because the final prices also represent the level at which winners are willing to pay for the spectrum rights;

A 4.189 Separately, spectrum awards can be designed so that, if there is an excess of spectrum over the aggregate demand from all bidders, they revert into a simple administrative assignment. This has been the case with several of ComReg's previous auctions.

A 4.190 Coverage obligations should not exceed the levels of coverage that might be expected anyway from well-functioning competition between network operators and therefore should not impact competition within an auction. However, where coverage in excess of competitively determined levels is required (as would

¹⁰⁰⁰ Vodafone paid an additional price of €200,000 for specific frequency assignments.

<https://www.comreg.ie/publication/results-of-the-26-ghz-spectrum-award-2018/>

¹⁰⁰¹ For example, Vodafone paid an additional price of € 230,012 for specific frequency assignments. <https://www.comreg.ie/publication/results-3-6-ghz-band-spectrum-award-2/>

¹⁰⁰² For example, Meteor, Telefonica and Vodafone paid €89,136, €300,058 and €2,109,275 for specific frequency assignments. https://www.comreg.ie/?d1m_download=frequency-arrangements-and-results-of-the-multi-band-spectrum-award-process

¹⁰⁰³ Wherever spectrum is scarce, this implies that there is an 'opportunity cost' associated with distributing the spectrum to particular uses and users.

¹⁰⁰⁴ Efficient spectrum assignment generally requires rights of use to be assigned to those users able to make the best economic use of it, and for the users of the assigned spectrum to make use of it in the way that generates the greatest social benefit.

seem to be suggested by Eir under Assignment Option 2A)¹⁰⁰⁵ auctions can lead to certain unavoidable distortions, including that:

- a) such obligations may exacerbate asymmetries between bidders, in that some bidders may be more able to meet the obligations than others (indeed some bidders may not be able to deliver such coverage obligations at all);
- b) such obligations could create an opportunity for an operator to exploit its relatively strong position in competing for a coverage lot to leverage its cost advantage to obtain more spectrum; and
- c) it is possible that the winner of a coverage lot gets a discount on spectrum in return for a coverage level it would have provided anyway (i.e. an undue benefit).

A 4.191 In contrast, auction formats offer flexibility and, depending on the willingness to pay for additional coverage, DotEcon advises that there are options for how such obligations might be provided which would ensure that distortions of the spectrum award process are kept to a minimum. For example, DotEcon states that *“Auctions offer considerable flexibility to resolve some of these problems. Although seldom used to date, auctions have the potential to explore award of alternative levels and forms of coverage obligation depending on their relative cost.”*¹⁰⁰⁶ In particular, and depending on the particular circumstances, under Option 1 it may be possible to split the award of spectrum and the procurement of a coverage improvement into two stages within an award process or to procure a coverage obligation in an entirely separate process either before or after the award of spectrum. This would usefully allow bidders to compete based on providing coverage rather than making bids in order to receive spectrum rights of use.

A 4.192 Therefore, and for the reasons stated above, ComReg is of the view that Assignment Option 1 (Auction) would, on balance, better promote competition within the award process (even where “interventionist” type coverage obligations are required).

¹⁰⁰⁵ Eir refer to the French example where rights of use were assigned with an agreement to accelerate mobile coverage without going through an auction and the State giving up future income. The foregone auction revenue reflecting the cost to network operators of meeting the obligation to extend coverage.

¹⁰⁰⁶ Coverage obligations and spectrum awards a report from DotEcon Ltd, Document 18/103d, published November 2018.

Competition in downstream markets

Administrative Assignment (Options 2A, 2B and 2C)

- A 4.193 Whilst only granting spectrum rights of use to specific parties or a category of operators, such as MNOs (or other operators), could be appropriate if the supply of spectrum is likely to exceed demand for same, doing so where demand is likely to exceed supply (such as this Proposed Award), runs the risk of the assigned spectrum being used inefficiently and/or distorting downstream competition.
- A 4.194 In that regard, ComReg observes that over the duration of the rights of use the basis for competition could change or shift from the data rates and prices offered by the different platforms towards converged services and content demanded by end-users. Additionally, in terms of technology both mobile and FWA operators are converging in terms of transmission standards, with both sectors moving towards adoption of LTE technology and in the future to 5G standards. In such circumstances, Option 2B (and effectively 2A given the requirement for interventionist mobile coverage obligations) would deny rights of use to other operators (FWA operators or small cell operators) and/or New Entrants¹⁰⁰⁷. This would place such bidders who may have the potential to provide a more efficient and differentiated range of services at a disadvantage by reducing the overall amount of spectrum in the award or even exclude them altogether from certain bands. This could act as a barrier to innovation, entry and/or expansion if such applicants were excluded from applying for some or all spectrum.
- A 4.195 Certain applicants might use spectrum rights of use less efficiently than others would have (had they succeeded in acquiring it), particularly considering the convergence of services and technologies in the future. Option 2C would likely be preferable than Option 2B as some 2.1 GHz rights of use would be made available for auction, allowing other users and New Entrants the opportunity to be assigned some 2.1 GHz rights of use. However, this option would artificially reduce the supply of spectrum to those users such as potential New Entrants.
- A 4.196 ComReg cannot rule out the possibility of new entry across any of the relevant downstream markets. For example, the 3.6 GHz Award resulted in one incumbent FWA operator (Imagine), three MNOs and a new small-cell operator obtaining spectrum rights of use.
- A 4.197 Second, ComReg further observes that even the administrative assignment to incumbents has the potential to create inefficient outcomes. For example, as Assignment Option 2B would involve the assignment of a symmetric quantum of rights to the incumbents, it would necessarily preclude asymmetric outcomes which may have been more efficient in terms of better promoting competition. As

¹⁰⁰⁷ Potential New Entrants who do not currently provide any services using spectrum in the State.

noted in Chapter 6, ComReg observes that asymmetric outcomes may be compatible with a diversity of operators engaging in effective downstream competition provided the asymmetry is not too extreme.

A 4.198 More generally, an assignment of spectrum to less efficient operators under an administrative assignment and as could occur in Options 2A, 2B and 2C could lead to reduced competition and, consequently, lower quality services being offered by less efficient operators. If such an award process fails to deliver an efficient outcome there may well be a negative impact on downstream competition. Therefore, there is a risk that applicants seeking to provide services to consumers may be awarded less spectrum than would be efficient, or none at all, while less efficient operators are awarded more rights of use than would be efficient in a competitive market.

A 4.199 In relation to more interventionist coverage commitments envisaged under Option 2A, MNOs would have incumbency advantages that would favour the assignment of rights of use to them. Further, the extent to which an obligation could be delivered by such operators would likely depend on several factors including existing network densification and rights of use already assigned. Since it is more cost effective to add spectrum (compared to densifying the network) any decisions taken by a regulator could distort competition by assigning comparable rights of use to MNOs who have been slower or less efficient compared to competing networks.¹⁰⁰⁸

A 4.200 Further, ComReg notes DotEcon's advice that applying interventionist obligations asymmetrically (i.e. only to a subset of network operators, or to just one) helps to avoid inefficient duplication of networks in rural areas, where the demand density is low and natural monopoly conditions are likely to apply due to strong scale economies in very lightly loaded networks.¹⁰⁰⁹ In that context, ComReg observes that should interventionist obligations be appropriate, then an auction format would be capable of providing for such outcomes while also assigning rights of use efficiently and preventing distortions to competition.

A 4.201 Options 2A, 2B and 2C could also compromise efficient investments already made and create investment distortions in the future if incumbents have an expectation that future rights of use will be assigned to them exclusively.

Assignment Option 1 (Auction)

A 4.202 Under Assignment Option 1, all existing operators (fixed and mobile), along with

¹⁰⁰⁸ The availability of spectrum, demand for throughput, cost of denser networks and more spectrally efficient radio systems together result in an optimum configuration at any point in time. As spectrum is finite but network density is variable it is important that operators are incentivized to use it efficiently. Very low cost would incentivize inefficient use.

¹⁰⁰⁹ Coverage obligations and spectrum awards a report from DotEcon Ltd, Document 18/103d, published November 2018. P. 26.

potential New Entrants, would be afforded the same opportunities to compete for, acquire, and use spectrum rights (subject to any competition caps). Accordingly, an auction would, avoid issues around having to make any *ex-ante* determinations as to the most efficient users or service providers, particularly where the regulator does not have perfect information.

- A 4.203 Auctions can entail the risk that bidders may try to reduce or distort the competitiveness of the auction in order to restrict the total number of winning bidders and so gain a competitive advantage (e.g. by preventing new entry or foreclosing access to spectrum required by incumbents to maintain or enhance existing services) and/or to reduce the amounts paid by winning bidders. This could restrict the number of undertakings capable of providing downstream retail services which, in turn, could reduce competition in the provision of those services. As a result, consumers could have less choice and some services may be of relatively low quality, because the service providers lack sufficient spectrum to provide services.
- A 4.204 However, auctions can also include measures designed to safeguard and promote competition in downstream markets to the ultimate benefit of end users. For example, the use of competition caps to prevent extreme asymmetric outcomes and minimum prices to reduce incentives for bidders to engage in strategic behaviour during an auction to decrease the eventual price(s) paid¹⁰¹⁰. This includes tacit collusion during an auction and arrangements entered into before an auction begins and which are aimed at reducing competition between bidders.¹⁰¹¹ Other measures to reduce collusion include having a carefully designed information policy.
- A 4.205 In relation to interventionist coverage obligations envisaged under Option 2A, auctions can also be designed to be sufficiently flexible to allow for market testing of coverage obligations at different levels and of different forms and ensuring that value for money is obtained in the provision of coverage (i.e. a winning bidder delivers the maximum amount of coverage relative to other competing bidders and that it is awarded only if the cost of doing so is not too high). As noted by DotEcon¹⁰¹², it is possible to procure a coverage obligation in an entirely separate process either before or after an award of spectrum. Because the provision of coverage is based on a bidder's private valuation of delivering that coverage (rather than the value of the spectrum), as opposed to an assessment by the regulator, the extent to which such obligations are delivered upon is higher as a bidder's private valuation would be based on the costs of delivering that

¹⁰¹⁰ Note also that minimum prices that are too high might have a negative impact on competition if smaller participant/new entrants are discouraged from participating, so there is a balance as discussed in Chapter 5.

¹⁰¹¹ See Section 4.3 DotEcon Report 17/85a.

¹⁰¹² Document 18/103d, Coverage obligations and spectrum awards a report from DotEcon Ltd, Section 5.2.

coverage.

A 4.206 Therefore, and for the reasons stated above, ComReg is of the view that Assignment Option 1 would, on balance, better promote downstream competition.

Impact on consumers

A 4.207 Generally, consumers will prefer the option which has the greatest potential to promote competition, thereby maximising the long-term benefits to consumers in terms of choice, price, and quality. They are also likely to favour options which avoid or minimise any disruption to existing services.

Assignment Option 2 (Administrative assignment)

A 4.208 The administrative assignment of spectrum rights of use is likely to be beneficial to consumers where sufficient spectrum is available to satisfy all possible licensees and services, and those services are made available to consumers on an equal basis. Similarly, short term assignments may be beneficial in order to prevent significant disruption to existing services^{1013 1014 1015} or to facilitate the efficient assignment of longer-term rights of use¹⁰¹⁶. However, as noted above, demand is likely to exceed supply in the present case, and an administrative assignment to certain operators under Assignment Options 2A, 2B or 2C would deny such spectrum to other potential providers of services, including potentially more efficient providers of services whose services consumers may be interested in receiving (e.g. mobile or fixed wireless broadband).

A 4.209 Consumers could be negatively impacted if the administrative assignment of spectrum resulted in restricting other potential services. Options 2B and 2C runs the risk of assigning rights of use to MNOs when an assignment to alternative operators could have been the more efficient and more beneficial outcome to consumers. Any negative impact of the administrative assignment of rights of use would fall on consumers¹⁰¹⁷ and even a relatively small negative effect could result in a substantial aggregate loss over the duration of the new rights of use. Further, as discussed previously, fees set administratively may not provide appropriate incentives for operators to use spectrum efficiently over the duration

¹⁰¹³ Interim 1800 MHz Rights of Use for the period 1 January 2015 to 12 July 2015 Consultation and Draft Decision, published April 2014.

¹⁰¹⁴ COVID-19 Temporary Spectrum Management Measures. <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/covid-19-temporary-spectrum-management-measures/>.

¹⁰¹⁵ ComReg observes that the potential for service continuity issues to arise can also be addressed by non-award measures, such as the proposed transition arrangements and rules outlined in Chapter 9.

¹⁰¹⁶ See Chapter 4 for issues arising in the 2.1 GHz.

¹⁰¹⁷ Such effects could include higher prices and less choice than might otherwise have been available; and poorer quality services than might have been achieved with a more efficient spectrum assignment.

of the spectrum rights. Such a scenario could be damaging where an operator does not return unused rights of use when it would have done so if the fees were set appropriately (denying access to other operators that could deliver services more efficiently).

A 4.210 In relation to interventionist coverage obligations, the potential to deliver on commitments made in terms of coverage, rollout or investment ultimately affects the delivery of services to consumers and an effective ex-ante mechanism to enforce the commitments made by applicants is difficult to achieve under Assignment Option 2A. In contrast, under Assignment Option 1, the use of binding bids ensures that bidders are committed to the bids they make, incentivising the delivery of services from the use of the assigned spectrum. Further, where commitments on coverage are made by incumbents in return for spectrum rights of use, such coverage, or a portion of it might ultimately have been provided absent such an assignment, and better coverage outcomes could have been obtained for consumers through a specific coverage procurement process after the competitive assignment of rights of use.

Assignment Option 1 (Auction)

A 4.211 As noted above, auctions are more likely to have a positive impact on downstream retail competition. By extension, this should benefit consumers through providing better choice, quality and pricing of services. By opening up the opportunity to obtain rights to use to all interested parties, an auction provides for a broader range of outcomes, including for differentiated services and/or technologies to be delivered in a timely manner.¹⁰¹⁸ It would also reduce risk of challenge from unsuccessful applicants as to the evaluation process and / or outcome of a beauty contest (on the basis of insufficient transparency, objectivity, due diligence, etc.) and delays resulting from such challenges. In contrast to an administrative assignment, the use of binding bids in an auction ensures that bidders are committed to the bids they make, incentivising the delivery of services from the use of the assigned spectrum.

A 4.212 Further, as noted above, auctions can also be used to procure additional coverage where required. Coverage outcomes are likely to be greater through a competitive process as bidders can price the anticipated cost to network operators of meeting the obligation to extend coverage. This contrasts with the administrative determination of coverage where there is the potential for winner(s) of the coverage requirement to obtain spectrum rights (at reduced or no fees) in return for a coverage level it would have provided anyway.

A 4.213 In summary, auctions offer the following benefits, relative to an administrative

¹⁰¹⁸ Consumers are more likely to gain access to the services in a timely manner, as the market mechanism in option 1 reduces the likelihood of challenge from dissatisfied bidders (which may delay the ultimate delivery of services to consumers).

assignment:

- a) all of the bands would be offered to all bidders and non-incumbents would not be restricted from participating;
- b) an auction better ensures that spectrum rights are assigned to those who most value those rights, and who are therefore most incentivised to maximise consumer welfare by using their assigned spectrum efficiently;
- c) an auction is more likely to ensure that none of the bidders are dissatisfied with the outcome, thereby minimising the prospect of delays due to litigation etc.; and

A 4.214 An auction can assign spectrum more efficiently and cater for interventionist coverage obligations without compromising the efficient assignment of spectrum and creating distortions to competition. An auction should therefore have the most positive impact on downstream retail competition and should therefore promote the interests of consumers in terms of the choice, price, and quality of electronic communications services.

A 4.215 ComReg is therefore of the view that consumers would, on balance, prefer Assignment Option 1 over the other assignment options.

Preferred option – Assignment Process RIA (Step 5)

A 4.216 This RIA has considered the impact of the various options from the perspective of industry stakeholders, as well as the impact on competition and consumers, and should aid stakeholders' understanding of the relative merits of the alternative assignment formats.

A 4.217 For the reasons outlined in this RIA, ComReg's preferred option under the Assignment Process RIA is to assign the relevant spectrum rights by way of an appropriately designed auction.

A4.6 Overall Preferred Option

A 4.218 In light of the preceding two RIAs and having had regard to the responses to Document 19/59R, Document 19/124, Document 20/32, Document 20/56 and Document 20/78, ComReg remains of the view that spectrum rights of use in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz bands should be assigned by way of an appropriately designed auction ("Overall Preferred Option").

A 4.219 In Chapter 7 and Annex 7 of this document, ComReg considers several different types of competitive auction formats for the Proposed Award.

A 4.220 The following section assesses the Overall Preferred Option against ComReg's other relevant functions, objectives and duties.

A4.7 Assessment of Preferred Option against ComReg's other relevant functions, objectives and duties

A 4.221 The RIAs considered several options potentially available to ComReg within the context of the RIA analytical framework as set out in the ComReg's RIA Guidelines (i.e. impact on industry stakeholders, impact on competition and impact on consumers). It necessarily also involved an analysis of the extent to which various options would serve to facilitate ComReg in achieving certain statutory objectives in the exercise of its functions. In particular, it involved an analysis of the extent to which the various options would serve to promote competition and ensure that there would be no distortion or restriction of competition in the electronic communications sector, whilst at the same time encouraging efficient investment in infrastructure, promoting innovation and ensuring the efficient use and effective management of the radio frequency spectrum. This would enable ComReg to ensure that users would derive maximum benefit in terms of choice, price and quality.

A 4.222 In this section, ComReg assesses the Overall Preferred Option in the context of other statutory provisions relevant to the management of Ireland's radio frequency spectrum (which are summarised in Annex 2 of this document). It is not proposed to exhaustively reproduce those statutory provisions here. However, set out below is a summary of all statutory provisions which ComReg considers to be particularly relevant to the management and use of the radio frequency spectrum with an assessment (to the extent not already dealt with as part of the RIAs) of whether, and to what extent, the Overall Preferred Option accords with those provisions. In carrying out this assessment, ComReg has highlighted below some of the relative merits / drawbacks which would arise if it was to select some of the alternative options assessed under the RIA above.

A 4.223 For the purposes of this section, the statutory provisions which ComReg considers to be particularly relevant to the management of the radio frequency spectrum in the State are grouped as follows:

- general provisions on competition;
- contributing to the development of the internal market;
- to promote the interest of users within the Community;
- efficient use and effective management of spectrum;
- regulatory principles;

- relevant Policy Directions and Policy Statements; and
- general guiding principles (in terms of spectrum management, setting of fees and licence conditions):
 - Objective justification;
 - Transparency;
 - Non-discrimination; and
 - Proportionality.

General Provisions on Competition

A 4.224 There is a natural overlap between the aims of the RIAs and an assessment of ComReg's compliance with some of its statutory obligations and, in particular, one of its core statutory objectives under section 12 of the 2002 Act of promoting competition by, among other things:

- ensuring that users derive maximum benefit in terms of choice, price and quality;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector;
- encouraging efficient use and ensuring effective management of radio frequencies;
- ensuring that elderly users and users with special social needs derive maximum benefit in terms of choice, price and quality; and
- ensuring that, in the transmission of content, there is no distortion or restriction of competition in the electronic communications sector.¹⁰¹⁹

A 4.225 There are also other various statutory provisions requiring ComReg generally to promote and safeguard competition in the electronic communications sector including:

- Regulation 16(2) of the Framework Regulations which requires ComReg to apply objective, transparent, non-discriminatory and proportionate regulatory principles by safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition;

¹⁰¹⁹ The final two statutory obligations were introduced by Regulation 16 of the Framework Regulations.

- Regulation 9(11) of the Authorisation Regulations which requires ComReg to ensure that competition is not distorted by any transfer or accumulation of rights of use for radio frequencies;
- Article 4 of Directive 2002/77/EC (Competition Directive) which requires ComReg to refrain from granting exclusive or special rights of use of radio frequencies for the provision of electronic communications services; and
- General Policy Direction No. 1 on Competition (2 April 2004) which requires ComReg to focus on the promotion of competition as a key objective, including removing barriers to market entry and supporting new entry (both by new players and entry to new sectors by existing players).

A 4.226 Based on the RIAs, ComReg's preliminary view is that the Overall Preferred Option is the one that would best safeguard and promote competition to the benefit of consumers.

Contributing to the development of the Internal Market

A 4.227 In achieving the objective of contributing to the development of the Internal Market, another of ComReg's core statutory objectives under section 12 of the 2002 Act, ComReg considers that the following factors are of particular relevance in the context of this award process:

- the extent to which the Overall Preferred Option would enable ComReg to ensure that harmonisation of the use of radio frequency spectrum across the EU is promoted, consistent with the need to ensure its effective and efficient use and in pursuit of benefits for the consumer such as economies of scale and interoperability of services, having regard to all decisions and measures adopted by the European Commission in accordance with the Radio Spectrum Decision¹⁰²⁰ (Regulation 17 of the Framework Regulations);
- the extent to which the Overall Preferred Option would encourage the establishment and development of trans-European networks and the interoperability of pan-European services, in particular by facilitating, or not distorting or restricting, entry to the Irish market by electronic communication services providers based or operating in other Member States; and

¹⁰²⁰ Decision No. 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the EU.

- in order to ensure the development of consistent regulatory practice and the consistent application of EU law, the extent to which ComReg has had due regard to the views of the European Commission, BEREC and other Member States in relevant matters, in selecting an option and considering any regulatory action required by ComReg in respect of such an option.

Promoting harmonised use of radio frequency spectrum across the EU

A 4.228 In relation to the first factor identified above, for the reasons set out in the 'Spectrum for Award' RIA, it is ComReg's view that the Overall Preferred Option would result in the award of harmonised spectrum rights of use in the selected bands which are suitable for the provision of advanced WBB services. In this regard, the Overall Preferred Option is consistent with and promotes the objectives of the relevant harmonisation decisions of the European Commission which emphasise the suitability of this band for WBB services.

Encouraging the establishment and development of trans-European networks and the interoperability of pan-European Services

A 4.229 ComReg notes the overlap between this objective and the objective of promoting competition in the provision of ECN/ECS. Encouraging the establishment and development of trans-European networks requires that operators from other Member States seeking to develop such networks are given a fair and reasonable opportunity to obtain spectrum rights of use required for such networks and, particularly, access to critical spectrum rights of use. Accordingly, options which would restrict or distort competition or otherwise unfairly discriminate against potential entrants (such as through administrative assignment of rights of use to critical spectrum to incumbent operators) would not, in ComReg's view, satisfy the requirements of this objective.

A 4.230 In this regard, ComReg refers to the 'Spectrum for Award' RIA and its finding that the Overall Preferred Option is likely to be preferred by New Entrants. This is because the Overall Preferred Option would not involve an administrative assignment of valuable spectrum rights that is more likely to favour incumbents simply by virtue of their incumbency, with the associated disincentives for potential participation by undertakings from other Member States in the proposed award process.

Promoting the development of consistent regulatory practice and the consistent application of EU law

A 4.231 In relation to this aspect of contributing to the development of the internal market, ComReg continues to cooperate with other National Regulatory Authorities ("NRAs"), including closely monitoring developments in other Member States to

ensure the development of consistent regulatory practice and consistent implementation of the relevant EC harmonisation measures and relevant aspects of the Common Regulatory Framework.

A 4.232 For instance, ComReg has had clear regard to international developments in the context of:

- promoting the provision of WBB services;
- considering whether to include other potential bands in the award process;
- harmonisation developments and equipment availability in relation to the potential candidate bands;
- licence durations for spectrum rights in the selected bands; and
- licence fees (and benchmarking in particular).

A 4.233 Furthermore, ComReg will continue to have regard to international developments as appropriate. In the present case, ComReg considers that the Overall Preferred Option is consistent with the approaches taken by and being considered in other Member States.

Promote the interest of users within the Community

A 4.234 The impact of the Overall Preferred Option and other options on users from a more general perspective and in the context of ComReg's objective to promote competition has been considered in the context of the above RIAs and it is not proposed to consider this matter further here.

A 4.235 ComReg also observes that the majority of measures set out in Section 12(2)(i) to (vii) of the 2002 Act, aimed at achieving this statutory objective, are more relevant to consumer protection, rather than to the management of the radio frequency spectrum.

Efficient Use and Effective Management of Spectrum

A 4.236 Under section 10 of the 2002 Act, it is one of ComReg's functions to manage the radio frequency spectrum in accordance with a Policy Direction under section 13 of the 2002 Act. Policy Direction No. 11 of 21 February 2003 requires ComReg to ensure that, in managing spectrum, it takes account of the interests of all users of the radio frequency spectrum (including both commercial and non-commercial users) (see discussion on this policy direction below). Importantly, in pursuing its objective to promote competition under section 12(2)(a), ComReg must also take all reasonable measures to encourage efficient use and ensure effective

management of radio frequencies. Section 12(3) of the 2002 Act also requires that measures taken with regard to encouraging the efficient use and ensuring the effective management of radio frequencies must be proportionate.

A 4.237 Regulation 9(11) of the Authorisation Regulations also provides that ComReg must ensure that radio frequencies are efficiently and effectively used having regard to section 12(2)(a) of the 2002 Act and Regulations 16(1) and 17(1) of the Framework Regulations.

A 4.238 In that light, ComReg is of the view that the Overall Preferred Option complies with the obligations contained in the above statutory provisions. ComReg is also of the view that the alternative spectrum and assignment options considered would fail to satisfy the above provisions to the same extent, if at all.

Regulatory Principles

A 4.239 Under Regulation 16(2) of the Framework Regulations, ComReg must, in pursuit of its objectives under Regulation 16(1) and section 12 of the 2002 Act, apply objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things:¹⁰²¹

- promoting regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods; and
- promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors and parties seeking access to diversify the risk of investment, whilst ensuring that competition in the market and the principle of non-discrimination are preserved.

Regulatory Predictability

A 4.240 ComReg notes that it places importance generally on promoting regulatory predictability and, as illustrated below, has complied with this principle in carrying out the current process.

A 4.241 In the present context, ComReg considers the following objectives to be of particular importance to achieving the aims of this regulatory principle:

- promoting regulatory predictability in relation to availability of spectrum rights to other users of spectrum by applying an open,

¹⁰²¹ Some of those principles listed in 16(2) are not listed here because they are either dealt with elsewhere in this chapter or were considered by ComReg as not being relevant to the Proposed Award.

transparent, and non-discriminatory approach to spectrum release;
and

- promoting regulatory predictability by, to the extent appropriate, taking a consistent approach to the award of spectrum in Proposed Award as that taken in other recent spectrum awards.

A 4.242 In relation to the first objective, ComReg notes that the Overall Preferred Option ensures that the rights of use to the proposed harmonised bands are made available. This would give the market the utmost transparency and predictability in terms of the availability of those rights. The alternative of potentially delaying the award of rights of use in these bands would not, in ComReg's view, contribute to the promotion of regulatory predictability.

A 4.243 In relation to the second objective, ComReg considers that the alternative options would not promote regulatory predictability due to fact that ComReg has taken the approach of , relying on a full market-based mechanism (with objective, transparent, non-discriminatory and proportionate rules) to assign rights of use in a large amount of valuable spectrum across a range of bands better promotes regulatory predictability in the 2012 MBSA and in the award of the 3.6 GHz Band. Therefore, the Overall Preferred Option is consistent with ComReg's approach to date. Moreover, relevant industry stakeholders (e.g. MNOs, FWA operators etc.) are becoming increasingly familiar with competitive auction processes and the use of such processes should contribute to regulatory predictability.

A 4.244 In addition, ComReg considers that the Overall Preferred Option – which, amongst other things, facilitates potentially significant variations in demand characteristics through the inclusion of TDD and FDD spectrum to accommodate uplink and downlink capacity requirements, and would incorporate appropriate spectrum competition caps informed by this consultation to facilitate advanced WBB service provision while avoiding extreme outcomes – would better minimise the risk of award participants failing to win their desired spectrum assignments for reasons other than competitive tension within the award.

A 4.245 In light of the above, ComReg is of the view that the Overall Preferred Option complies with the regulatory principle of promoting regulatory predictability.

Promoting Efficient Investment and Innovation in New and Enhanced Infrastructures

A 4.246 ComReg considers that the Overall Preferred Option is consistent with the aims of this regulatory principle because it:

- has the capacity to facilitate a fully competitive release of the selected bands at the earliest possible opportunity. Providing clarity around the

availability of these bands as soon as possible ensures that winners of rights of use are appropriately incentivised to efficiently invest in new and enhanced infrastructures, to deploy new technologies and to provide advanced WBB services to end users, while avoiding the potential costs, uncertainties and inefficiencies associated with a delayed release of such rights; and

- would give participants the scope to bid according to their own valuation of the spectrum rights, based on their own business plans and market and financial positions, and thus to invest efficiently.

Relevant Policy Directions and Policy Statements

A 4.247 ComReg has taken due account of the Spectrum Policy Statement issued by the then DCENR in September 2010 and its Consultation on Spectrum Policy Priorities issued in July 2014. ComReg notes that the core policy objectives, principles and priorities set out therein are broadly in line with those set out in the 2002 Act and in the Common Regulatory Framework and, in turn, with those followed by ComReg in identifying the Overall Preferred Option.

A 4.248 Section 12(4) of the 2002 Act requires ComReg, in carrying out its functions, to have regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to it, in relation to the economic and social development of the State. Section 13 of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister as he or she considers appropriate to be followed by ComReg in the exercise of its functions.

A 4.249 ComReg considers below those Policy Directions which are most relevant in this regard (and which have not been considered elsewhere in this chapter).

Policy Direction No.3 of 21 February 2003 on Broadband Electronic Communication Networks

A 4.250 This Policy Direction provides that:

“ComReg shall, in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.”

A 4.251 The purpose of this Policy Direction was to ensure that the regulatory framework for electronic communications plays its part in contributing to the achievement of

the Government's objectives regarding the rollout of broadband networks.

- A 4.252 ComReg is cognisant of the fact that the three-year objective described in this policy direction has now expired. In any case, ComReg is of the view that the Overall Preferred Option is aligned with the objectives of the Programme for Government. For example, it would promote the introduction of advanced WBB services in the selected bands at the earliest possible date and it complements other schemes such as the Mobile Broadband Taskforce aimed at improving broadband infrastructure and services for businesses and citizens.
- A 4.253 In addition, the Overall Preferred Option should result in a greater competitive tension than in the case of an administrative assignment, and it can be expected to positively impact on downstream retail competition in the deployment, or augmented deployment, of enhanced services in terms of bandwidth.
- A 4.254 Furthermore, ComReg considers it unlikely that some form of administrative assignment of spectrum in the place of a competitive award procedure would incentivise the roll out of broadband infrastructure by recipients to the same extent as the Overall Preferred Option, if at all.

Policy Direction No.4 of 21 February 2003 on Industry Sustainability

- A 4.255 This Policy Direction provides that:

“ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.”

- A 4.256 The purpose of this policy direction is to ensure that any regulatory decisions take due account of the potential impact on the sustainability of industry players, in particular in light of the business cycle at the time such decisions are taken.
- A 4.257 ComReg observes that this policy direction concerns the sustainability of the industry rather than just the position of individual players. Notwithstanding, in its RIAs above, ComReg has considered the impact of its award proposals in the context of all industry stakeholders, including different types of industry stakeholders. ComReg considers that an open auction which facilitates greater participation on a non-discriminatory basis facilitates the sustainability of the industry.
- A 4.258 This Policy Direction is clearly relevant in terms of those costs that industry must bear which are, to some extent, within the control of ComReg, for example, the nature and extent of any minimum prices in the Proposed Award and the related issue of the duration of spectrum rights of use. ComReg has had regard to this

policy direction in devising its proposals in relation to licence duration and minimum prices.

Policy Direction No.11 of 21 February 2003 on the Management of the Radio Frequency Spectrum

A 4.259 This Policy Direction provides that:

“ComReg shall ensure that, in its management of the radio frequency spectrum, it takes account of the interests of all users of the radio frequency spectrum.”

A 4.260 The purpose of this policy direction is to ensure that ComReg achieves an appropriate balance between the interests of various users of the radio frequency spectrum, in particular, the respective interests of commercial and non-commercial users.

A 4.261 In carrying out the above RIAs, ComReg has considered the Overall Preferred Option in light of the interests of various categories of industry stakeholders and consumers.

A 4.262 ComReg is of the view, therefore, that it has complied with this requirement in carrying out the above RIAs and that the Overall Preferred Option is the one that best serves the interests of all users of the radio frequency spectrum and strikes an appropriate balance where those interests may conflict.

General guiding principles (in terms of spectrum management, licence conditions and setting of licence fees)

A 4.263 ComReg notes that it is required to comply with the guiding principles of objectivity, transparency, non-discrimination and proportionality in carrying out its functions under the 2002 Act and the Common Regulatory Framework. In relation to the current process, ComReg considers that these principles are very relevant in terms of its functions concerning spectrum use and management, attaching conditions to rights of use and the setting of licence fees.

A 4.264 In relation to spectrum management and use, ComReg notes that:

- Regulation 11(2) of the Authorisation Regulations requires that ComReg grants rights of use for radio frequencies on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate; and
- the regulatory principle set out in Regulation 16(2) of the Framework Regulations requires ComReg in pursuing its objectives to apply objective, transparent, non-discriminatory and proportionate

regulatory principles by, amongst other things, ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services.

A 4.265 ComReg notes that the above guiding principles are Irish and EU law principles that ComReg abides by generally in carrying out its day to day regulatory functions.

A 4.266 ComReg is of the view, having regard to the applicable legislation and legal principles, its RIAs and other analyses, its expert advice and reports, and the other material to which it has had regard, that the Overall Preferred Option is objectively justified, transparent, non-discriminatory and proportionate.

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Annex: 5 Aligning existing spectrum rights of use in the 2.1 GHz Band

A5.1 Background and summary of ComReg's proposals in Annex 7 of Document 19/124

A 5.1 In Section 5.4 of Document 19/59R, ComReg proposed that Three should be provided with the option of applying for new interim rights of use in the 2.1 GHz Band for the purpose of aligning the expiry dates of its existing 2.1 GHz licences (comprised of Three's existing "Licence A" and "Licence B" which expire on 24 July 2022 and 1 October 2022, respectively) with Vodafone's existing 2.1 GHz licence which expires on 15 October 2022, such that the above three 2.1 GHz Band licences would expire on 15 October 2022 ("Interim Licence Proposal").

A 5.2 In Annex 5 of Document 19/59R, ComReg set out:

- background material regarding similar matters which have informed the present proposals namely, ComReg's 2011 Decision to grant interim 900 MHz rights of use for the period 16 May 2011 – 31 January 2013 and its 2013 Decision to provide for short term extensions to those rights of use; and its 2014 Decision to grant interim 1800 MHz rights of use for the period 1 January 2015 to 12 July 2015. Interested parties are referred to that material;
- observations on the relevance of these previous matters in terms of guiding ComReg's approach to the present matter¹⁰²²; and
- key aspects of the proposed grant of Interim 2.1 GHz A and B Licences to Three.

¹⁰²² Specifically:

"ComReg observes the close similarities in terms of the underlying rationale for the current interim licence proposal and previous interim licensing proposals and, in particular, in respect of the grant of 1800 MHz interim rights to Telefonica. ComReg further observes the clear similarities in terms of the mechanics of its previous interim licensing proposals.

Given this, and recalling in particular the principle of promoting regulatory predictability which ComReg is required to apply in its pursuit of its statutory objectives, there is obvious merit in adopting a consistent approach to the mechanics between the previous interim licensing proposals and the present matter where it is reasonable and appropriate to do so."

A 5.3 In Annex 7 of Document 19/124, ComReg set out:

- a summary of responses received to Document 19/59R relating to the Interim Licence Proposal;
- ComReg's assessment of those responses, including by reference to the considerations set out in paragraphs A.533 and A.534 of Annex 5 to Document 19/59R; and
- in light of the above, ComReg's preliminary decision on this aspect of the Proposed Award.

A 5.4 ComReg does not reiterate the analysis set out therein and interested parties are referred to same. However, relevant extracts from this and earlier analysis may be provided by way of background and context to its consideration of the views of interested parties received on its Interim Licence Proposal and other relevant material since the publication of Document 19/124.

A 5.5 The preliminary decision described in Annex 7 of Document 19/124 was as follows:

- upon receipt of an appropriate application from Three, grant it interim 2.1 GHz rights of use - comprised of the frequencies in its existing "A Licence" – which would commence on 25 July 2022 and fully expire on 15 October 2022 ("Interim 2.1 GHz A Licence");
- upon receipt of an appropriate application from Three, grant it interim 2.1 GHz rights of use - comprised of the frequencies in its existing "B Licence" – which would commence on 2 October 2022 and fully expire on 15 October 2022 ("Interim 2.1 GHz B Licence");
- attach conditions to both the Interim 2.1 GHz A and B Licences corresponding to the current conditions in each of the existing "A Licence" and "B Licence", respectively; and
- calculate the licence fees for each of the Interim 2.1 GHz A and B Licences by reference to the licence fees for Vodafone's and Eir's existing 2.1 GHz licences but updated to current day levels by applying the overall consumer price index ("CPI"). In that regard, ComReg proposed to calculate the overall CPI change using the latest CPI data available at the time at which it would be making the proposed licensing regulations under the Wireless Telegraphy Act (a draft of which would be made available for comment alongside the draft Information Memorandum).

A 5.6 ComReg also noted that “*this preliminary decision is subject to the matters described in section 4.4.5 of this document*”, i.e. whether ComReg received a binding commitment from licensees to surrender their 2.1 GHz licences by 10 February 2020. However, ComReg notes that the licensees did not choose to avail of this option.

A 5.7 ComReg also reflected its preliminary decision (as described in Annex 7 of Document 19/124) in Chapter 9 of that document as follows:

3.3 under section 5 of the Wireless Telegraphy Act 1926, and pursuant to the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations, and upon application properly being made to it and payment of the relevant fee/s in accordance with the terms of the 2.1 GHz Band Interim Licence and Early Liberalisation Regulations, to grant Three Ireland (Hutchison) Limited a limited number of individual rights of use for radio frequencies, by way of a 2.1 GHz Band Interim A Licence and/or a 2.1 GHz Band Interim B Licence, in respect of the 2.1 GHz Band;

A 5.8 In Annex 2 of Document 20/32 (the draft Information Memorandum), ComReg then set out for consultation the draft 2.1 GHz Early Liberalisation and Interim Licensing Regulations which would be made under the Wireless Telegraphy Act.

A5.2 Background: certain extracts from Document 19/59R

A 5.9 By way of background and context to the following discussion, ComReg would highlight the following two sections from Document 19/59R regarding its rationale for proposing to grant the interim rights of use to Three, and the proposed spectrum fees for same.

***“Grant of individual and limited number of 2.1 GHz rights to Three only*”**

[A.525] ComReg has assessed and is of the preliminary view that its proposal to grant these two sets of rights of use only to Three would comply with its regulatory obligations generally for the following reasons:

- *although Three, Vodafone and Meteor are all MNOs with existing rights of use in the 2.1 GHz Band, only Three and Vodafone have such rights expiring in 2022 and, further, if the proposal is to align these rights of use expiring in 2022 to 15 October 2022 (being the expiry of Vodafone's 2.1 GHz rights) to enable the efficient assignment of new rights in the 2.1 GHz Band, then Three is clearly in a materially different position to Vodafone and Meteor in this context because only its existing 2.1 GHz rights would have expired by this date;*
- *the proposed grant of the Interim 2.1 GHz A Licence and Interim 2.1 GHz B Licence to Three only would, in this context, be objectively justified and non-discriminatory;*
- *in addition, the proposed grant of the interim licences would, in circumstances where there does not appear to be any obvious additional benefit to an earlier co-termination date in 2022, be more proportionate (and better promote regulatory certainty) than any potential foreshortening of existing rights of use (i.e. Vodafone's). That is, ComReg's interim licensing proposal would respect the full term of the existing 2.1 GHz rights of all licensees, including Vodafone and Meteor;*
- *the durations of the proposed interim licences would also be the minimum necessary to ensure co-termination with Vodafone's 2.1 GHz licence;*
- *by means of this consultation process, the proposed grant of the interim licences to Three only is also being made transparent;*
- *in the context of the promotion of competition (including ensuring there is no distortion or restriction of competition and safeguarding competition to the benefit of consumers), ComReg would highlight the following factors:*
 - *by avoiding the unnecessary complexity that would otherwise arise from a larger number of time slices to address the 3 expiry dates in 2022, ComReg's proposal would benefit all participants in the Proposed Award thereby, among other things, promoting competition in the award (by better enabling efficient award outcomes and, in turn, promoting efficient spectrum use, and downstream competition for services using this spectrum);*

- *ComReg's proposal would safeguard existing competition in the mobile markets concerned (and protect end-users from any potential disruption to services that would otherwise arise) by avoiding a situation where Three would lose access to 2.1 GHz rights for that short period between licence expiry and commencement of any new 2.1 GHz rights won by it in the Proposed Award, while the spectrum lay fallow;*
- *the durations of the Interim Licences would be of the minimum necessary to co-terminate and are of a very limited duration (i.e. 83 days and 14 days for the Interim 2.1 GHz A and B licences, respectively), especially when viewed in the context of the duration of the original rights of use (i.e. 20 years);*
- *further, these Interim Licences (comprising a total of 2x30 MHz) would only take effect from mid-2022 in circumstances where ComReg is proposing to award substitutable spectrum rights in the 2.3 GHz and 2.6 GHz Bands which could be used shortly after the Proposed Award (circa 2020);*
- *ComReg proposes to attach appropriate licence conditions and require the payment of appropriate spectrum fees for the proposed Interim A and B Licences to ensure that no distortions to competition would arise from the terms under which said licences would be granted;*
- *the proposal would encourage the efficient use and ensure the effective management of radio frequencies for the reasons identified above;*
- *the proposal would promote regulatory predictability for all affected parties by, among other things:*
 - *avoiding the unnecessary complexity for all potential award participants that would otherwise arise from a larger number of time slices to address the 3 expiry dates in 2022; and*
 - *adopting a consistent regulatory approach in similar circumstances (i.e. the proposed grant of interim rights as a facilitating measure for a spectrum award process).*

[A 5.26] In light of the above, ComReg is of the preliminary view that its proposal to grant interim rights of use to Three (as described in the first paragraph of this section) is justified having regard to the relevant provisions of the 2002 Act and Common Regulatory Framework and the general system of licences and licensing for MNOs in Ireland.

[A 5.27] This preliminary view is, however, without prejudice to the conditions that would be attached to these interim rights and the financial terms on which these interim rights would be granted.”

“Proposed spectrum fees

...

Proposal

[A 5.33] In light of ComReg’s obligations regarding promoting regulatory predictability, ensuring no distortions to competition and, further, in similar circumstances ensuring no discrimination in the treatment of undertakings providing ECS, ComReg proposes that:

- i. the fees for each of the Interim 2.1 GHz A and B licences would be set by reference to the spectrum fees (both SAFs and SUFS) for Vodafone’s and Eir’s existing 2.1 GHz licences; and*
- ii. these fees be updated to current day levels by reference to the overall CPI to account for the change in prices of goods and services since grant of the existing A and B licences in 2002.*

[A 5.34] This proposal also reflects the following factors:

- the proposed interim licences would comprise new rights of use rather than an extension of existing rights;*
- these additional rights of use are of economic value, the determination of which is required to be made in the context of the Common Regulatory Framework which requires inter alia objective, non-discriminatory and transparent treatment in the award of rights to radio spectrum, taking into account the need to maximise benefits to users, ensure optimum utilisation of scarce resources and facilitate the development of competition;*
- in the present case, no “market value” can be determined for these additional rights of use since there are no unassigned 2.1 GHz rights which could be awarded and used as a reference;*
- therefore the fees payable for the interim licences should approximate to fees already payable by direct competitors;*
- Vodafone and Eir are the relevant comparators in the present case as both are actual direct competitors in the relevant mobile markets and the other 2.1 GHz FDD licensees; and*

- *the proposed interim licences would provide Three additional periods beyond the 20 year licence duration of all existing 2.1 GHz FDD licences by which to continue to provide 3G mobile services and said additional periods would not in any event be available to Vodafone and Eir, given the intended purpose of the interim licensing proposal and the different factual circumstances.”*

[A 5.35] Table 31 below sets out the proposed spectrum fees for each interim licence, and is based on the following:

- *the quantum and location of spectrum in each of the interim licences would reflect the corresponding existing A and B licence;*
- *the duration of the Interim 2.1 GHz A Licence would be 83 days;*
- *the duration of the Interim 2.1 GHz B Licence would be 14 days;*
- *the relevant spectrum fees for each of Vodafone’s and Eir’s current 2.1 GHz FDD licence are:*
 - *total SAF of €114.3 million for access to 2×15 MHz FDD over 20 years; and*
 - *annual SUF of €1,904,610 for 2×15 MHz of spectrum in each licence;*
- *these fees would be updated on a once-off basis to present day terms to take account of the change in the prices of goods and services since the grant of the existing A and B licences in 2002. Note: ComReg proposes to calculate the overall CPI change using the latest CPI data available at the time at which it would be making the proposed licensing regulations under the Wireless Telegraphy Act (currently expected circa Q4/2020).*

Table 31 of Document 19/59R: Proposed spectrum fees Interim 2.1 GHz A and B licences

	Existing 2.1 GHz FDD licence fees (for 2×15 MHz) (€)	Fees updated to current price levels (from 2002-2019) ¹⁰²³
Spectrum Access fee		
SAF for 20 year licence (2×15 MHz)	114,300,000	142,150,877.19
SAF on yearly basis (pro-rata)	5,715,000	7,107,543.86
SAF on daily basis (pro-rata)	15,657.53	19,472.72
Spectrum Usage Fee		
SUF on yearly basis (for 2×15 MHz)	1,904,610	2,368,696.26
SUF on daily basis (pro-rata)	5,218.11	6,489.58
Proposed Interim 2.1 GHz A Licence Spectrum Fee	1,732,678.44	2,154,871.04
Proposed Interim 2.1 GHz B Licence Spectrum Fee	292,259.01	363,472.22

A5.3 Summary of respondents' views to Annex 7 of Document 19/124 (and Document 20/32)

A 5.10 Three interested parties submitted responses to the proposal set out in Document 19/124 (being Eir, Vodafone and Three).

¹⁰²³ As noted above, ComReg proposes to calculate the overall CPI change using the latest CPI data available at the time at which it would be making the proposed licensing regulations under the Wireless Telegraphy Act.

Eir

A 5.11 In its response to Document 19/124, Eir submits in relation to paragraph 3.3 of the draft Decision:

- i. *eir assumes the proposed granting of licence(s) is to grant, in effect, an extension of Three's existing licences (or part(s) thereof) and will be undertaken in accordance with the principles in ComReg 19/124. If that is the case eir would have no issue with the proposed decision text provided it is made explicit that any such licence will expire on or before 15 October 2022. Please note eir's position on this matter is reserved until we have sight of and the opportunity to comment on the proposed 2.1 GHz Band Interim Licence and Early Liberalisation Regulations.*

Vodafone

A 5.12 In its response to Document 19/124, Vodafone submits:

- ii. *If eir do not agree to early surrender of their 2.1GHz licence then Time Slices are required but at a minimum the alignment of start dates for both Three licenses [sic] in the 2.1GHz band and Vodafone's license should be completed;*
- iii. *We would support the ComReg proposal that the expiry dates for Vodafone and Three licences in the 2.1GHz band should be aligned by the extension of both Three licences. Applying a fee for the extension of both Three licences with reference to the SUF currently paid by Vodafone and eir appears be a fair and reasonable proposal.*

Three

A 5.13 Three does not agree with ComReg's proposal and raised numerous various concerns and queries which, for ease of reference, have been broadly grouped under the following headings:

- submissions regarding ComReg's statutory objectives and rationale for the proposed grant of interim licences to Three;
- submissions regarding the proposed spectrum fees for any interim licences;
- Three's alternative spectrum fee proposal; and
- submissions regarding the likely effect of the Interim Licence Proposal upon Three (aside from the matter of ComReg's proposed spectrum fees), spectrum efficiency and end consumer services.

A5.3.1 Three's submissions regarding ComReg's statutory objectives and rationale for the Interim Licence Proposal

- iv. *[ComReg's proposal] requires that Three applies for, pays for, and is granted interim licences in order to provide continuity of licensing through the period of expiry to the commencement of the new licences. ComReg's objectives, including those relating to efficient use of spectrum, protection of users' interests, and avoidance of inefficient investment require that provision is made for such continuity. Three has a commercial requirement to continue to use this spectrum through the expiry of the existing licences into the new licence period. Without provision for continuity Three would be required to "switch-off" its equipment that uses this spectrum during the two gap periods, only to switch it back on again later. This would in turn mean loss of service to some existing customers and that Three would be required to take measures to try to mitigate that loss of service, which would also entail an unnecessary and inefficient investment.*
- v. *Three further notes:*
- a. *ComReg's spectrum management functions require that unnecessary disruption to consumers is avoided, and that inefficient investment is avoided. The gap in availability would cause unnecessary loss of service to some of Three's customers in circumstances where spectrum is available, equipment is installed and available to provide service, and Three is willing to provide service.*
 - b. *This consumer disruption is unnecessary.*
 - c. *It would be caused by ComReg setting an excessive spectrum fee. [This is addressed under the following heading.]*
- vi. *ComReg proposes to issue interim licences to Three that are unchanged from the original A licence and B licence, save for the removal of obsolete conditions and for price. It should be noted that these licences will only be applied for and issued in 2022, which is some time after the auction will have been completed (in contrast to the situation in 2012). By this time, all licences for mobile and broadband services will be liberalised-use licences. ComReg has clarified that it does not plan to amend the expiry date of the old licences (for which the access fee has already been paid), but to issue new licences. In this circumstance, it makes no sense to issue*

*an interim licence which is based on the old ones from the 3G era and whose terms were derived from a now outdated award process. ComReg should instead issue any interim licence based on the same template that is to be used to issue all licences under this consultation – liberalised use licences.*¹⁰²⁴

A5.3.2 Three's submissions regarding the proposed spectrum fees for any interim licences, including ComReg's approach to same

- vii. *Three remains of the view that ComReg's proposed interim licence fees are excessive, and that the basis for deriving them is erroneous. There are several important considerations that have been overlooked in developing this proposal:*
- a. *Both ComReg and DotEcon have indicated that the price to be charged for licences should be derived from the opportunity cost, and not the value to the licensee itself. Three agrees with this point and further adds that the price imposed should be no greater than the opportunity cost. This is the optimum price to ensure efficient assignment, as ComReg has no revenue generating objective and any charge above this would divert funds away from investment in services.*
 - b. *Given that no other operator will be in the position of being required to apply for interim licences, it is unlikely that any other user would place a significant real value on obtaining them, and so the opportunity cost can be expected to be quite low.*
 - c. *Both ComReg and DotEcon have indicated their expectation that the current market value of 2.1GHz spectrum is likely to be less than the fees based on the 2002/2007 licences [ComReg 19/124, paragraph 4.38; 19/124a, paragraph 8]. Three agrees that this is the case and is confident that the current market price is significantly lower than that which the historical 3G era licences would indicate. On this basis, the proposal to charge interim licence fees based on the 2002/2007 licences seem immediately to be at-odds with a price based on opportunity cost.*

¹⁰²⁴ Three similarly submits:

“When the time comes to issue these licences it would not seem to make sense to want to revert back, “skipping over” the more recently issued licences in favour of the ones that are from a bygone era.”

- d. *ComReg has mistakenly assumed that there is no market mechanism available to determine the prices that should apply for these interim licences. There will exist information on market derived prices for this spectrum in this same time slice by the time it is necessary for Three to apply for the interim licences. Given the consideration in the previous bullet, it is safe to say that these prices would represent an upperbound limit for the opportunity cost of the interim licences.*
 - e. *ComReg and DotEcon have already proposed a detailed methodology to extract the market based price for 2.1GHz spectrum from the award for the purpose of determining if it would be necessary for Eir to pay an additional fee to liberalise its licence in Time Slice 1. This same methodology, adjusted for duration, can be applied to determine the upper-bound of the interim licence fee.*
- viii. *There are inconsistencies in ComReg's approach to setting the interim licence fees:*
- a. *It is proposed to set the fee by reference to the remaining Vodafone and Eir licences, adjusting for CPI. Those licences differ in their commencement date by approximately 5 years, meaning there is no single appropriate time over which a CPI adjustment can be calculated.*
 - b. *No operator currently pays 2.1GHz licence fees on the same basis that ComReg proposes, because there is no index adjustment to the Vodafone or Eir licence.*
 - c. *The two licences that will expire are different, one was an A licence and the other a B licence. The terms and conditions are different and so the original values and licence fees are different. If reference is to be made to the historical licences for price, then the same price cannot be applied to both.*

A5.3.3 Three's alternative interim licence fee proposal

- ix. *It is further noted that by the time these interim licences are to be issued, ComReg will have completed the auction and awarded spectrum in the 2.1GHz band in Time Slice 1, which will have established the market value for this spectrum. This can be used to establish the relevant upper-bound opportunity cost for the interim licences in the same way as it is to be used to determine if Eir is required to pay a liberalisation fee for its 2.1GHz licence during Time*

Slice 1. Three believes this is a reasonable basis on which to determine the interim licence fee and is confident that it will be significantly less than the fees currently proposed by ComReg. ComReg's own estimate as provided by DotEcon supports this conclusion.

Submissions regarding the likely effect of the Interim Licence Proposal upon Three (aside from the matter of ComReg's proposed spectrum fees), spectrum efficiency and end consumer services.

- x. *[i]f ComReg does not amend the current proposed pricing for interim licences they would likely prohibit Three from seeking interim licences for all 6 blocks for the full extent of the licence gap. This would unnecessarily leave useable spectrum fallow for a period (contrary to ComReg's objective to ensure efficient use of spectrum), would cause unnecessary cost to Three, and would cause significant customer disruption. Rather than charge an excessive licence fee, it would be better to include all of the 2.1GHz spectrum in the award with different commencement dates as determined by the expiry of the current licences. This approach may add some complexity to the award but is superior to ComReg's current proposal.*

A5.4 ComReg's assessment of respondents' views

A 5.14 ComReg is grateful for the views received on its Interim Licence Proposal since the publication of Document 19/124.

A 5.15 In that regard, ComReg firstly notes Vodafone's support for the proposal and Eir's observation in relation to paragraph 3.3 of the draft Decision (Chapter 9 of Document 19/124). In relation to the latter, ComReg confirms that the position set out in paragraph 3.3 of the draft Decision was to be read in conjunction with the proposals set out in Annex 7 of same document. ComReg also observes that the expiry dates of the proposed interim licences were set out in the relevant draft licensing regulations which accompanied the draft Information Memorandum (i.e. Document 20/32) and that Eir did not raise this issue again in its response to the Document 20/32.

A 5.16 In relation to Three's submissions, ComReg addresses same using the broad groupings identified at paragraph A 5.13 above and by reference to the italicised numbers of the points raised.

A5.4.1 Assessment of Three's submissions regarding ComReg's statutory objectives and rationale for the Interim Licence Proposal

- A 5.17 In relation to **points (iv) and (v)** (regarding the various objectives cited by Three), ComReg notes that, in essence, Three agrees with ComReg's proposal to grant interim rights of use and so does not propose to consider those points further.
- A 5.18 In relation to **point (vi)** (i.e. that, instead of basing its proposals on the existing 2.1 GHz licensing framework, ComReg should issue interim licences based on the "template" for new liberalised 2.1 GHz Band rights of use), ComReg outlines its response below.
- A 5.19 First, Three's observation ignores the critical fact that the proposed interim rights would come in to being and fully expire before any new liberalised, long term 2.1 GHz Band rights granted on foot of the award commenced. Indeed, that is the intended purpose of the proposed interim rights - to enable Vodafone's and Three's existing rights to terminate in a more orderly fashion (and thereby reduce undue complexity in the proposed award) in advance of the commencement of entirely new, long term rights in that band.
- A 5.20 Second, it also follows that the relevant period for the consideration of the particulars of the proposed interim rights - such as in relation to licence conditions and spectrum fees – in the context of ComReg's statutory obligations (such as non-discrimination and proportionality), is also the period of the proposed interim rights themselves.
- A 5.21 Third, there would be no apparent objective justification for basing any short term continuation of Three's existing rights of use on an entirely new licensing regime (e.g. fees, licence conditions) the rights for which would not commence until following the expiry of the proposed interim rights and would last for approximately 18 years beyond same.
- A 5.22 Fourth, it would not appear proportionate to make such additional changes to the substance of Three's existing rights of use (such as in relation to licence conditions) when they would not be necessary for the realisation of the intended purpose of the proposed interim rights.
- A 5.23 Finally, and to the extent that Three's claims are predicated on it obtaining some likely benefit relative to the existing licensing regime, then this would also likely discriminate against other 2.1 GHz Band licensees holding rights of use for the same time period as the proposed interim rights (i.e. Vodafone and Eir). Indeed, Eir's existing 2.1 GHz Band rights continue until 2027 and ComReg does not propose to amend those rights of use to reflect the new licensing regime.
- A 5.24 Accordingly, ComReg does not find this point persuasive and does not

consider it further.

A5.4.2 Assessment of Three's submissions regarding the proposed spectrum fees for any interim licences, including ComReg's approach to same

A 5.25 As a preliminary observation, ComReg refers to the rationale for the proposed spectrum fees set out in Annex 5 of Document 19/59R and to its assessment of Three's submission in respect of same in Annex 7 of Document 19/124. ComReg notes that Three does not appear to have squarely addressed the substance of ComReg's assessment.

A 5.26 Without prejudice to this general view, ComReg outlines its response to the concerns and queries raised by Three in its response to Document 19/124.

Three's submission regarding proposed spectrum fees – point (vii)(a) and (b) (regarding Three's claim that the opportunity cost of any interim rights "can be expected to be quite low")

A 5.27 In relation to point **(vii)(a) and (b)** (regarding opportunity cost pricing and Three's view that the opportunity cost of any interim rights "*can be expected to be quite low*"), ComReg outlines its response below.

A 5.28 First, ComReg observes that Three appears to be referencing comments made in the context of the determination of spectrum fees for longer term rights of use and where there would be different potential acquirers for such rights of use.

A 5.29 Second, ComReg further observes that the proposed grant of interim licences is, clearly, a materially different set of circumstances. For example:

- a) ComReg is proposing to make a direct and exclusive administrative assignment of valuable spectrum rights to Three, in contrast to a competitive award where, for example, there may be alternative acquirers of the spectrum rights, and considerations around an efficient assignment of rights of use between the potential acquirers would arise;
- b) as noted in Document 19/59R, there are also no unassigned 2.1 GHz rights in the same period as the proposed interim rights by which to determine the "market value" of the proposed interim rights; and
- c) in that context, opportunity cost pricing is not realistic or feasible.

A 5.30 Third, this does not mean, however, that the proposed interim rights of use are of little or no economic worth. In that regard, ComReg recalls:

- a) that Three would be provided rights of use for additional periods beyond the 20 year duration set out in the existing licensing regime (and these additional periods would not be available to other existing 2.1 GHz licensees), in circumstances where:
 - i. it has an extensive pre-existing network with which to readily make use of the proposed interim spectrum rights and generate income from same; and
 - ii. it presently has double the 2.1 GHz spectrum rights of the other 2.1 GHz licensees;
- b) that an existing 2.1 GHz licensee (i.e. Eir) is still paying considerable sums for its licence. See Table 30 of Document 19/59R; and
- c) Three's 2014 submission to ComReg regarding the proposed grant of interim 900 MHz licences to Vodafone and O2 (as replicated in footnote 492 of Document 19/124) where it criticised the indexing of interim licence fees to pre-existing fees as resulting in interim licence fees which were too low.

A 5.31 Fourth, ComReg also recalls that in the 2012 MBSA it applied different spectrum pricing methodologies for (a) its award of long term rights of use (i.e. determined using a CCA format with opportunity cost pricing) and (b) the spectrum fees for 900 MHz interim rights of use for Vodafone and O2, which were set by reference to the fees of the other licensee holding 900 MHz rights for the same time period (i.e. Eir).

A 5.32 In relation to **point (vii)(c)**, ComReg recalls that it addressed this issue in its response to Document 19/59R (addressed at paragraph A 7.17 of Document 19/124) and observes that Three has not squarely addressed these considerations. ComReg considers that it has already adequately addressed this point and so does not consider it further.

A 5.33 In relation to **point (vii)(d)**, ComReg observes that the prices determined in the Proposed Award for new, long term 2.1 GHz licences are for the period following the expiry of the proposed interim rights of use and would be determined on a materially different basis (e.g. assignment mechanism, duration, licence conditions, etc). Accordingly, such prices are not an appropriate point of reference against which to benchmark 2.1 GHz Band Interim Licence fees in the present case. ComReg also refers to bullet point three of paragraph A 7.17 of Document 19/124. Accordingly, ComReg does not find this point persuasive and does not consider it further.

A 5.34 In relation to **point (vii)(e)**, ComReg refers to paragraph A 7.19 of Document 19/124 and also observes that, in contrast to the proposed interim rights of

use (which would have expired before the commencement of Time Slice 1), Eir's existing 2.1 GHz rights of use span the entirety of Time Slice 1 (for which there would be unassigned 2.1 GHz rights that could be used to determine if any additional sum ought to be paid by Eir for liberalising its rights). Accordingly, it would not be appropriate to apply this methodology to the setting of 2.1 GHz Band Interim Licence fees in the present case. In addition, ComReg refers to bullet point paragraph A.523 above regarding the potential to discriminate against other 2.1 GHz Band licensees holding rights of use for the same time period as the proposed interim rights (i.e. Vodafone and Eir) and, further, that Eir's existing 2.1 GHz Band rights continue until 2027 and ComReg does not propose to amend those rights of use to reflect the new licensing regime.

A 5.35 In relation to point **(viii)(a)**, ComReg recalls that Three's current A and B licences commenced in July and October of 2002, respectively. Upon further consideration, and rather than applying a common CPI adjustment date as previously proposed, ComReg recognises that it would be more appropriate for the CPI adjustment to any interim rights to reflect the particular commencement of the corresponding existing A and B licences in 2002. ComReg provides an updated table at the end of this Annex.

A 5.36 In relation to point **(viii)(b)**, ComReg firstly refers to paragraphs A 7.15 - 7.16 of Document 19/59R where it noted that its proposals are consistent with its previous practice in this area. ComReg also observes that, whilst the purpose of the interim licence proposal is to effectively maintain the substance of Three's existing rights to enable co-termination with Vodafone's 2.1 GHz licence, Three would nevertheless be provided with rights of use for additional periods beyond the 20 year duration compared to other existing 2.1 GHz existing licensees. In that context, it would be appropriate to take account of the change in the prices of goods and services since the commencement of the respective existing A and B licences in 2002.

A 5.37 In relation to point **(viii)(c)**, ComReg refers to paragraphs A 5.33 – A 5.34 of Document 19/59R and, in particular, that the proposed spectrum fees for any interim rights to Three should approximate to fees already payable by its direct competitors who would have existing 2.1 GHz rights of use for the same time period as the proposed interim rights of use (i.e. Vodafone and Eir). ComReg also recalls that the existing fees for Vodafone and Eir are the same for Three's B Licence (see Table 31 in Document 19/59). Furthermore, while there are differences in the licence conditions between Three's A and B Licence (and primarily with respect to the MVNO Access Condition in the A Licence¹⁰²⁵), ComReg does not consider that these differences are likely

¹⁰²⁵ In Schedule 5 of Part 7 of the A Licence: <https://www.comreg.ie/media/2018/12/M3G1011.pdf>

to have any material bearing upon the benefit to Three of the additional periods beyond the 20 year duration which are unavailable to the other two MNOs.¹⁰²⁶ Accordingly, ComReg does not find this point persuasive and does not consider it further.

Three's alternative spectrum fee proposal

A 5.38 In relation to Three's alternative spectrum fee proposal, ComReg refers to its previous assessments, including those set out above, and would highlight the following:

- a) Three's proposal ignores the critical fact that the prices determined in the Proposed Award for entirely new, long term liberalised 2.1 GHz rights (e.g. for Time Slice 1) are not for the same temporal periods as the proposed interim rights (and that there is no unassigned 2.1 GHz rights in the same time period against which to determine the appropriate market price for the period of the interim rights). Accordingly, Three's spectrum fee methodology is not a suitable alternative for setting interim licence fees in the present case;
- b) in that regard, ComReg also observes that Three has also not reconciled the contradiction identified by ComReg at paragraph A 7.17 in Document 19/124¹⁰²⁷; and
- c) inherent in Three's proposal is the risk that Three would be (a) provided with rights of use for additional periods beyond the 20 year duration which are unavailable to the other two MNOs and (b) at the same time paying licence fees which are less than those paid by the other two MNOs. Accordingly, its proposal raises clear risks around distortions to competition and non-discrimination which Three does not address in its submission.

A 5.39 Accordingly, ComReg does not consider Three's alternative spectrum fee

¹⁰²⁶ For example, and in relation to the MVNO Access Condition in the A Licence:

- ComReg is not aware of any undertaking successfully availing of the MVNO Access Condition since the issue of the A Licence in 2002; and
- the MVNO Access Condition is limited to providing access to Three's GSM (or equivalent) and 3G network and is therefore highly unlikely to be attractive to any prospective MVNO; and
- the proposed corresponding Interim Licence would, in any event, expire in October 2022.

¹⁰²⁷ In particular:

"That is, whereas Three appears to be claiming that ComReg's benchmark figures are sufficiently robust by which to support a lower spectrum fee for any 2.1 GHz interim rights of use it might be granted on foot of ComReg's proposal, it also appears to be of the view, in the same matter and for the same time period, that there is "no reliable method to derive the appropriate fee for liberalisation during the period until 15 October 2022" (which presumably is the difference between the price of liberalised 2.1 GHz rights (currently unknown) and unliberalised 2.1 GHz spectrum rights (known));"

proposal to be a viable or appropriate alternative methodology for determining interim licence fees in the present case.

A 5.40 ComReg also notes DotEcon's consideration of this issue in its report.

Submissions regarding the likely effect of the Interim Licence Proposal upon Three (aside from the matter of ComReg's proposed spectrum fees), spectrum efficiency and end consumer services

A 5.41 In relation to **point (x)** raised by Three, ComReg outlines its response below.

A 5.42 First, ComReg has set out the basis for the determination of the appropriate spectrum fees for the proposed interim rights in accordance with its statutory obligations¹⁰²⁸ and having had regard to Three's various concerns expressed in relation to same;

A 5.43 Second, ComReg is satisfied that its methodology for the setting of interim licences would not result in fees which are 'excessive' for the reasons outlined above, including that:

- i. Three would be provided additional periods beyond the 20 year duration set out in the existing licensing regime and which additional periods would not be available to its direct competitors holding existing 2.1 GHz rights in the same time period;
- ii. these additional periods are being provided where Three:
 - A. has an extensive pre-existing network with which to readily make use of the proposed interim spectrum rights and generate income from same; and
 - B. also presently has double the 2.1 GHz spectrum rights of the other 2.1 GHz licensees;
- iii. the interim fees proposed approximate those being paid by its direct competitors holding 2.1 GHz rights in the same time period (i.e. Vodafone and Eir) and, indeed, the fees for Vodafone and Eir are the same for Three's B Licence¹⁰²⁹;

¹⁰²⁸ See, in particular, paragraphs A.5.33 – A 5.35 of Document 19/59R.

¹⁰²⁹ Noting ComReg's view that differences in the licence conditions in the A and B Licences are unlikely to have any material bearing upon the benefit to Three of the additional periods beyond the 20 year for the A Licence.

- iv. furthermore, Eir (the smallest MNO and with half the 2.1 GHz holdings of Three) will continue to pay its existing 2.1 GHz fees until 2027, well beyond the expiry of the proposed interim licences; and
- v. the application of CPI indexation (to take into account changes in the prices of goods and services) is commonplace, generally, and in the context of ComReg's previous interim licence regimes¹⁰³⁰ and should, in any event, be viewed in the context of the additional periods that would be provided to Three (and not available to its direct competitors).

A 5.44 Third, ComReg has also carefully considered Three's alternative spectrum fee proposal and, for the reasons outlined above, does not consider it to be a viable or appropriate alternative methodology for setting interim licence fees in the present case.

A 5.45 Finally, and given the above, ComReg observes that it is a commercial matter for Three to determine whether it wishes to avail of the additional periods (over and above the 20 years that would not be available other existing licensees) that ComReg is proposing to make available to it and on the terms proposed for same.

A 5.46 Accordingly, ComReg does not find this point persuasive.

A5.5 ComReg's final position

A 5.47 Having carefully considered the submissions received to Document 19/124 and other relevant material, ComReg's final position on its interim licence proposals is as follows:

- a) upon receipt of an appropriate application from Three, grant it interim 2.1 GHz rights of use - comprised of some or all of the frequencies in its existing "A Licence" – which would commence on 25 July 2022 and fully expire on 15 October 2022 (Interim 2.1 GHz A Licence);
- b) upon receipt of an appropriate application from Three, grant it interim 2.1 GHz rights of use - comprised of some or all of the frequencies in its existing "B Licence" – which would commence on 2 October 2022 and fully expire on 15 October 2022 (Interim 2.1 GHz B Licence);

¹⁰³⁰ Again noting that Three's 2014 submission to ComReg regarding the proposed grant of interim 900 MHz licences to Vodafone and O2 (as replicated in footnote 492 of Document 19/124) where it criticised the indexing of interim licence fees to pre-existing fees as resulting in interim licence fees which were too low.

- c) attach conditions to both the Interim 2.1 GHz A and B licences consistent with the current licence conditions in each of the existing “A Licence” and “B Licence”, respectively; and
- d) calculate the licence fees for each of the Interim 2.1 GHz A and B licences by reference to the licence fees for Vodafone’s and Eir’s existing 2.1 GHz licences¹⁰³¹, but updated to current day levels by reference to the overall CPI change since the commencement of the respective Three A and B licences. In that regard, ComReg proposes to calculate the overall CPI change using the latest CPI data available at the time at which it makes the licensing regulations under the Wireless Telegraphy Act (a draft of which was made available for comment alongside the draft information memorandum (Document 20/32)).

¹⁰³¹ Noting also that these are the same as Three’s existing B licence.

Table 22. Interim 2.1 GHz Licence Fees

	A Licence	B Licence
SAF 20 Years (no CPI adjustment)	114,300,000	114,300,000
SAF Annually (no CPI adjustment)	5,715,000	5,715,000
SAF Dailly (no CPI adjustment)	15,658	15,658
SUF Anually (no CPI adjustment)	1,904,610	1,904,610
SUF Daily (no CPI adjustment)	5,218	5,218
Duration (days)	83	14
CPI adjustment since commencement	22.6% ¹⁰³²	20.7% ¹⁰³³
Interim Licence Fee (€) (2 × 15 MHz)	2,124,264	352,757

¹⁰³² The CPI change from July 2002 to October 2020.

¹⁰³³ The CPI change from October 2002 to October 2020.

Annex: 6 Final '2.1 GHz Band Liberalisation' RIA

Introduction

- A 6.1 In Annex 8 of Document 19/124 ComReg set out a draft RIA on the options regarding liberalisation prior to the expiry of the existing 2.1 GHz rights of use, which are not liberalised and which expire in 2022 (Three and Vodafone) and 2027 (Eir).
- A 6.2 This Annex sets out the RIA, amended in light of comments received in response to Document 19/124, 20/32, 20/56 and 20/78 and market developments since that time.

RIA Framework

- A 6.3 The purpose, structure and scope of the RIA framework is discussed at the commencement of the 'Spectrum for Award' RIA which is set out in Annex 4 and is not repeated here.

Background

- A 6.4 By way of background, ComReg sets out some information on the following which are relevant to the assessment provided in this RIA.
1. European Commission Decision 2012/688/EU, as amended by European Commission Decision (EU) 2020/667;
 2. ComReg's preliminary consultation on the liberalisation of the paired terrestrial 2 GHz spectrum band (Document 14/65)¹⁰³⁴;
 3. Market developments since 2014; and
 4. Technical benefits of liberalisation.

European Commission Decision 2012/688/EU

- A 6.5 In November 2012, the European Commission (EC) adopted a decision on the harmonisation of the frequency bands 1920 – 1980 MHz and 2110 – 2170 MHz (i.e. 2.1 GHz Band) for terrestrial systems capable of providing electronic

¹⁰³⁴ <https://www.comreg.ie/publication/preliminary-consultation-liberalisation-of-the-paired-terrestrial-2-ghz-spectrum-band/>

communications services in the Union (Decision 2012/688/EU).

- A 6.6 Among other things, Decision 2012/688/EU requires Member States to “designate and make available, on a non-exclusive basis, the paired terrestrial 2 GHz band for terrestrial systems capable of providing electronic communications services, in compliance with the parameters set out in the Annex” to that decision.¹⁰³⁵
- A 6.7 The technical conditions set out in the Annex to Decision 2012/688/EU, and as amended by Decision (EU) 2020/667, are derived from CEPT Report 72 and are presented in the form of frequency arrangements¹⁰³⁶ for the band and Block Edge Masks¹⁰³⁷ for base stations and terminal stations¹⁰³⁸.
- A 6.8 These technical conditions are technology-neutral and allow technologies other than the UMTS technology to be deployed in the 2.1 GHz Band (e.g. LTE).

Consultation Document 14/65

- A 6.9 In Document 14/65¹⁰³⁹, ComReg sought views from interested parties on the implementation of Decision 2012/688/EU in Ireland (i.e. “liberalisation”) in the context of ComReg’s statutory functions, objectives and duties in relation to the radio frequency spectrum.
- A 6.10 ComReg sought views on the potential impact of such liberalisation particularly in terms of:
- the benefits to consumers in terms of furthering their interests by, for example, encouraging innovation, investment, and the availability and use of mobile services in Ireland; and result in better choice, price, quality of service and value for money; and/or
 - whether liberalisation might give rise to a material risk of a distortion of competition to the detriment of consumers such that any benefits resulting from liberalisation would be outweighed by the detriment to consumers resulting from any such a distortion of competition.

¹⁰³⁵ Article 2(1) of Decision 2012/688/EU, Decision (EU) 2020/667 replaces the Annex to Decision 2012/668/EU and is derived from CEPT Report 72.

¹⁰³⁶ Frequency arrangements refer to the band plan and duplex mode of operation.

¹⁰³⁷ A Block-Edge Mask (BEM) “is an emission mask that is defined, as a function of frequency, relative to the edge of a block of spectrum for which rights of use are granted to an operator. It consists of in-block and out-of-block components which specify the permitted emission levels over frequencies inside and outside the licensed block of spectrum, respectively.” (Source Annex to Decision 2012/688/EU)

¹⁰³⁸ In Decision 2012/688/EU the BEM for the terminal station consists only of an in-block component.

¹⁰³⁹ <https://www.comreg.ie/publication/preliminary-consultation-liberalisation-of-the-paired-terrestrial-2-ghz-spectrum-band/>

A 6.11 ComReg received three responses¹⁰⁴⁰ to Document 14/65. ComReg referred to these responses in Document 19/59R and again in formulating its views on stakeholders likely views with regard to each of the regulatory options.¹⁰⁴¹ Operators have since provided updated views in response to Documents 19/59R, 19/124, 20/32, 20/56 and 20/78 and ComReg considers that the more recent responses are likely to better reflect the current views of stakeholders. In that regard, ComReg addresses the specific issues raised by respondents on the '2.1 GHz Band Liberalisation' RIA in Chapter 4. However, the 'Impact on Stakeholders' section below has been updated to take account of the most recent views.

Market developments since 2014

A 6.12 Below, ComReg briefly outlines certain developments since the publication of Document 14/65 and that are likely to be relevant to the assessment that follows in this RIA. These developments are likely to provide information on the extent to which competitive distortions might occur over the period set out in the regulatory options below.

LTE rollout

A 6.13 All MNOs have now launched LTE but in bands other than the 2.1 GHz Band and coverage is widespread across the country. For example, a European Commission study on broadband coverage in Europe published in October 2019 found that 96% of the homes in Ireland had LTE coverage¹⁰⁴² and this is illustrated in ComReg's outdoor mobile coverage map.¹⁰⁴³

A 6.14 This has resulted in a large increase in the number of 4G subscribers. For example, between Q3 2014 and Q3 2020, the proportion of 3G subscriptions has fallen from 69% to 31.5% while the proportion of 4G subscriptions has increased from 9% to 62% over the same period.¹⁰⁴⁴

3.6 GHz Award

A 6.15 The 3.6 GHz Award resulted in the successful assignment of all 350 MHz of spectrum available to five winning bidders and services are beginning to be rolled out across the country.¹⁰⁴⁵ This award has significantly reduced relative spectrum asymmetry between MNOs:

¹⁰⁴⁰ ComReg Document 19/59f.

¹⁰⁴¹ Summaries of these views are provided in Document 19/59R.

¹⁰⁴² <https://ec.europa.eu/digital-single-market/en/news/study-broadband-coverage-europe-2018>

¹⁰⁴³ <https://www.comreg.ie/outdoor-mobile-coverage-map/>

¹⁰⁴⁴ ComReg Quarterly Key Data Portal. <https://www.comreg.ie/industry/electronic-communications/data-portal/>

¹⁰⁴⁵ <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/3-6ghz-band-spectrum-award/>

- a) Prior to the 3.6 GHz Award (and at the time of Document 14/65):
 - i. the spectrum asymmetry between Eir and Three was **80 MHz or 20%** of total spectrum holdings.
 - ii. the spectrum asymmetry between Vodafone and Three was **60 MHz or 15%** of total spectrum holdings.
- b) Following the 3.6 GHz Award and the assignment of 290 MHz between MNOs¹⁰⁴⁶:
 - i. the spectrum asymmetry between Eir and Three was **105 MHz or 14%** of total spectrum holdings.
 - ii. the spectrum asymmetry between Vodafone and Three was **55 MHz or 8%** of total spectrum holdings.

Market shares

A 6.16 The market share of the three MNOs have been relatively static over the period since the merger of Three and O2 (Q2' 2014 – Q3' 2020).¹⁰⁴⁷ In overview¹⁰⁴⁸:

- a) Vodafone's market share remains at around 38% in Q3 2020 and it has added 415,262 subscribers.
- b) Three's market share has risen to around 36% and it has added 410,848 subscribers.
- c) Eir's market share has fallen from 18.3% in Q2 2014 to 17% in Q3 2020 but it has added 128,815 subscribers.

Additional rights of use

A 6.17 ComReg notes that proposals to assign additional liberalised rights of use have significantly progressed, with this Proposed Award due to take place in 2021. An additional 350 MHz of liberalised rights of use is proposed to be released (including 2.3 GHz and 2.6 GHz Bands, which are likely to become more substitutable for the 2.1 GHz Band in the medium to long term). This follows the 350 MHz already released in the 2017 3.6 GHz Award.

COVID-19 Temporary Spectrum Management Measures

A 6.18 As discussed in Chapter 2 of this document, temporary spectrum rights of use have been issued for spectrum in the 700 MHz Duplex and 2.1 GHz Band. These

¹⁰⁴⁶ This does not include any temporary rights of use assigned as part of ComReg's Temporary Spectrum Management Measures.

¹⁰⁴⁷ Tesco Mobile gained over 2% market share (Q2 2014 – Q3 2020).

¹⁰⁴⁸ ComReg QKDR Portal (Q2'14 – Q3'20)

licences expire on 7 January 2020 and any renewal licences issued will expire on 1 April 2020 at the latest.

- A 6.19 At the outset, it is worth noting that as part of ComReg's Temporary Spectrum Management Measures, ComReg has issued new temporary licences which include liberalised 2.1 GHz rights of use. Note that these rights of use do not involve the liberalisation of existing rights of use, but rather, new and separate rights of use. In that regard, this RIA concerns whether to liberalise **existing rights of use** and when licensees would be able to apply for any such liberalisation.
- A 6.20 Furthermore, it should be noted that this RIA has been conducted on the basis of the Temporary Spectrum Management Measures expiring **before the Proposed Award**. To the extent that future circumstances require a further renewal of the Temporary Spectrum Management Measures (including liberalising 2.1 GHz rights of use) up to the assignment of new rights of use in the Proposed Award then some of the issues in relation to the regulatory options may not be relevant.

Technical benefits of liberalisation

- A 6.21 ComReg notes that any distortions to competition that may arise would be related to the particular benefits that could be obtained from liberalisation. By allowing the deployment of technologies other than UMTS (and LTE/5G in particular), liberalisation should provide several technical benefits ultimately leading to consumer benefits through (a) higher speeds and (b) increased capacity:

a) **In relation to (a)**, higher peak data rates and user throughput is primarily the result of wider channel bandwidths and carrier aggregation. This allows operators to provide higher speed services. For example:

- i. The peak data rate¹⁰⁴⁹ for HSDPA (Release 7) is 14.4 Mbit/s, with a peak user data rate of 13.4 Mbit/s.¹⁰⁵⁰
- ii. The peak data rate for LTE Advanced (Release 10) is 3 Gbps (DL) and 1.5 Gbps (UL)¹⁰⁵¹.
- iii. The minimum data rate requirements for Release 15 (first 5G standard)¹⁰⁵² is 20 Gbps (DL) and 10 Gbps (UL)¹⁰⁵³.

¹⁰⁴⁹ Peak data rate is the maximum achievable data rate under ideal conditions (in bit/s), which is the received data bits assuming error-free conditions assignable to a single mobile station.

¹⁰⁵⁰ <http://www.3gpp.org/technologies/keywords-acronyms/99-hspa>

¹⁰⁵¹ <http://www.3gpp.org/technologies/keywords-acronyms/97-lte-advanced>

¹⁰⁵² <https://www.3gpp.org/release-15>

¹⁰⁵³ <https://5g-ppp.eu/wp-content/uploads/2020/02/5G-IA-Final-Evaluation-Report-3GPP-1.pdf>

- b) **In relation to (b)**, improved spectrum efficiency provides greater capacity in a cell. Spectral efficiency is a good indicator of the capacity of a particular technology and the ability of operators to deliver additional capacity at a site. This allows operators to increase capacity and reduce or eliminate capacity constraints in certain areas. For example:
- i. The minimum peak spectral efficiencies requirements for Release 15 (first 5G standard)¹⁰⁵⁴ of 30 bit/s/Hz (downlink) and 15 bit/s/Hz (uplink)¹⁰⁵⁵.
 - ii. A maximum spectral efficiency¹⁰⁵⁶ of 30 bit/s/Hz for LTE Advanced (Release 10).¹⁰⁵⁷
 - iii. A maximum spectral efficiency of 4.5 bit/s/Hz for HSDPA (Release 7).¹⁰⁵⁸

Identify the policy issues and identify the objectives (Step 1)

Policy issues

- A 6.22 The primary policy issue is to determine whether and, if so, when existing rights of use in the 2.1 GHz Band should be liberalised to enable the deployment of technologies compatible with the technical conditions set out in Decision 2012/688/EC (as amended), in the context of ComReg's statutory functions, objectives and duties in relation to the radio frequency spectrum.

Objectives

- A 6.23 The focus of this RIA is to assess the impact of the proposed measure(s) (see regulatory options below) on industry stakeholders, and on competition and consumers. In that way, it allows ComReg to identify and implement the most appropriate and effective means to assign spectrum rights of use, while still allowing ComReg to achieve its objectives of:
- a) liberalisation of the 2.1 GHz Band for terrestrial systems capable of providing ECS, in compliance with the parameters set out in 2.1 GHz Decision;

¹⁰⁵⁴ <https://www.3gpp.org/release-15>

¹⁰⁵⁵ <https://5g-ppp.eu/wp-content/uploads/2020/02/5G-IA-Final-Evaluation-Report-3GPP-1.pdf>

¹⁰⁵⁶ The peak spectrum efficiency is the highest data rate normalised by overall cell bandwidth assuming error-free conditions

¹⁰⁵⁷ 3GPP TR 36.913 V10.0.0 (2011-03) Technical Report. P9.

¹⁰⁵⁸ ftp://www.3gpp.org/tsg_ran/WG1_RL1/...20/.../R1-01-0471.pdf

- b) assigning liberalised rights of use in the 2.1 GHz Band with other complementary and substitutable bands in the Proposed Award (i.e. 700 MHz Duplex, 2.3 GHz Band and 2.6 GHz Band);
- c) promoting competition and ensuring that there would be no distortion or restriction of competition in the electronic communications sector by, amongst other things:
 - i. ensuring that users derive maximum benefit in terms of choice, price and quality;
 - ii. ensuring that there is no distortion or restriction of competition in the electronic communications sector;
 - iii. encouraging efficient use and ensuring effective management of radio frequencies;
- d) encouraging efficient investment in infrastructure, promoting innovation and ensuring the efficient use and effective management of the radio frequency spectrum; and
- e) promoting the interest of economic development of the State and electronic communications sector.

A 6.24 ComReg's other overarching objectives are to contribute to the development of the internal market and to promote the interests of users within the Community. ComReg also notes that, in achieving its objectives, its ultimate aim is to choose regulatory measures which maximise the benefits for consumers in terms of price, choice and quality.

Identifying the regulatory options

A 6.25 The two broad options available are to liberalise, or not, some or all existing 2.1 GHz rights of use. In relation to the timing of any such liberalisation, ComReg is of the view that the earliest time at which such liberalisation could reasonably be provided for would be around the time of the substantive decisions concerning the proposed award of a limited number of individual rights of use in the proposed frequency bands. This view is informed by several factors, including that:

- a) any decision to liberalise existing rights of use in the 2.1 GHz Band (by way of licence amendment) is subject to consultation and response to same which could take up to 1 year;
- b) the potential for distortions to competition from any liberalisation would reduce as one gets closer to the time of the Proposed Award; and

- c) the views of DotEcon that it may be preferable to wait until at least the point at which substantive decisions have been made regarding this award and the liberalisation process, to ensure that all operators will have reasonable clarity in advance with regard to the terms of liberalising their own licences.¹⁰⁵⁹

A 6.26 In light of the above, three regulatory options appear to be available:

- **Option 1:** Do not liberalise any 2.1 GHz rights of use prior to expiry of same¹⁰⁶⁰;
- **Option 2A:** Provide the option for all existing licensees to liberalise some or all existing 2.1 GHz rights of use from the time of the substantive decisions concerning the present Proposed Award; and
- **Option 2B:** Provide the option for all existing licensees to liberalise some or all existing 2.1 GHz rights of use following the assignment of new rights of use in the proposed frequency bands in the Proposed Award.

A 6.27 ComReg notes that under Option 2A and 2B the licensee would retain full discretion on when to liberalise existing 2.1 GHz rights of use. The difference between Option 2A and 2B concerns when the option to liberalise would be made available to all licensees.

A 6.28 In relation to Options 2A and 2B, ComReg considers whether a material distortion to competition would be likely to arise from the liberalisation of all 2.1 GHz rights of use. ComReg only considers it necessary to assess whether to liberalise a portion of an existing licensee's rights of use (i.e. 2 x 15 MHz each as previously suggested by Eir) if a material distortion to competition would be likely to arise from liberalising all rights of use.

A 6.29 Further, ComReg notes that a relevant consideration in determining the preferences of stakeholders relates to whether liberalisation fees should apply and, if so, how and when such fees should be calculated. In that regard, Chapter 4 sets out ComReg's views on the liberalisation fees that would apply in the event of liberalisation being the preferred option. In summary, ComReg is of the view that:

¹⁰⁵⁹ DotEcon Award Design Report (Document 19/59a), p20.

¹⁰⁶⁰ The various licence expiries are set out below.

- Three's rights of use in its "A licence" expire on 24 July 2022, and its "B Licence" expire 1 October 2022;
- Vodafone's rights of use expire 15 October 2022; and
- Eir's rights of use expire 11 March 2027.

- a) for the period up until 15 October 2022 it would not be appropriate to apply fees for the early liberalisation of licences; and
- b) while liberalisation fees are unlikely to be required for Eir for the period 16 October 2022 – 11 March 2027, it would be prudent nonetheless to have in place a process that would apply appropriate liberalisation fees, if in the unlikely event, the new 2.1 GHz liberalised rights of use fees were higher than fees currently being paid by Eir for its unliberalised rights of use.

A 6.30 Finally, ComReg notes the following assumptions are relevant to the timing of Option 2A and Options 2B:

- a) ComReg's proposal to align the expiry of Vodafone's and Three's existing rights to October 2022¹⁰⁶¹;
- b) any liberalised existing rights of use would be available to Three and Vodafone until October 2022 and until October 2027 for Eir;
- c) ComReg's substantive decisions on the Proposed Award would be made in 2020; and
- d) the time between ComReg's substantive decisions on the Proposed Award and the commencement date of any new rights of use granted on foot of the Proposed Award is likely to be between 6-12 months (noting that this period was circa 11 months in the case of the 3.6 GHz Award).

Identification of stakeholders

A 6.31 Stakeholders consist of two main groups:

- consumers (for the purposes of this RIA, consumers include both business and residential consumers), and
- industry stakeholders.

A 6.32 There are two key industry stakeholders in relation to the matters considered in this Annex:

- existing MNOs who have spectrum rights of use in the 2.1 GHz Band¹⁰⁶²); and

¹⁰⁶¹ See Annex 5.

¹⁰⁶² Eir, Three and Vodafone.

- MVNOs.

Impact on stakeholders

Option 1

- A 6.33 MNOs are unlikely to prefer Option 1 as they would continue to be prevented from deploying and using technologies compatible with the technical conditions in Decision 2112/688/EU in the 2.1 GHz Band (such as LTE). As noted by DotEcon¹⁰⁶³, in addition to significant benefits for consumers, liberalisation may bring about potential cost savings for operators by facilitating transition to more spectrally efficient technologies. All MNOs have expressed a preference for liberalisation (in response to Document 14/85, Document 19/59R and Document 19/124) and the increased demand for data-intensive services (e.g. see 'Spectrum for Award' RIA) means that liberalisation, even for a short period of time prior to expiry of existing licences, could be beneficial to MNOs.
- A 6.34 Currently under the Temporary Spectrum Management Measures all MNOs have rolled out liberalised 2.1 GHz rights of use to a greater or lesser extent across their networks. Under Option 1, MNOs would have to cease providing LTE services in the 2.1 GHz Band until the expiry of existing licences. This poses several difficulties, including that:
- a) the investment made by each of the MNOs in rolling out liberalised 2.1 GHz rights in the period up to the expiry of the temporary rights of use would prove inefficient and each would have to take remedial measures in order to mitigate the impact on their networks and ultimately consumers. Depending on the timing of the expiry of the Temporary Spectrum Management Measures these impacts could be greater or less. For example, for Vodafone and Three, the reinstatement of LTE 2100 would not be available until the commencement of new rights of use in the 2.1 GHz Band in 2022 (i.e. Time Slice 1), which would be circa 1 - 2 years after the proposed assignment of rights of use in the 2.3 GHz Band and 2.6 GHz Band;
 - b) there is the potential for inefficient rollout if operators would have preferred to use 2.1 GHz rights of use but instead had to use alternative liberalised rights of use (e.g. 2.3 GHz and 2.6 GHz instead) because liberalised 2.1 GHz rights of use were unavailable due to a licence condition;
 - c) Eir would either have to wait until 2027 to reinstate LTE 2100 (until its existing rights of use expired) or obtain new 2.1 GHz rights from 2022,

¹⁰⁶³ DotEcon award Design Report, p19.

which may be inefficient if it did not require its entire existing spectrum rights to support UMTS services (i.e. Eir could have made use of some or all of its existing rights for the provision of LTE services); and

- d) some or all operators may already be capacity constrained in certain areas and liberalisation at the earliest opportunity would allow any such operator the capacity to remedy some of these concerns prior to the assignment of additional rights of use in the Proposed Award.

A 6.35 Similarly, other industry stakeholders, such as MVNOs, would likely prefer liberalisation as it would provide additional LTE services to its customers.

A 6.36 Consumers would likely prefer liberalisation as it would allow for the continuation of LTE service provided under temporary liberalisation and thus provide for the provision of additional LTE services to them.

A 6.37 Therefore, and considering the responses to Document 19/59R and Document 19/124, ComReg is of the view that stakeholders generally would be unlikely to prefer Option 1.

Option 2A v Option 2B

A 6.38 Whilst stakeholders would likely prefer liberalisation than not, they may have different views about the nature and timing of any such liberalisation.

A 6.39 In response to Document 19/124, Three confirms that it agrees with liberalisation from the date of the decision arising from this process (Option 2B). In its view, the 2.1 GHz licences should have been already liberalised and ComReg should now take the necessary steps to avoid further delay. This would be appropriate in Three's view, in line with EC decision (2012/688/EU) and permissible given that ComReg has concluded that no competitive distortions apply.¹⁰⁶⁴

A 6.40 In response to Document 19/59R, Vodafone outlined that it would support liberalisation of the 2.1 GHz Band once dates for the proposed award were fixed.¹⁰⁶⁵ In Document 19/124, ComReg clarified that Option 2A provides for liberalisation before the award and that draft timelines would be available in the Draft IM, which would be published before the Decision. ComReg further noted that in the case of the 3.6 GHz Award, the time period between the publication of the substantive decision and the Final IM was approximately 6 weeks. In response to Document 19/124, Vodafone confirms that it agrees with Option 2A

¹⁰⁶⁴ This is also consistent with Three's stated views in response to Document 14/65 and Document 19/59R that ComReg should liberalise all 2.1 GHz rights of use with appropriate technical restrictions to avoid interference.

¹⁰⁶⁵ Similarly, in response to Document 18/60 it submitted that it would be possible to construct an "early liberalisation option" to allow some or all the existing licensees the option to liberalise via the Proposed Award.

on the basis that the timeline between the Decision and the final IM (wherein the timetable for the award would be provided) is approximately 6 weeks.¹⁰⁶⁶

A 6.41 Eir agrees that there should be an early liberalisation option but does not support ComReg's preferred Option 2A. In Eir's view the timing of the exercise of the liberalisation rights could be better aligned to Option 2B. In Chapter 4, Document 19/124, ComReg provided further clarity and confirmed that the difference between Option 2A and 2B relates purely to when the option to liberalise would be available to licensees. Under both options the decision on when to apply for liberalisation would remain a matter for the licensee. Eir would be free to liberalise at its discretion under Option 2A (or Option 2B) and it would not be required to do so at the time of the substantive decision. In that regard:

- in response to 19/124, Eir welcomed ComReg's confirmation (para. 4.61) "that the liberalisation option may be exercised at the licensee's discretion at any point from when the option becomes available." However, it further noted that Option 2A is of little benefit to it until after the Award has been completed and any liberalisation fee is known;
- in response to Document 20/32, Eir welcomed the confirmation in section 13(3) and 13(6) of the Draft Regulations that the option may be exercised before or after the award; and
- in response to Document 20/56, Eir noted, among other things that liberalisation should only be exercised by any operator after the award process has concluded.

A 6.42 Therefore, while Eir is likely to prefer Option 2A over Option 1, it has concerns regarding potential liberalisation fees and the possible impact on competition. Consequently, it would prefer Option 2B. While Eir would retain discretion on when to liberalise its 2.1 GHz holdings under either option, it would prefer certainty over any liberalisation fees that might apply and in doing so would wish that Three and Vodafone could only liberalise at that time.

A 6.43 In particular, under Option 2A, other operators would likely liberalise at the time of the substantive decision. Alternatively, under Option 2B, Eir would have full knowledge of any liberalisation fees that would apply, prior to a decision to liberalise 2.1 GHz rights of use, while other operators¹⁰⁶⁷ would not be permitted to liberalise any earlier (i.e. operators would be unable to take advantage of liberalisation between the time of the substantive decision and the Proposed

¹⁰⁶⁶ Vodafone notes that "on basis that the Final Decision will be approximately 6 weeks from the publication of the IM and auction timetable (footnote 57) we agree with ComReg's proposal for the timing of liberalisation"

¹⁰⁶⁷ For example, Eir has previously expressed concerns about the potential negative impacts of the spectrum asymmetry (between it and Three).

Award).

Impact on competition

A 6.44 In Document 14/65, ComReg sought views on whether liberalisation would give rise to a material risk of a distortion of competition to the detriment of consumers such that any benefits resulting from liberalisation would be outweighed by the detriment to consumers resulting from any such a distortion of competition.

A 6.45 However, as outlined above, (see Policy Issues and Objectives) there are different elements to competition that are relevant in determining the impact of any of the preferred options. In that regard, ComReg considers the following to be particularly relevant in assessing the impact on competition across each of the options:

- Ensuring that there is no restriction or distortion of competition in the electronic communications sector¹⁰⁶⁸;
- Safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition¹⁰⁶⁹;
- Encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources¹⁰⁷⁰.
- Promoting efficient investment and innovation in new and enhanced infrastructures¹⁰⁷¹; and
- Promoting competition during the award.

Option 1

A 6.46 Under Option 1, existing levels of competition would remain the same until the assignment of new rights of use in the Proposed Award. However, Option 1 could create distortions to competition in the future. In particular, and post award, it is likely that Option 1 would create a situation where different MNOs would have to compete on a different basis using the same spectrum band (i.e. 2.1 GHz rights of use). For example, Eir would likely have non liberalised rights of use for the period up to the expiry of its existing licence in 2027. At the same time, Vodafone and Three could have been assigned liberalised rights of use in Time Slice 1 (up to 2027) and Time Slice 2 (up to expiry). While Eir could bid for new liberalised 2.1 GHz rights in Time Slice 1, this would not be neither an efficient use of the radio spectrum or an efficient investment and could also create competition

¹⁰⁶⁸ Section 12(2)(a) of the 2002 Act.

¹⁰⁶⁹ Regulation 16(2) of the Framework Regulations.

¹⁰⁷⁰ Ibid.

¹⁰⁷¹ Ibid.

concerns during the award.

- A 6.47 Under Option 1, infrastructure-based competition would not be best promoted in the period between 2022 and 2027. Vodafone and Three would likely be able to roll out LTE 2100 on their networks using liberalised 2.1 GHz spectrum, while Eir would be restricted to providing 3G mobile telephony services in the 2.1 GHz band until 2027. Further, over the same period, operators are likely to commence migration from 3G to 4G/5G services in any event (See the 'Spectrum for Award' RIA for further information). While Eir could provide LTE services using existing and newly assigned rights of use in the Proposed Award, LTE 2100 could not be rolled out using its existing rights of use. This would not contribute to users deriving maximum benefits in terms of choice, price and quality as Eir customers would not be provided with LTE services via the 2.1 GHz Band.
- A 6.48 Further, under Option 1, the recent rollout of LTE 2100 under the Temporary Spectrum Management Measures would cease and could not be deployed by any MNO prior to 2022 when new liberalised 2.1 GHz rights of use would become available (i.e. 1 - 2 years after the proposed assignment of rights of the 2.6GHz and 2.3 GHz bands). This would not encourage the efficient use of the radio spectrum as the use of a more efficient mobile technology (LTE) would not be permitted following the expiry of temporary rights of use and a restriction of existing licence conditions, notwithstanding a likely preference for operators to utilise that technology.
- A 6.49 Such a situation would also increase the risk of inefficient investment and rollout as operators who:
- a) have already rolled out LTE 2100 using the temporary liberalised rights of use would have to cease using this technology until the commencement of new rights of use assigned in the Proposed Award commence; and
 - b) would prefer to rollout LTE 2100 in certain areas would either have to wait until 2022 or use the 2.6 GHz and/or 2.3 GHz bands which may be a less efficient way of achieving its desired network rollout.
- A 6.50 It would also shield any less efficient operators who could prefer the existing usage restrictions in order to hinder competitors in expanding LTE 2100 services.
- A 6.51 Finally, given the later expiry of Eir's 2.1 GHz rights, Option 1 could create artificial competition in the Proposed Award if it was necessary for Eir to bid for new liberalised 2.1 GHz rights in Time Slice 1 when it could have otherwise met any requirements for the rollout of LTE 2100 with its existing rights of use if liberalised. Similarly, Eir may have to bid for additional 2.1 GHz rights of use in Time Slice 1 in order to just ensure the continuation of LTE 2100, currently being

provided through the use of its temporary liberalised rights of use licence. ComReg also observes that such scenarios would be unlikely to promote the efficient use of spectrum.

A 6.52 Considering the above, ComReg is of the view that competition is unlikely to be best promoted under Option 1.

Option 2A v Option 2B

A 6.53 Option 2A and Option 2B both encompass the liberalisation of existing 2.1 GHz rights of use. In that regard, DotEcon is of the view¹⁰⁷² that there would appear to be clear potential benefits in liberalising the 2.1 GHz licences such that operators are able to use the frequencies on a service and technology neutral basis. Liberalisation would provide operators with the opportunity to rollout LTE services using the 2.1 GHz Band up to two years (Vodafone and Three) and seven years (Eir) earlier than would otherwise have been the case. As noted by *DotEcon*, “Applying an early liberalisation option on the current 2.1 GHz licences would mean that (where efficient), the spectrum could be used earlier for the provision of services other than UMTS. This may bring about significant benefit for consumers and potential cost savings for operators by facilitating transition to more spectral efficient technologies.”¹⁰⁷³

A 6.54 This is further evidenced by reference to the benefits to society arising from Temporary Spectrum Management Measures as set out in Document 20/21 and Document 20/86R.

A 6.55 Such an approach would allow all operators to use the 2.1 GHz band without restriction on what services could be rolled out.¹⁰⁷⁴ This should promote competition in downstream markets by increasing the availability of liberalised rights of use and thereby facilitating all operators in the provision of more advanced services. This should contribute to users deriving maximum benefits in terms of choice, price and quality.

A 6.56 Both options would also have a positive impact on other elements of competition for the following reasons:

- a) infrastructure based competition would be better promoted as all MNOs would have the option to roll out LTE 2100 on their networks using existing rights of use;
- b) the rollout of LTE 2100 using existing rights of use could begin no later than the availability of other liberalised rights of use (2.6 GHz and 2.3

¹⁰⁷² DotEcon Award Design Report, p39.

¹⁰⁷³ Document 19/59a p 22.

¹⁰⁷⁴ Subject to complying with appropriate BEMs etc. to protect other licensees.

GHz) promoting more efficient use of the radio spectrum and more efficient investment;

- c) any less efficient operators who currently prefer the existing usage restrictions would no longer be shielded from more efficient operators wishing to rollout LTE 2100 at the earliest opportunity; and
- d) competition during the award would be based on actual demand rather than an artificial demand derived from the restriction on existing rights of use.

A 6.57 Therefore, Options 2A and 2B should, absent any other concerns, better promote competition than Option 1 by allowing MNOs to rollout LTE 2100 in the 2.1 GHz Band. In order to determine whether Option 2A or 2B would better promote competition. ComReg assesses the following:

- a) **First**, ComReg considers whether liberalisation of all 2.1 GHz rights of use would confer a material advantage on Three under Options 2A and Option 2B, as it would have the option to liberalise an additional 2 × 15 MHz rights of use.
- b) **Second**, ComReg assesses whether liberalisation at the earliest possible opportunity (i.e. at the time of the substantive decision (Option 2A)) would create competition concerns such that liberalisation following the assignment of new rights of use in the proposed award would better promote competition.

1. Would the liberalisation of an additional 2 × 15 MHz confer a material advantage on Three?

A 6.58 The main theory of harm associated with liberalisation appears to be that Three would be permitted to liberalise 2 × 30 MHz 2.1GHz rights of use, allowing it to obtain a material advantage that could not be efficiently/effectively replicated by Vodafone and/or Eir who would only have the option to liberalise 2 × 15 MHz 2.1GHz rights of use. In this regard, an important consideration is the extent to which the availability of an additional 2 × 15 MHz 2.1 GHz liberalised rights of use could create a material distortion to competition under Option 2A or Option 2B.

A 6.59 ComReg notes that the technical benefits of liberalisation referred to above would be available to all MNOs. However, Three could theoretically be better able to exploit these advantages given the availability of an additional 2 × 15 MHz rights of use. For example, the liberalisation of the 2.1 GHz band would allow Three to deploy two 2 × 15 MHz LTE carriers in the band. This could support higher user data speeds, improve capacity, and quality of service and potentially give it a headline speed advantage in the near term over both Eir and

Vodafone. Alternatively, it could rollout LTE in part of the spectrum and maintain UMTS services using some of its 2.1 GHz spectrum, in a manner that would not be available to other operators.

A 6.60 However, ComReg is of the view that Three is unlikely to be able to obtain a material advantage for several reasons:

- i. The time between the substantive decision and expiry of Three's 2.1 GHz rights of use is narrow.
- ii. Vodafone and Eir would both have the opportunity to be assigned other liberalised rights of use across both Time Slices in the Proposed Award.
- iii. Three is unlikely to have the ability or incentive to exploit any advantages of an additional 2×15 MHz.

A 6.61 **In relation to (i)**, Three is unlikely to provide additional high-speed services across its network using all 2×30 MHz rights of use, if the spectrum on which those services depend is due to expire in a short period. Even if Three provided such services, it would take time before the benefits to Three in terms of consumer switching (even if it occurred) could be realised.

A 6.62 Furthermore, ComReg notes that the time between any liberalisation of existing rights of use and the proposed award has already been effectively reduced by the temporary liberalisation of the 2.1 GHz Band up to a least 7 January 2021 and potentially 7 April 2021, noting that temporary liberalised rights of use have been in place since April 2020.

A 6.63 **In relation to (ii)**, the Proposed Award would provide Vodafone and Eir with the opportunity to compete for 350 MHz of additional rights of use in other liberalised bands (e.g. 2.3 GHz and 2.6 GHz). Further, because existing holdings (other than 2.1 GHz) are considered as part of the spectrum competition cap, bidders with lower existing holdings having greater capacity to add spectrum to close the spectrum asymmetry. For example, given the overall competition cap of 375 MHz, ComReg notes that:

- a) Eir could bid for up to 190 MHz (375 MHz less 185 MHz) in Time Slice 1 and up to 220 MHz in Time Slice 2;
- b) Vodafone could bid for up to 180 MHz (375 MHz less 180 MHz) in both time slices; and
- c) Three could bid for up to 155 MHz (375 MHz less 220 MHz) in both Time Slices.

A 6.64 **In relation to (iii)**, ComReg is of the view that due to a number of factors, Three

has neither the ability nor incentive to materially exploit the advantages of an additional 2 × 15 MHz rights of use over a short period:

- a) any 2.1 GHz liberalisation of existing rights of use that may occur prior to the Proposed Award is likely to be focussed on maintaining services to existing customers that has already been enabled by the Temporary Spectrum Management Measures that all three MNO's have enjoyed. This view is supported by the recent actions taken by all operators since April and previously assessed by ComReg in Document 20/27 and 20/88;
- b) there is no certainty that Three would retain 2 × 30 MHz in the 2.1 GHz Band following the Proposed Award, it is also uncertain how extensively Three may choose to deploy LTE 2100 in advance of knowing what its long term holdings in the band would be;
- c) any significant rollout of LTE 2100 using 2 × 30 MHz prior to the Proposed Award would risk inefficient investment, if lesser, or no, rights of use were subsequently assigned in the Proposed Award;
- d) Three currently uses existing 2.1 GHz rights of use for 3G services and it will likely require some of those rights to continue to be used for UMTS beyond the Proposed Award in order to facilitate an orderly transition to LTE over an extended period¹⁰⁷⁵;
- e) Three seems unlikely to advertise services based on higher theoretical speeds (a possibility referred to by Eir in response to Document 14/65) as the spectrum holding on which such claims would be made could be lost to it post award. In any event Three typically does not advertise based on the speed of its services but rather on the size of its data caps (i.e. All You Can Eat)¹⁰⁷⁶;
- f) further, ComReg notes that GoMo, a trading name of Eircom Limited, a member of the group of companies to which Eir belongs, launched on 15 October 2019. The sim-only, online-only 'virtual' operator runs on Eir's national mobile network and had an introductory offer of 80GB of data, plus all calls and texts, for €9.99 per month for the first 100,000 customers, an offer which ended on 15 January 2020¹⁰⁷⁷. This aligns with Eir Mobile's decision in August to rollout uncapped data usage across all its prepay, bill and small business plans. In effect, Eir would currently appear to have the capability to compete on the same basis

¹⁰⁷⁵ As part of the COVID-19 Temporary Spectrum Management Measures, ComReg decided to temporarily make the 2.1 GHz Band available on a liberalised basis.

¹⁰⁷⁶ www.three.ie

¹⁰⁷⁷ Now currently offered at €12.99 per month.

as Three (i.e. high data caps) despite Three's 2.1 GHz short term advantage; and

- g) notably, Three has held more spectrum rights in other liberalised bands than Vodafone and Eir for the past five years (e.g. in the 1800 MHz Band which is already used to provide 4G services) but added fewer subscribers than Vodafone over the same period^{1078 1079}.

A 6.65 Finally, in light of the common request received from all MNOs (including Eir) to extend the terms of the Temporary Spectrum Management Measures unchanged, it would appear that MNOs are already satisfied that the use of the 2.1 GHz Band on a liberalised basis (including any spectrum asymmetries arising from same) for a period of at least 9 – 12 months¹⁰⁸⁰ would be unlikely to materially distort competition between them.¹⁰⁸¹ Given the time between the expiry of Temporary Spectrum Management Measures and the Proposed Award is likely to be small (i.e. the Proposed Award may have commenced by April¹⁰⁸²) it is unlikely that any MNO would have additional concerns.

A 6.66 In light of the above, ComReg is of the view that liberalisation of all rights of use is unlikely to confer a material advantage on Three.

2. Would liberalisation at the earliest opportunity create any competition concerns?

A 6.67 Option 2A would permit the liberalisation of all existing 2.1 GHz Band rights of use but at an earlier date than Option 2B (i.e. from the time of ComReg's substantive decisions regarding the Proposed Award, instead of following the Proposed Award). In effect, competition could be better promoted as the benefits of liberalisation brought about by the Temporary Spectrum Management Measures would be retained in the period after the expiry of the Temporary Spectrum Management Measures.

A 6.68 However, earlier liberalisation of all existing rights under Option 2A (compared

¹⁰⁷⁸ Assessment of ComReg Quarterly Data Q4'14 – Q3'19.

¹⁰⁷⁹ ComReg would note this may be impacted, to some extent, by the merging of the Three and O2. Notwithstanding, it is relevant in determining any competitive impacts in the short term where Three holds what were formerly Telefonica's rights of use.

¹⁰⁸⁰ Depending on the expiry of the temporary rights of use in January or April 2021, Three would already have access to 2 x 30 MHz liberalised 2.1 GHz rights of use since April 2020 for a period of 9 – 12 months.

¹⁰⁸¹ ComReg notes while Eir (in response to Document 20/32) submitted that it "*did not believe it would be appropriate to further extend the temporary liberalisation measures in the 2100MHz band given the material spectrum imbalance that persists*" it later submitted a request, on 2 September 2020, that the Temporary Spectrum Management Measures should be extended until the completion of the Award Process.

¹⁰⁸² The publication of the Final Information Memorandum marks the start of the Proposed Award.

to Option 2B) raises two additional issues for consideration.

- i. MNOs would not be able to obtain new rights of use in the bands proposed for award (e.g. 2.6 GHz Band and 2.3 GHz Band) prior to or at the same time as the liberalisation of existing 2.1 GHz rights; and
- ii. Eir may wish to wait until after the Proposed Award to determine whether or not to liberalise its existing 2.1 GHz rights of use due to, albeit limited uncertainty, over what fees it may be required to pay.¹⁰⁸³ This would occur in circumstances where Vodafone and Three would likely have availed of liberalisation of their respective 2.1 GHz rights soonest after ComReg's substantive decisions regarding the Proposed Award (circa 6-12 months earlier).¹⁰⁸⁴

A 6.69 **In relation to (i)**, ComReg firstly notes the main use of 2.1 GHz liberalised rights of use between the time of the substantive decision and the time of the Proposed Award would be to alleviate any capacity constraints in specific areas. In that context, an additional 2 × 15 MHz of liberalised rights could confer an advantage on Three if such capacity constraints could be addressed by it but not by other rival operators.

A 6.70 Based on the available information, however, ComReg does not consider that any such advantage would give rise to a material risk of a distortion of competition to the detriment of consumers, such that any benefits resulting from liberalisation would be outweighed by the detriment to consumers resulting from any such a distortion of competition. This is informed by the assessment provided above, and the following:

- a) the temporary 2.1 GHz liberalised rights of use assigned to Three under the Temporary Spectrum Management Measures have been used by it to alleviate capacity constraints as assessed by ComReg in Document 20/27 and 20/88. Any liberalisation of existing 2.1 GHz rights of use after the substantive decision is highly likely to be used for a similar purpose;
- b) any advantage that may accrue to Three would be of a limited duration (i.e. the time period between January 2021 and the award or April 2021 and the Proposed Award; and

¹⁰⁸³ However, Three and Vodafone would, equally time face uncertainty as to whether or not they will win any new 2.1 GHz rights of use and regarding the fees they will have to pay for same.

¹⁰⁸⁴ Three and Vodafone would be very likely to liberalise at the earliest opportunity because there would not be uncertainty over the fees that would apply to the liberalisation of their respective rights (i.e. these fees would be zero).

- c) the benefits of reducing capacity constraints would only apply to certain elements of high-density areas such as the cities and not on a scale likely to distort or restrict competition. Further, Vodafone and Eir would be similarly able to address such constraints (albeit to a lesser degree).

A 6.71 **In relation to (ii)**, under Option 2B any liberalisation fees that would apply to Eir's existing rights in Time Slice 1 (on the basis of ComReg's proposed potential spectrum liberalisation fee mechanism) would be known to Eir prior to making any decision to liberalise, reducing the risk that Eir would not liberalise at the time of the substantive decision. This may create competition concerns such that Eir would have unliberalised rights of use for a short period between the time of the substantive decision and the assignment of new rights of use following the Proposed Award.

A 6.72 However, under Option 2A, Eir may, because of any financial exposure that may result from the potential spectrum liberalisation fee mechanism in respect of the liberalisation of its existing 2.1 GHz rights in Time Slice 1, choose to wait until after the Proposed Award to liberalise its existing rights. However, it may also decide to liberalise at the earliest opportunity, regardless of the uncertainty over potential fees.

A 6.73 [X [REDACTED] X]. It is highly unlikely that Eir would choose to invest in the rollout of temporary liberalised 2.1 GHz rights of use in the period from October up to January or April 2021 and subsequently choose not to liberalise existing rights of use, if temporary rights of use came to an end (when Three and Vodafone would likely liberalise their rights of use).

A 6.74 In effect, any decision taken by Eir to utilise temporary 2.1 liberalised rights of use would likely be made in the knowledge that breaks in liberalisation (whether through additional temporary or liberalisation of existing rights of use) would need to be avoided by it in the period up to the end of the Proposed Award.

A 6.75 Regardless, of how Eir decides to use temporary rights of use, ComReg observes:

- a) based on the available information, it is unlikely that any liberalisation fees would apply ¹⁰⁸⁵;
- b) furthermore, other substitutable bands are proposed to be awarded alongside the 2.1 GHz Band; and
- c) in light of the above factors and recalling that Time Slice 1 is circa 5.5 years, it is unlikely that Eir would choose not to liberalise its existing

¹⁰⁸⁵ Document 19/124a, DotEcon Award Design Report, p22-23.

rights in Time Slice 1 at market-determined rates and may therefore avail of any liberalisation option at the time of the ComReg's substantive decision.

A 6.76 Even if Eir decided not to liberalise at the same time as Vodafone and Three, ComReg does not believe that any material distortion to competition would arise given the reasons identified above in respect of **issue (i)** and, in particular, that any advantage Three or Vodafone might enjoy would be of limited duration (less than a few months) until the proposed availability of a large quantum of new and substitutable liberalised rights in the 2.3 GHz and 2.6 GHz bands became available.

A 6.77 Conversely, Option 2B, and the later ability of all existing licensees to liberalise some or all existing 2.1 GHz rights also raises potentially serious competition concerns. In particular, should the Temporary Spectrum Management Measures expire in either January or April as outlined above, MNOs would be unable to offer LTE 2100 services which are currently being provided to alleviate capacity constraints arising from COVID-19. For example, under Option 2B:

- a) the expiry of temporary liberalised 2.1 GHz rights of use would likely cause a temporary quality of service degradation and could impact some operators greater than others (depending on the extent to which those rights of use were relied upon in alleviating capacity constraints.¹⁰⁸⁶
- b) any impact on the quality of service of particular operators could have impacts on long run competition particularly if such impacts are caused by issues (i.e. the expiry of rights of use) that would not persist in the long run (because existing rights of use could be liberalised following the Proposed Award under Option 2B).

A 6.78 Therefore, ComReg is of the view that Option 2A would be highly unlikely to create a material distortion to competition and is preferable to Option 2B because it would prevent LTE 2100 services already being delivered using the Temporary Spectrum Management Measures from being removed. Further, Option 2A would give operators the option to liberalise all existing 2.1 GHz rights of use at the earliest opportunity and, based on the available information, without creating material distortions of competition.

Impact on Consumers

A 6.79 It can be assumed that what is good for competition, and what promotes

¹⁰⁸⁶ MNOs have used the Temporary Spectrum Management Measures in different ways in order to satisfy demand arising from the COVID-19 Pandemic. For example:

- Three have used 2.1 GHz.
- Eir have used 700 MHz.

innovation and efficient investment in infrastructure, is, in general, good for consumers. This is because increased competition between MNOs brings benefits to their customers in terms of price, choice and quality of services.

A 6.80 Consumer demand for wireless data services has grown significantly in recent years and is expected to grow exponentially, in data volume terms, over the coming years. As licensees can provide higher data throughput using new technologies, which can only be deployed using liberalised rights of use, consumers would likely prefer the option that increases the supply of liberalised rights of use at the earliest possible opportunity. This is subject to no material distortions of competition arising in circumstances where the benefits resulting from liberalisation would be outweighed by the detriment to consumers resulting from any such distortion of competition.

A 6.81 Whilst Option 1 would preserve existing competition up until 2022, consumers are unlikely to prefer Option 1 because newly liberalised rights in the 2.1 GHz Band would not become available until October 2022 (for the 2 × 45 MHz currently assigned to Vodafone and Three) and until March 2027 for the remaining 2 × 15 MHz (currently assigned to Eir). Based on the available information, there is no reason to believe that Options 2A or 2B would result in a material distortion to competition to their overall detriment. Further, as noted above, under Option 1 Eir customers would have to wait until 2027 to receive the benefits of liberalised 2.1 GHz rights of use. Under Option 2A or 2B, consumers would be able to better utilise user devices which are compatible with LTE 2100 (which are generally widespread at this point) and benefit higher speeds and greater quality of service as described above.

A 6.82 As between, Options 2A and 2B, consumers are likely to strongly prefer Option 2A because this would address any potential for the short-term withdrawal of LTE 2100 that is currently being provided through the Temporary Spectrum Management Measures. Further, it would provide operators with the option to liberalise all their existing 2.1 GHz rights of use at the earliest opportunity and, based on the available information, without creating material distortions of competition.

A 6.83 Therefore, ComReg is of the view that consumers are likely to prefer Option 2A.

Preferred option

A 6.84 Based on the information currently before it, ComReg is of the view that Option 2A would be appropriate in the context of ComReg's statutory framework, including being objectively justified and proportionate. Factors informing this view are outlined below.

A 6.85 **First**, Option 2A would accord with the objective of promoting competition

because, among other things:

- a) it would be unlikely to result in a distortion or restriction of competition to the detriment of users because:
 - i. any potential advantages that would accrue to Three from liberalisation would be of very limited duration (circa 6-12 months) before an additional 350 MHz of liberalised spectrum rights of use (including substitutable spectrum rights in the 2.3 GHz and 2.6 GHz bands) would be made available to all MNOs (and other interested parties) in the Proposed Award; and
 - ii. the avoidance of inefficient investment costs by all operators from having to rollout LTE 2100 after should not distort or restrict competition to the detriment of consumers generally;
- b) it would facilitate MNOs LTE 2100 roll-out programme in an efficient manner, the outcome of which should contribute to users deriving maximum benefits in terms of choice, price and quality; and
- c) the discretion of when liberalisation would occur would remain with each licensee but it would also provide licensees with the opportunity to liberalise at the earliest point possible, if they so wished.

A 6.86 **Second**, Option 2A would encourage the efficient use of the radio spectrum by facilitating the commencement of LTE 2100 earlier and in a more efficient manner than other options, by avoiding inefficient investment costs arising from any roll out of 2.6 and 2.3 GHz in circumstances where the 2.1 GHz would have been preferable had it been available.

A 6.87 **Third**, Option 2A would also accord with the relevant regulatory principles which ComReg is obliged to apply in pursuit of its objectives. In particular:

- a) it would promote efficient investment and innovation in new and enhanced infrastructures by enabling additional LTE capacity to be provided using spectrum rights which might otherwise be underutilised.
- b) it would not give rise to undue discrimination in the treatment of undertakings providing ECN and ECS because all existing licensees would be able to avail of liberalised 2.1 GHz rights of use at the same time, if they so choose.
- c) it would accord with the principle of safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition for the reasons identified above (in relation to distortion and restriction of competition).

A 6.88 **Fourth**, Option 2A would be proportionate because, among other things:

- a) Liberalisation of existing 2.1 GHz band rights generally accords with the principle and requirements of technology neutrality in the Common Regulatory Framework.
- b) it would achieve the earliest liberalisation of existing rights in the 2.1 GHz Band without giving rise to a material distortion to competition in circumstances where the benefits resulting from liberalisation would be outweighed by the detriment to consumers resulting from any such a distortion of competition; and
- c) there do not appear to be less onerous means by which these objectives and principles could be achieved.

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Annex: 7 Response to Auction Formats

7.1 Background

7.1.1 Summary ComReg's views in 19/59R and 19/124

A 7.1 In Section 7.3 of Document 19/59R, ComReg identified and examined a number of suitable auction formats for awarding rights to the Award Spectrum. These formats included:

- simultaneous multiple-round ascending (SMRA) auction;
- simple clock auction (SCA);
- combinatorial clock auction (CCA);
- sealed bid combinatorial auction formats (SBCA); and
- combinatorial multiple-round ascending auction (CMRA).

A 7.2 In summary, ComReg considered that a CCA format would best mitigate the risks identified in Section 7.3 of Document 19/59R, while ensuring spectrum rights would be awarded to those users who value it the most. In particular, the CCA format would:

- a) avoid aggregation risks, by allowing bidders to bid for packages of lots, under the guarantee that bidders would only be assigned a combination of lots if they specifically made a “package bid” for same;
- b) mitigate substitution risks by:
 - i. allowing bidders to submit multiple, mutually exclusive bids for alternative packages;
 - ii. selecting winning bids and prices in a way that would ensure that bidders prefer their own winning outcome to that of any other bidder given the final prices
 - iii. allowing bidders to switch across lot categories in response to price changes during the open stage, without creating an unacceptable risk of gaming or strategic behaviour that weakens competition;
 - iv. allowing bidders to switch bids for lots across different bands without risk of fragmentation across bands;
 - v. being sufficiently transparent and providing opportunities for

bidders to obtain information through the bidding process to mitigate concerns about bidder information deficits;

- vi. mitigating incentives for bidders to strategically reduce demand, which could result in an inefficient assignment and reduce service provision in downstream markets;
- vii. allowing for the possibility of non-uniform prices, which might be the only way of supporting an efficient outcome when valuations are synergistic, and avoiding inefficiently unsold lots;
- viii. mitigating the risk of inefficiently unsold lots by allowing bidders to offer, through supplementary bids, to take those lots that would remain unsold at clock prices; and
- ix. destabilising tacit collusion and thereby reducing the risk of same

A 7.3 Having considered the responses received to Document 19/59R, ComReg reaffirmed its view, in Document 19/124, that a CCA was the appropriate award format for assigning rights of use in the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands.

A 7.4 ComReg reflected its position on the award format in its draft Decision (Document 19/124) as follows:

“3.15 to incorporate into the competitive selection procedure, inter alia, the following elements:

3.15.1 a number of stages including an application stage, a qualification stage, a main stage and an assignment stage, with the outcome of the qualification stage determining whether the procedure moves directly to the assignment stage due to demand not exceeding supply, or whether the main stage is necessary, due to demand exceeding supply;

3.15.2 the main stage, if it occurs, comprising of a combinatorial clock auction;

...

3.15.6 in the event of the main stage of the auction proceeding, multiple clock primary rounds, with the auctioneer setting the price in each round for each lot category specified in the Information Memorandum, with Qualified Bidders entitled to bid, subject to detailed rules to be set out in the Information Memorandum, for packages of Lots at those prices, until supply equals or exceeds demand across all lot categories at the round prices or for such other reason as may be set out in the Information

Memorandum;

3.15.7 following any such primary rounds, a single, sealed-bid, supplementary round, entitling Qualified Bidders to submit a number of bids for packages of Lots for which such Qualified Bidders are eligible to bid, at bid prices of their choosing, all of which will be subject to detailed rules set out in the Information Memorandum.

3.15.8 Winning bids will be determined by selecting at most one bid from amongst the entirety of bids made by each Qualified Bidder in order to maximise the total value of winning bids subject to not allocating more Lots than available. A price calculation methodology as set out in the Information Memorandum will then be applied to calculate the Base Price on the basis of the opportunity cost of awarding Lots to each Winning Bidder;

3.15.9 an assignment stage in which:

i. Winning Bidders will be required to participate (other than in respect of 2.3 GHz Band Fixed Frequency Lot (Lower), 2.3 GHz Band Fixed Frequency Lot (Upper), 2.6 GHz Band TDD Fixed Frequency Lot (Lower), and 2.6 GHz Band TDD Band Fixed Frequency Lot (Upper)) and in which each Winning bidder can bid for its preferred option/s out of a range of assignment option/s for which it is eligible to bid, such eligibility being determined by the detailed rules set out in the Information Memorandum;

ii. All Existing 2.1 GHz Band Licensees will be required to participate to determine the location of their existing 2.1 GHz Band rights of use in Time Slice 1. ComReg will reimburse any reasonable and vouched costs associated with the relocation of existing 2.1 GHz Band rights of use required as a result of the assignment stage which an Existing 2.1 GHz Band Licensee can demonstrate to ComReg's satisfaction which would not otherwise have been incurred;

3.15.10 winning bids and prices in the assignment stage which are determined in accordance with the winner and price determination methodology set out in the Information Memorandum;"

A 7.5 Finally, ComReg reflected this position in its Draft IM and Draft Regulations (Document 20/32) where, among other things, it defined the "Award" as "*the competitive award procedure used by the Commission for the purpose of granting individual rights of use for radio frequencies to the Liberalised Spectrum, as detailed in the Information Memorandum*".

A 7.6 In order to further inform its consideration of the appropriate auction format for

the Proposed Award, and taking account of the suggestions contained in the responses to Document 19/124, ComReg, in its information notice (Document 20/56), sought views from interested parties on the five auction format options, some of which have multiple sub-options¹⁰⁸⁷.

7.1.2 Summary of Respondents Views to Document 19/59R, 19/124 and 20/56

A 7.7 ComReg summarises the views of respondents under the following headings.

- Strategic demand reduction;
- Unsold lots at the end of the Primary Bid Round;
- Budget Constraints;
- Complexity;
- Aggregation Risk;
- Asymmetric pricing and competition caps;
- Smaller Bidders; and
- Gaming/Price Driving.

A 7.8 ComReg's assessment of same is laid out under the same headings.

Strategic demand reduction

Document 19/124

A 7.9 Three submits the following points in relation to strategic demand reduction:

- a) ComReg places too much emphasis, in its view, on strategic demand reduction as a concern in this award, and that the CCA poses risks in relation to strategic demand reduction that are not present in a SMRA;
- b) Demand reduction occurs, it contends, to "*a greater or lesser extent*" in most spectrum auctions, in order to a) protect profitability, b) preserve capital, and c) manage a bidder's exposure to winner's curse;
- c) Demand reduction is only a problem, in its view, when it leads to potential winning bids or marginal bids exiting too early. Three states that marginal bids impact revenues but not in its view efficiency and therefore only the

¹⁰⁸⁷ As outlined in Document 20/56 and Chapter 7 of this document.

exiting of potentially winning bids is relevant to this award;

- d) Demand reduction in an SMRA is unlikely to prevent an efficient outcome, whereas it risks distorting prices and allocations in a CCA as bidders may adopt very different strategies;
- e) In auctions where a large amount of spectrum is available such as MBSA2, Three contends that the incentive to reduce demand in order to achieve a lower price may be greater because one or more bidders may forgo bidding on lots that are marginal to the bidder's business case. Further such lots would likely be awarded to rivals with similar values and the economic impact of any resulting inefficiency is likely to be small;
- f) Three argues that inefficiency may arise from bidders adopting different strategies in relation to demand reduction. Three characterises a CCA as being equivalent to a prisoner's dilemma, wherein each bidder is incentivised to bid for spectrum that the bidder does not expect to win, but which may determine prices; and
- g) Three gives an example in which a budget constrained bidder reduces demand in the hope that in response rival bidders also reduce demand. Three notes that should rivals not reduce demand in response, in its view any resulting price differential is the result not of differences in valuations but of bidding strategies.

A 7.10 Three submits that ComReg is incorrect to draw parallels between the MBSA2 award and the 2010 Danish 2.6 GHz award. Three submits that in the 2010 Danish 2.6 GHz award, bidders likely had ascending values for lots that would be pivotal to the auction outcome.

A 7.11 Three submits that in contrast to MBSA2, bidders are likely to have descending values for lots for all bids that are likely to be relevant in determining allocation and prices. Three submits that values for a second 700 MHz lot are likely to be ascending, in its view, but that these bids are not relevant to determining the allocation or prices:

- a) Three submits that it recognises that in certain awards, such as the Danish 2.6 GHz award non-uniform prices can promote an efficient allocation.
- b) Three submits that, in its view, ComReg has not demonstrated that such conditions apply to the MBSA2 award.
- c) Three submits that non-uniform prices are necessary to achieve an efficient allocation only where marginal valuations of lots are (at some point) ascending, and where such ascending valuations are relevant to determining the efficient outcome.

- A 7.12 Three submits that synergies are present in most spectrum auctions and that ComReg's approach in the MBSA2 would imply that the CCA should be used in all spectrum awards. Three states that ComReg must examine the likely demand and valuations of potential bidders, and whether incremental ascending valuations are likely to determine the efficient outcome.

Document 20/56

- A 7.13 Three states that in multi-band awards all auction formats are somewhat vulnerable to gaming behaviour but that it is more concerned about gaming in a CCA. Three is aware that incentives for demand reduction are greater in a SMRA than a CCA, but does not consider this concern is "viable" as in other auctions bidders typically drop "only" the lots they "do not expect to win" which may not impact allocative efficiency. Three disagrees with ComReg that it is smaller bidders that have the strongest incentive to reduce demand. Rather, Three believes that bidders pursuing larger packages have the strongest incentive to reduce demand.

Unsold lots at end of primary bids round

Document 19/124

- A 7.14 In response to Document 19/124, Eir submits its concern in relation to the potential inefficient strategic demand reduction by rival bidders to [✂ ██████████ ██████████ ██████████ ✂].
- A 7.15 Eir contends that bidders in MBSA1 and the 3.6 GHz auction, [✂ ██████████ ██████████ ██████████ ✂]. Eir maintains that as a result, in the supplementary round of that award bidders were required to submit bids far in excess of the final clock round price as knockout bids.
- A 7.16 Eir submits that its concerns have not been addressed by points made by ComReg in Document 19/124 - that any such strategy would be irrational, and that the impacted bidder would be better off not winning the spectrum.¹⁰⁸⁸

Budget constraints

Document 19/124

- A 7.17 In response to Document 19/124, Eir queries ComReg's view that knockout bids help budget constrained bidders without having to bid to their value and that a knockout bid above budget would mean a bidder is unable to bid to its valuation. Further, Eir submits that ComReg's view that some issues facing budget

¹⁰⁸⁸ Chapter 6, Document 19/124.

constrained bidders are not a consequence of auction format ignores the view that CCA design elements may allow for gaming.

Document 20/32

A 7.18 In response to Document 20/32, Eir submits that ComReg fails to appreciate the distinct risks faced by budget constrained bidders in a CCA compared to a SMRA or SCA:

- Eir submits that in a SMRA a budget constrained bidder may bid until the point at which price exceeds either the budget or valuation for a given package, with no risk of exceeding its budget.
- Alternatively, Eir submits that in a CCA a bidder faces the risk of not winning despite being willing to pay a higher price than bidders that do win lots.

A 7.19 Eir gives an example of a budget constrained bidder that has bid on a package in the final clock round for which the knock-out bid in the supplementary round exceeds its budget. Eir notes that:

- if that bidder then limits its maximum bid for that package to its budget, it may not win that package;
- such a bidder faces a cap on bidding on packages smaller than its final primary package in the supplementary round and is therefore prevented from bidding up to its budget; and
- a budget constrained bidder in this case would have to bid lower than its budget by at least the difference in price between the bidder's final clock package and the relevant smaller package.

A 7.20 In contrast, Eir submits that a bidder in a SMRA or SCA may always bid up to its budget for smaller packages. Eir submits that DotEcon have previously suggested that a bidder with such concerns could respond by bidding for smaller packages as opposed to bidding on larger packages up to their valuation.

A 7.21 Eir submits that DotEcon have failed, in its view, to understand that this is a distinct problem to strategic demand reduction in which a bidder lowers its demand in order to obtain a lower price. Instead this is about the willingness of the bidder to take the risk that it is wrong and the consequence that they inefficiently fail to acquire a smaller package of spectrum. Eir submits that as a result, the incentive is greater for a budget constrained bidder to engage in strategic demand increasing the risk of an inefficient outcome.

A 7.22 Eir submits that the outcome will be influenced by bidder's appetite for such risk,

and ComReg's failure to consider this matter are not in line with Regulation 17(1).

Complexity

Document 19/124

- A 7.23 In response to Document 19/124, Eir submits that it has no objection to the 700 MHz Band being made available in one temporal period with a duration of 20 years. Eir submits that it has concerns relating to the complexity arising from time slicing which were contained in its response to Document 19/59.
- A 7.24 Vodafone reiterated its view that given the complexity of the lots on offer in this auction, a combinatorial clock auction (CCA) is the most appropriate auction format to use.

Document 20/32

- A 7.25 Vodafone supports the view that open, simultaneous, multi-round auctions (whether SMRA or CCA) are the most efficient way to assign new spectrum. Vodafone submits that this auction is more complex than most, as a result of the Time Slice structure of the lots available but also the varying lot sizes in the 2.3 GHz band.
- A 7.26 Vodafone submits that a single time slice would allow for greater simplicity by both simplifying transition, and simplifying the valuation of combinations lots.¹⁰⁸⁹ However Vodafone's view is that the CCA format is preferred if parts of the spectrum are to be awarded in two time-slices, due to aggregation risk.
- A 7.27 Eir submits that the auction design should be simplified wherever possible to facilitate effective participation by bidders.
- A 7.28 Eir submits that DotEcon appear to have identified a lacuna in the rules used in the 2012 MBSA, regarding the application of constraints arising out of eligibility reducing bids made after a bidder has submitted an eligibility reducing relaxed primary bid, and thereby created a loop of relative caps and provide no analysis of the consequences of this new rule.

Document 20/56

- A 7.29 Imagine would not be in favour of any proposed change of auction format or modification of the currently preferred CCA format that:

- increases the complexity of the auction;

¹⁰⁸⁹ Through reducing the number of combinations to bid for at both the primary and assignment stage.

- has a disproportionate effect on smaller operators; and/or
- gives advantage to larger MNO or results in higher prices to smaller bidders.

Aggregation risk

Document 19/124

A 7.30 Three submits that, in its view, too much weight has been given to aggregation risk which can be addressed by removing time slices.

Document 20/56

A 7.31 Three submits that aggregation risks (besides those of Time Slices) for bidders in this award are modest and could be managed within a Hybrid SMRA framework. Three submits that the minimum requirements within a band are likely low and across bands, aggregations risk are large only for Time Sliced bands.

Asymmetric pricing or price uniformity

Document 19/124

A 7.32 In summary, Three submits the following in relation to price uniformity:

- the efficiency case for allowing non-uniform prices is unlikely to apply in the specific circumstances of this award; and
- in contrast to ComReg's characterisation in Document 19/59R, Three is not opposed in principle to auction formats that allow for non-uniform prices, rather that formats with uniform prices for equivalent spectrum are more appropriate.

A 7.33 Three lists several points on which it submits that ComReg and DotEcon misunderstand its position, as follows:

- it does not object to non-uniform prices in principle, which could arise in a CCA with symmetrical caps. Three submits that its concerns relate to differences in price arising from Three's restricted ability to express its valuations.
- ComReg incorrectly characterises Three's objective as having bidders pay "above their respective opportunity costs". Three submits that ComReg acknowledges that a departure from opportunity cost pricing may result in inefficient outcomes in the following and is unsure how ComReg can square the following views:

“This means that each winner (and group of winners) needs to pay at least its opportunity cost, otherwise there would be alternative higher value users and an efficient assignment would not have been achieved.”

“At some point, (where some bidders can bid for more spectrum and Three cannot) this will result in Three imposing less of an opportunity cost on those bidders compared to the opportunity cost others impose on Three”.

- Three submits ComReg should not “pick winners”, and that ComReg cannot side-step its requirement to provide a non-discriminatory and fair process. Three submits that ComReg appears to have preferences to avoid certain circumstances that conflict with these objectives and notes ComReg’s views that:

"ComReg would be primarily concerned with a situation where the two larger MNOs could bid up to a sub-1 GHz cap in order to make the smallest MNO (i.e. Eir) a more marginal player by denying it 700 MHz rights of use"

- ComReg appears to extend this to the protection of Eir from competition from entrants as well as MNOs; and
- in its report on the Dutch Award, Three maintains that DotEcon cautioned against the use of a second-price rule where asymmetric caps were in effect, even in the presence of strong synergies.

A 7.34 Three submits that, in the short term, neither the 800 MHz or 900 MHz bands are substitutes for 700 MHz, and that as licenses in both the 800 MHz and 900 MHz band will both expire in 2030, ten years before the expiration of the license for 700 MHz, neither are they reliable substitutes in the longer term. Three submits that there is no guarantee that the 800 MHz or 900 MHz spectrum will be available beyond 2030, nor that ComReg will take spectrum awarded in MBSA2 into account in later awards.

A 7.35 Three submits that the effect of the bias against Three will last 10 years beyond the expiry of the 900 MHz license relevant to the asymmetric cap.

A 7.36 Three suggests Time Slices in the 700 MHz band from July 2030 to December 2040 could remedy this and that such Time Slicing could apply to supra-1 GHz spectrum also.

Document 20/32

A 7.37 Three submits that DotEcon is quick to dismiss cases where CCA’s may have contributed to high and asymmetric prices. Three submits that DotEcon is correct

that on the basis of publicly available information the high pricing asymmetry in the Austria 4G auction cannot be attributed to price driving by rivals.

- A 7.38 Three notes that the bidders have blamed the format for high prices and the Austrian Regulator has subsequently opted for simpler clock-based formats over the CCA when conducting a multi-region award in the 3.5 GHz band and its planned multi-band 5G award. Three construes this as evidence that price driving may have occurred in the Austrian 4G auction.
- A 7.39 Three submits that DotEcon understates the risk of missing bids distorting the outcome of CCAs. Three acknowledges that missing bids may have contributed to the pricing asymmetry between Sunrise and Swisscom. Three notes that increased bidder sophistication may reduce the risk of bidders not submitting bids, however Three submits that errors and mistakes may arise and impact prices, given the complexity and high number of potential bids in the supplementary rounds. Three provides an example which purports to demonstrate that a bidder improves its relative and absolute price by bidding on a package it does not want.

Document 20/78

- A 7.40 Eir agreed with Three's proposal that, in its proposed Hybrid SMRA (in which it is possible that some winning bids are at final round prices, whereas others are standing high bids at the penultimate round price) all winning bidders should pay the same price per lot won in each category but is of the view that the price paid should be equal to the highest losing and not lowest winning bid.

Asymmetric pricing and competition caps

Document 19/124

- A 7.41 Three submits that the interaction between a CCA Auction, and asymmetric caps, leads to several issues. These are:
- the possibility of Three not winning any sub-1 GHz spectrum;
 - a pricing bias against Three;
 - the possibility for Eir to win less spectrum than Three or Vodafone; and
 - a pricing bias against Eir.
- A 7.42 Three submits that ComReg acknowledges and accepts that asymmetric caps will likely increase the prices paid by Three relative to other bidders. Three does not accept ComReg's characterisation of the increased relative prices as not being "*excessive to the objective sought*", referencing its estimate of a premium

potentially as high as [\times ██████████ \times] from the NERA Annex (attached to Three's response to Document 19/124). Three states there is a contradiction between ComReg's approach to the asymmetric caps and its position in Annex 7 of Document 19/124 that the proposals adopt "*the general principle that equivalent charges should be applied to competing operators for the use of scarce resources whose values appear to be 'equivalent in economic terms'*".

A 7.43 Three submits that, in contrast to ComReg's and DotEcon's characterisation, Three has not argued for non-uniform prices in all cases. Three states that it accepts that non-uniform pricing may reflect different valuation and be required in certain circumstances to ensure efficiency.

A 7.44 Three submits that as a result of ComReg's proposed asymmetric caps a pricing bias against Three is "*built in*" to the process. Three submits that it is not bidding for spectrum different to other MNOs in this auction, that Three has paid for its additional sub-1 GHz lot in its acquisition of O2. Three submits that the pricing bias against Three arising from the asymmetric cap amounts to "*double-counting*".

Fees

Document 19/124

A 7.45 Three submits that ComReg is incorrect to state that price differences do not matter much, as spectrum fees are a "*sunk cost*". Three submits that as costs are amortised over the duration of the rights of use, they have an on-going impact on the business. Three submits that spectrum fees may limit an operator's willingness to compete on price, and may constrain investment, including that on 5G for which Three submits operators have limited access to capital and that ComReg's position is based on an overly simplistic interpretation of economic theory that ignores real world financial pressures on MNOs.

Gaming

Document 19/124

A 7.46 Three submits that inefficiency may arise from bidders adopting "*conquering bid strategies*" in which a bidder attempts to acquire spectrum in order to prevent it being acquired by a rival, in particular it submits that:

- the uniform price rule in an SMRA disincentivises bidders from submitting inflated values, relative to the CCA with its second price rule.
- such a risk is greater where a rival bidder has dropped demand or where caps prevent a rival expressing opportunity cost.

- in MBSA2 this concern is most relevant to the 700 MHz Band, and that bidders may attach a value to denying rivals access to this band given its status as the 5G pioneer band.

A 7.47 Three submits that ComReg is incorrect to state that the CCA is not susceptible to gaming, price-driving. Three submits that DotEcon has acknowledged the risk of price driving in CCA awards in its report on the Dutch Award.

A 7.48 Three submits that DotEcon is not impartial and is invested in the CCA auction format. Three submits that DotEcon has three main blind spots when analysing the downsides of the CCA, namely that DotEcon:

- misinterpret the incentives for price driving behaviour;
- fail to recognise that price driving in CCAs for spectrum is often low risk; and
- understate the potential problem of ‘missing bids’ in more complex multi-band settings.

Document 20/32

A 7.49 Three characterises the CCA as comprising a prisoner’s dilemma in which bidders that do not price drive (i.e. behave ‘cooperatively’) are exposed to much worse outcomes than those that do price drive (i.e. ‘do not cooperate’).

A 7.50 Three submits that DotEcon overstate the risks arising for bidders engaging in price driving in a CCA. In that regard, Three notes that:

- in contrast to DotEcon’s views, bidders have some understanding of rival bidder’s demand, in particular for bands such as 700 MHz and 2.1 GHz where there are a limited number of likely scenarios and many bids are submitted in the supplementary rounds when there is greater certainty in relation to potential auction outcomes.
- in an SMRA a bidder engaged in price driving may be increasing its own price.
- in a CCA bidders may better identify situations in which they may raise prices without increasing their own price or whereby dropping demand a bidder may expose itself to the risk of price driving by rivals without any option to respond.

A 7.51 Separately, Three agrees with DotEcon’s view that competition caps may be effective in removing the opportunity for price driving behaviour, but submits that caps may introduce predictable asymmetries between bidders that may create

low or zero risk opportunities for price driving.

A 7.52 Vodafone submits that price driving is not a concern in the proposed award, as a result of the existing spectrum holdings and competition caps. Vodafone believes that missing bids should not be a concern, provided enough bids and time is allowed at the supplementary stage.

Smaller Bidders

Document 19/124

A 7.53 Three submits that the CCA advantages the strongest MNO and exposes smaller MNOs and entrants to paying higher prices for any spectrum they may win, which Threes submits is not in line with ComReg's obligations and objectives.

A 7.54 Three disagrees with ComReg's view that the CCA benefits smaller bidders and entrants. In contrast, Three believes that "*in relative terms*" the CCA benefits larger bidders, such as Vodafone the most, and entrants the least. Three states that the CCA disadvantages entrants and smaller bidders relative to larger bidders for all bands as:

- **700 MHz:** Three believes that Vodafone should be expected to have a greater value than Eir for a third lot, given its larger number of subscribers and equivalent sub-1 GHz holdings. Three state that this implies that:
 - If Eir and Vodafone bid to value and each bidder wins 2 × 10 MHz, Eir will pay a higher price than Vodafone;
 - If Eir strategically reduces its demand, and Vodafone does not reduce its demand in response, the difference in price will increase further; and
 - Any value Vodafone places on preventing Eir or Three securing 2 × 10 MHz at 700 MHz is enhanced. If Eir drops demand early there is a risk that Vodafone is able to inefficiently grab three lots at low relative prices.
- **2.1 GHz, 2.3 GHz and 2.6 GHz:** Three submits that given the large quantity of spectrum available in MBSA2, the likelihood of an entrant acquiring spectrum is greater under a SMRA, and not a CCA. Three submits that under an SMRA the incentives for strategic demand reduction may encourage incumbent MNOs to forgo bidding on marginal lots. Three states that this incentive would "*create room*" for an entrant to acquire spectrum. Three submits that, in contrast, under a CCA bidders have an incentive to bid on spectrum to avoid unfavourable relative prices (i.e., to ensure it imposes its opportunity cost). Three submits that Eir may

be tempted to bid on additional spectrum in supra-1 GHz band in order to retaliate to any attempt at price driving by Vodafone in the 700 MHz band. Three believes that the benefit in an SMRA to an entrant of incumbents strategically reducing demand outweighs any upside in a CCA from reduced aggregation risk.

A 7.55 Three states that in a CCA, winners of smaller quantities will have higher prices for their lots, relative to winners of larger quantities who typically face lower opportunity cost for some number of lots. Three notes that in the 3.6 GHz Award, entrants paid a higher price per lot.

A 7.56 Three believes that ComReg's view that CCA is good for entrants is incorrect.

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A 7.57 Imagine remains of the view that CCA is a "suitable" mechanism for the auction and allocation of this spectrum and stands by its previous statement as referenced by ComReg.

A 7.58 However, Imagine would also point out that this reference omits an important part of the full text which stated that: *"Given the recent experience of the CCA auction process of 3.5 GHz Imagine believes that CCA is a suitable mechanism for the auction and allocation of this spectrum. However, Imagine believes that the process as constructed and operated for 3.5 GHz spectrum does significantly disadvantage smaller operators."*

Transparency

Document 20/32

A 7.59 Imagine states that it agrees with DotEcon's views that *"providing exposure prices could be seen as a measure to level the playing field to remove any advantages of more sophisticated and better resourced bidders able to undertake such calculations"*. Imagine is of the view that providing Exposure Pricing is a welcome addition to the auction process as a tool that helps address transparency concerns and governance challenges that may in particular impact smaller operators and therefore should be included.

A 7.60 Eir welcomes ComReg's proposal to include an Exposure Pricing element but notes that the value shown to bidders could go up as well as down. As a result, and if there are any unsold lots at the end of the final primary round, this may mean a bidder will have to make a supplementary bid for its final primary package that is significantly higher than its final primary bid in order to be certain of winning that package. Hence Eir does not consider Exposure Pricing to address all its concerns regarding uncertainty. Eir considers that further additional information could be provided:

- the minimum bid that the bidder could make for its final primary package in the supplementary bids round for that bid to win; and
- the minimum bid that the bidder would need to make for its final primary package in the supplementary bids round for that bid to win if no other supplementary bids were made by any other bidder.

A 7.61 Three asked its consultant NERA to comment on the proposed introduction of Exposure Pricing and submits the following:

“Overall, we note that the report contains a large amount of general material that is only loosely relevant to ComReg’s proposed award. The paper is quite helpful in explaining the evolution of the CCA design but, in our view, the analysis paints an overly positive picture of the benefits and relevance of this particular auction format. We do not oppose the addition of an exposure tracker in ComReg’s CCA implementation, but we also do not think that it meaningfully addresses the concerns about the format as already described to ComReg in detail in the Earlier Response.”

A 7.62 Three notes ComReg’s proposals to introduce Exposure Pricing but submits that it does not address its concerns raised regarding the award process.

A 7.63 Vodafone welcomes the Exposure Pricing study included in Annex 12 of Document 20/32 and states that including this mechanism would be a significant positive change in the auction design.

7.1.2 DotEcon’s updated view

Asymmetric pricing and competition caps

A 7.64 DotEcon observes that Three’s stated concerns relate primarily to the interaction of the pricing rule and competition caps preventing Three expressing a value for a third lot and not to the design of the competition caps or choice of CCA itself. DotEcon rejects Three’s characterisation of this as “overpaying” as Three’s own price will reflect the opportunity cost of its winning package.

A 7.65 Furthermore, DotEcon notes the requirement for the competition cap to prevent extreme asymmetry in spectrum holdings and that the same competition cap and pricing rule apply to all bidders.

Non-uniform pricing

A 7.66 DotEcon notes that the proposal to move towards a uniform price format would reduce the incentive for Vodafone or Eir to bid for a third lot.

A 7.67 DotEcon disagrees with Three that non-uniform pricing is rarely required to

formats, with an efficient and competitive outcome we would not expect the final prices paid by winners to differ drastically across formats. DotEcon also notes that it does not expect that the upfront fee is likely to be significantly higher under the CCA than under any other auction format. DotEcon notes that the decision in relation to the split of the SUF and the SAF is independent of the choice of award format.

Gaming/Price Driving

- A 7.72 DotEcon notes that if 'aggressive' behaviour simply entails bidding a higher proportion of valuation, this is entirely consistent with efficiency. Similarly, DotEcon notes that Three's characterisation of the CCA as a prisoners dilemma highlights a positive argument for the CCA, that bidders have an incentive to bid truthfully, as there is no direct benefit to unilaterally reducing demand in a way that is not based on the bidder's valuations. A rational bidder would not expect its reduction in demand to be reciprocated, and DotEcon states it is unclear why Three consider this an argument for the likelihood of strategic demand reduction under a CCA.
- A 7.73 DotEcon notes that bid-conquering strategies appear unlikely as the competition caps are set to avoid bidders being able to express a value based on blocking a competitor from competing effectively downstream.
- A 7.74 DotEcon notes Three's reference to the DotEcon Report in the Dutch Award, in which it noted that price-driving could be a greater issue under a second price rule in some circumstances. In relation to the questions Three raises on this DotEcon notes that Three omitted the answer offered in that report, namely that these might be conditions under which a CMRA is appropriate, however no respondents support the use of a CMRA in this case and DotEcon does not consider price-driving a main concern in this award.

Budget Constraints

- A 7.75 Regarding the effect of gaming on knockout bids, DotEcon notes that [\times [REDACTED] \times], but not after the supplementary bids round, is not indicative of gaming.
- A 7.76 DotEcon recognises Eir's concern that budget constrained bidders might at some point be unable to bid for their preferred package. However, DotEcon note this specific issue for budget constrained bidders is Eir's primary reason for preferring a uniform price format, and it is not in agreement with Three, even though both prefer other formats to a CCA.

Additional Information

- A 7.77 DotEcon notes that all bidders would likely find it useful to know the minimum bid

that it could submit for its final primary package to ensure that bid would win. However:

- a) in relation to Eir's first proposal (to calculate this minimum bid), DotEcon notes that this measure would not provide any guarantees to the bidder that it would win its final primary package and are unclear as to why this would be of use.
- b) in relation to Eir's second proposal, (proposed 'minimum bid') this appears meaningless as it is based on a very specific assumption of what other bidders will do and does not appear to provide any information that would help the bidder to maximise its chance of winning the final primary package.

A 7.78 Separately, DotEcon notes that a modified knock-out bid that considers the hypothetical supplementary bids that rivals may make could answer Eir's concerns, however DotEcon notes that such a measure may reveal too much information to a bidder allowing it to infer the range of scenarios faced by competitors at the start of the supplementary bids round.

7.1.3 ComReg's Assessment

A 7.79 It should be noted that ComReg's assessment of different auction formats is undertaken separately in Chapter 7 which, *inter alia*, comprises the Auction Format RIA, which sets out that assessment under the framework of a RIA. While, in the below assessment, some of ComReg's considerations expressly, and necessarily, overlap with the Auction Format RIA, this annex addresses specific points raised by respondents more directly, ComReg's treatment of those points here being consistent with ComReg's assessment and decision reached on its selection of its Preferred Option and the relevant elements thus comprising that part of the auction format which is set out at the end of Chapter 7.

A 7.80 ComReg addresses the respondents' submissions under the following headings:

- Strategic demand reduction;
- Budget constraints;
- Unsold lots at the end of the primary bid round;
- Additional information;
- Complexity;
- Aggregation Risk and complementarities;

- Price Driving;
- Asymmetric pricing and competition caps;
- Missing Bids;
- Smaller Bidders;
- Sunk costs;
- Enhanced SCA;
- Relative Caps; and
- NERA Annex

Strategic demand reduction

- A 7.81 In Section 7.3.3 of Document 19/59R and Section 6.1.4 of Document 19/124, ComReg discussed in detail its concerns in relation to strategic demand reduction. The assessment is not repeated here, however, the CCA and opportunity cost pricing provides bidders with incentives to compete for additional spectrum and provides good incentives for bidders to make bids that reflect their actual relative valuations for the different packages that bidders consider they could win.
- A 7.82 In response to Three's submission that demand reduction occurs to a greater or lesser extent in most spectrum auctions¹⁰⁹², ComReg notes, for clarity, that it is not referring to bidders reducing demand in response to prices increasing during the award relative to their actual valuations. Such reductions in demand are a normal and welcome feature of any open award format. Rather, ComReg is referring to the case where a bidder reduces demand not because a different (smaller package) has a higher surplus but because a bidder may identify that the price for its winning package may be lower on a per lot basis if it seeks to win fewer lots early in the process (instead of competing for many lots in the normal way and then dropping back to fewer lots if its larger package gets too expensive).
- A 7.83 Bidders might ultimately have been assigned more spectrum but refrained from competing for additional spectrum **through fear** of having to potentially reduce demand later and pay a higher price as a result of competing for additional spectrum. In effect, formats that allow bidders to compete for additional spectrum without fear that it will increase the price of a package it may eventually end up

¹⁰⁹² Three's Response to Document 19/124, p11 (published in ComReg Document 20/56s).

winning are much more conducive to efficient outcomes.

A 7.84 In relation to Three's view that ComReg places too much emphasis on strategic demand reduction¹⁰⁹³, ComReg notes that it has previously stated views in Document 19/59 in paragraph 7.49 of Document 19/59R and 6.41 of Document 19/124 that strategic demand reduction is a potentially material issue in the Proposed Award because:

- a) there is a large amount of spectrum available and bidders would likely require multiple substitutable lots allowing bidders greater opportunity to obtain enough spectrum (although less than optimal) without having to compete strongly;
- b) bidders seeking performance spectrum are likely to be more flexible in relation to the total bandwidth they acquire, which means that they may have greater scope for reducing demand with the prospect of being able to acquire spectrum at a lower price, even if this may not lead to an outcome where the optimal level of additional capacity is provided at the lowest possible cost;
- c) the risk of strategic demand reduction is greater in low participation scenarios (which is typically the situation in spectrum auctions, due to the large investment required for potential spectrum users), especially when one or more bidders can act unilaterally to bring the auction to a close at lower prices; and
- d) given the range of potential bidders for the proposed award (including smaller incumbents and potential New Entrants), strategic demand reduction is a very real concern and smaller bidders are likely to prefer incentives that allow them to compete for additional spectrum. (noting that that two non-MNO bidders in the 3.6 GHz Award obtained rights of use in the 3.6 GHz Award and likely benefited from being able to compete for additional rights of use in a straightforward fashion).

A 7.85 ComReg has not received any convincing evidence from Three or any other bidder that cause it to change its views in that regard. Indeed, Three itself appears to acknowledge at least part of ComReg's rationale above.

"In auctions where there is a lot of spectrum available (like this one), the incentive to moderate demand may be greater. One or more bidders may decide to surrender some marginal lots that they could have won in the hope of realising a better price. Almost certainly, these will be lots that are marginal to the bidder's business case and will be picked up by rivals with similar

¹⁰⁹³ Three's Response to Document 19/124, p10 (published in ComReg Document 20/56s).

*values. Accordingly, while this demand reduction may result in a degree of inefficiency, most likely the economic impact of this inefficiency will be small.*¹⁰⁹⁴
[Emphasis added]

- A 7.86 ComReg acknowledges Three's view that bidders may behave in this manner given incentives to do so. However, many bidders would prefer to compete for the additional spectrum and not reduce demand until consistent with its bidding strategy (e.g. until the surplus of smaller package is higher). In that regard, under some auction formats a bidder must decide whether to:
- (a) compete for additional spectrum and risk increasing the price for a smaller package it may end up on; or
 - (b) reduce demand to a smaller package early (to avoid a higher price) and avoid competing for additional spectrum that it might have won had it competed.
- A 7.87 The CCA removes this trade-off for bidders by allowing it to compete for the additional spectrum without having to concern itself about whether this might increase the price of a package it eventually ends up on. For example, if a bidder competes strongly for 2 × 10 MHz, this does not automatically lead to a higher price if that bidder ultimately wins 2 × 5 MHz unless the smaller package is also competed for. This arises because the CCA uses a second price rule that determines what each winning bidder must pay by reference to that bidder's opportunity cost, rather than what the bidder bid. In effect, it provides bidders with the best of both worlds under (a) and (b).
- A 7.88 Similarly, Three's suggestion that in an SMRA "*bidders typically only drop the lots they do not expect to win, so there may be no impact on allocative efficiency*"¹⁰⁹⁵ again only serves to highlight ComReg's concern. For avoidance of doubt, ComReg is not saying that if bidders compete for additional lots in a CCA it will win those lots, rather the CCA provides the opportunity to compete for those lots regardless of whether it expects to win or not. A bidder does not know the point at which it is unlikely to win lots and the only sure way to test whether it is possible or not is to compete for those lots (without incentives that encourage it to do otherwise).
- A 7.89 Further, ComReg agrees with Three that the "*exiting of potentially winning bids*"¹⁰⁹⁶ is relevant to this award. However, this again somewhat highlights the difficulty of formats that encourage strategic demand reduction. Such "*potentially winning bids*" might not end up being considered in determining winning

¹⁰⁹⁴ Three's Response to Document 19/124, p12 (published in ComReg Document 20/56s).

¹⁰⁹⁵ Three's Response to Document 20/56, p13 (published in ComReg Document 20/78).

¹⁰⁹⁶ Three's Response to Document 19/124, p11 (published in ComReg Document 20/56s).

assignments because such bids might not have been made from fear of increasing its prices. Alternatively, under a CCA such bids can be made, and the winner determination process determines whether such bids are winning or not. This would not be available under other formats because the bids would never be made in the first place.

- A 7.90 ComReg also notes that Three appears to conflate tacit collusion to reduce demand with strategic demand reduction. Strategic demand reduction does not need to be “*tacitly coordinated demand reduction*” and can occur unilaterally (and as a result is more likely to occur under some formats).¹⁰⁹⁷ Strategic demand reduction may only require a unilateral decision by a bidder to reduce demand strategically and is separate from tacit collusion which can be difficult to coordinate.
- A 7.91 It is important to note that tacit collusion is a different consideration from strategic demand reduction¹⁰⁹⁸ because strategic demand reduction arises because bidders have to make a choice between (a) and (b) above, whereas tacit collusion requires all bidders (or a subset of bidders) to **willingly** reduce demand in order to achieve a lower price.. Alternatively, some bidders would prefer to compete for additional spectrum (and would not tacitly coordinate even if arranged¹⁰⁹⁹) however the auction format may make this choice expensive if it did.
- A 7.92 In such cases, strategic demand reduction arises primarily **through fear** of having to potentially reduce demand later and pay a higher price as a result of competing for additional spectrum early. If the format provided it to compete safely for additional lots some bidders would always compete for those lots. As noted by DotEcon, weaker bidders are able to submit bids for larger packages up to valuation and **test their ability** to win the larger packages **without fear** that it will increase the price they would pay for winning a smaller amount of spectrum.¹¹⁰⁰
- A 7.93 In relation to Three’s view that the scope for inefficiency under an SMRA may be narrow because there may be obvious focal points for sharing demand¹¹⁰¹, ComReg notes that such an approach would be a tacitly collusive outcome because multiple bidder aim to reduce competition for lots and bring the auction

¹⁰⁹⁷ Three’s Response to Document 19/124, p8 & p9 (published in ComReg Document 20/56s).

¹⁰⁹⁸ While strategic demand reduction is a separate concern from gaming, ComReg notes that gaming strategies are less likely the more competitive the auction process, as the ability of individual bidders to affect outcomes and coordinate across bidders is more limited. In this way, auctions that provide incentives to compete for additional spectrum (e.g. reduce incentives for strategic demand reduction) have the added benefit of reducing the possibility of gaming strategies being successful.

¹⁰⁹⁹ Tacit collusion is a gaming issue and is a potential issue with all open auctions and may be possible if a sufficient number of bidders jointly reduce their demands to moderate the prices they pay.

¹¹⁰⁰ Document 19/124a, p43.

¹¹⁰¹ Three’s Response to Document 19/124, p11 (published in ComReg Document 20/56s).

to an early end. ComReg agrees that the risk of such behaviour is higher where there are outcomes that all bidders may consider to be particularly likely which then provide so-called ‘focal points’ for co-ordination. Such strategies are of concern to ComReg because they can result in inefficient outcomes, because bidders hide their value for additional spectrum.

A 7.94 In any event, ComReg notes that the presence of a potential ‘focal point’ cannot be relied upon to achieve an efficient outcome. This is because, contrary to Three’s hypothetical example¹¹⁰²:

- a) bidders may not share views on what constitutes a “*reasonably efficient outcome*” and therefore such views may not serve as an effective focal point for coordination between bidders. Bidders may, after all, have differing views on what constitutes a “*reasonably efficient outcome*” or a focal point;
- b) there is no guarantee that any potential focal point within a given band coincides with an efficient assignment. ComReg notes the presence of a focal point which leads to an outcome that is an inefficient allocation may bias any award to an inefficient outcome;
- c) the presence of a focal point alone does not guarantee that bidders will successfully coordinate. Even in the presence of a potential focal point, tacit coordination is unstable and subject to a shared understanding among bidders (i.e., adopting similar strategies).

A 7.95 In that regard, the sealed element of the CCA (i.e. supplementary bids round) provides incentives to deviate from such strategies that would not be available under other formats which are easier to coordinate (e.g. SMRA).

A 7.96 In relation to Three’s view that the CCA is equivalent to a prisoner’s dilemma¹¹⁰³ which can result in asymmetric prices, ComReg notes and agrees with DotEcon¹¹⁰⁴ that there is no reason to expect bidders are not interested in winning additional lots (e.g., a third 700 MHz lot) and absent any credible incentives for price driving (which it notes does not exist), this would be legitimate competition. Furthermore, ComReg notes that for bidders trying to organise a tacit arrangement in a CCA is not an optimal strategy and the CCA has been designed with that in mind. (i.e. the incentives to reduce demand in the hopes that others follow is low in a CCA whereas the incentives to compete for additional spectrum are much higher).

A 7.97 In that regard, Three’s example of a budget constrained bidder reducing demand

¹¹⁰² In Three’s Response to Document 19/124, p11 & p12 (published as Document 20/56s).

¹¹⁰³ Three’s Response to Document 19/124, p12 (published in ComReg Document 20/56s).

¹¹⁰⁴ DotEcon Report, Document 20/122a, p91.

in hope that others will follow¹¹⁰⁵ merely highlights why tacit agreements are difficult to coordinate in CCA (because bidders are provided incentives to compete for additional spectrum). As noted by DotEcon, a rational bidder, even if budget constrained, will not expect its demand reduction to be reciprocated, therefore it is unclear why Three claims that this analysis demonstrates incentives for strategic demand reduction in a CCA.¹¹⁰⁶

- A 7.98 Related to this issue, ComReg agrees with Eir that the incentive is greater for a budget constrained bidder to engage in strategic demand reduction and this increases the risk of an inefficient outcome. However, as noted above, such incentives are less in a CCA and such strategies would only arise in SMRA and SCA. ComReg addresses Eir's concerns in relation to the difficulty in deciding whether to compete for larger or small packages in the supplementary bids round in the presence of budget constraints separately below. However, ComReg would note here that any bias for smaller packages in the supplementary bid rounds arising from budget constraints is a separate consideration from strategic demand reduction (i.e. it only arises because some bidders may have budget constraints and refers to decisions such bidders may have to make in the supplementary bids round).
- A 7.99 In relation to Three's view that the economic impact of strategic demand reduction by larger bidders would be small¹¹⁰⁷, ComReg notes and agrees with DotEcon¹¹⁰⁸ that for entrants or smaller bidders in the award, the spectrum they could potentially win could represent a large fraction of their total holdings.¹¹⁰⁹ Such a view may be true of operators with large existing holdings (e.g. MNOs), but the impacts on smaller operators would be significantly larger and a small reduction in demand could constitute a large amount of their existing holdings (or restrict a new entrants ability to compete). As noted in Document 19/124, strategic demand reduction can impact the incentives for smaller bidders that wish to acquire additional spectrum in a straightforward fashion.
- A 7.100 In relation to Three's views that larger bidders have the strongest incentive to engage in strategic demand reduction¹¹¹⁰, ComReg acknowledges that such bidders have scope to engage in strategic demand reduction. However, the impact on smaller bidders may be higher because smaller bidders are more likely to require additional spectrum given smaller existing holdings (or none at all in the case of entrants). Further, as noted by DotEcon, incentives for strategic demand reduction can be greater for weaker bidders who might anticipate

¹¹⁰⁵ Three's Response to Document 19/124, p13 (published in ComReg Document 20/56s).

¹¹⁰⁶ DotEcon Report, Document 20/122a, p89.

¹¹⁰⁷ Three's Response to Document 19/124, p12 (published in ComReg Document 20/56s).

¹¹⁰⁸ DotEcon Report, Document 20/122a, p139.

¹¹⁰⁹ DotEcon Report, Document 20/122a, p89.

¹¹¹⁰ Three's Response to Document 19/124, p9 (published in ComReg Document 20/56s).

needing to reduce demand later in the auction (as prices increase and they can no longer compete with stronger bidders).¹¹¹¹

- A 7.101 In any event, ComReg notes that any strategic demand reduction (regardless of which stakeholders have the strongest incentives) is problematic from the perspective of an efficient assignment and should be avoided.
- A 7.102 In relation to suggestions that ComReg's concerns may relate to revenue¹¹¹², ComReg refers to its previously stated view in Section 5.7.3 of this document. Further, as Three will be aware, the CCA uses second price rules that seeks to minimise incentive distortions by keeping prices actually paid by winning bidders **as low as possible** subject to the floors set by individual and collective opportunity cost imposed by winners.
- A 7.103 In this way, minimum revenue core (MRC) pricing is the theoretical benchmark for the revenue that an efficient competitive process **needs to raise**, as this is the least amount that winners **need to pay** so that other bidders would not want to make a higher alternative bid. As noted by DotEcon revenue is simply a by-product of an efficient award¹¹¹³. If an auction raises less than the MRC benchmark, then this must be because of some suppression of potential competition, in that the format has inhibited the expression of higher value outcomes. (e.g. strategic demand reduction).
- A 7.104 In relation to the 2.6 GHz Danish Award, ComReg notes that it did not use this as an example for demonstrating synergies between lots (though it could be used for that purpose also). This example was primarily used to illustrate why a CCA prevents a smaller bidder engaging in strategic demand reduction instead of competing for additional spectrum. In that regard, Three itself acknowledges the same in explaining why it considered the pricing outcome fair:

*"In this situation, an opportunity cost pricing rule was effective because it encouraged the marginal bidder (Three Denmark) to bid strongly for 2 × 20 MHz while preserving an option to fall back to 2 × 10 MHz at the reserve price."*¹¹¹⁴

- A 7.105 ComReg agrees and reiterates that this provides a good example of how the CCA can be effective at dealing with strategic demand reduction considerations

¹¹¹¹ Document 19/124a, p 43.

¹¹¹² For example, Three notes that "ComReg has been very clear that revenue is not a concern. Furthermore, to the extent that lower spectrum prices mean MNOs have greater funds available to invest in networks, including on 5G deployment, there may be an upside for everyone from realising an efficient outcome at a lower price." Three response to Document 19/124, p11.

¹¹¹³ If ComReg wished to raise revenue it for example it may be possible to raise more revenue than the MRC benchmark by using mechanisms that extract surplus from strong bidders in situations where there are sufficiently strong asymmetries across bidders

¹¹¹⁴ Three's Response to Document 19/124, p14 (published in ComReg Document 20/56s).





















Three Response to Document 19/124, p14.

and promoting competition during the award. Under an SMRA format, Three would likely have reduced demand early. As noted by DotEcon, “*Three ultimately won two lots, but these were assigned at the reserve price (i.e. bidding for more lots had no bearing on the price it paid) and the fact that Three was able to bid for larger packages meant that other bidders would have been required to pay the opportunity cost of denying Three any additional spectrum*” ¹¹¹⁵ [Emphasis added].

A 7.106 Finally, ComReg notes and agrees with DotEcon that bid conquering strategies are unlikely, given that the competition caps are set to avoid bidders being able to express a value based on blocking a competitor from competing effectively downstream. For example, Three is permitted to be assigned 2 x 10 MHz of the 700 MHz Band and can express valuations for same.¹¹¹⁶

Budget constraints

A 7.107 In relation to Eir’s example of how a budget constrained bidder could have difficulties during the award, ComReg notes the following:

- a) the scenario raised by Eir could only arise where [✕ 



- b) 




- c) 




- d) 




 ✕]

¹¹¹⁵ DotEcon Report, Document 19/124a, p44.

¹¹¹⁶ DotEcon Report, Document 20/122a, p89.

- e) while bidders may not be able to retain the valuation difference between smaller and larger package, it will still be able to bid up to budget for the larger package, which may be sufficient. If it considers that it is unlikely to win the larger package, it might choose not to express its full valuation difference between smaller and larger packages, instead prioritising its bid for its smaller package. Therefore, strategies are available for budget constrained bidders, but some trade-offs may need to be struck between competing objectives.

A 7.108 Notwithstanding, ComReg accepts that there may be a bias towards smaller packages¹¹¹⁷ for budget constrained bidders in the supplementary bids round if they assess that they are unlikely to win larger packages. Therefore, bidders can adjust their bids to maximise their chances of winning on the basis of their expectations on what they might be able to win. This is an inevitable consequence of being budget constrained; bidders need to prioritise packages they are likely to win and may not be able to express all valuations to their true levels. Similar issues would arise with other formats.

A 7.109 For example, a budget constrained bidder might have a choice between prioritising a smaller package or a larger package:

1. bidding less than valuation for the smaller package while bidding for the larger package at its budget and expressing the true the value differential between smaller and larger packages if it thought this would likely win the large package, or
2. if it was unlikely to win the large package at its budget, bid for the small package at full valuation but consequently understate its valuation differential between the smaller and larger packages.

A 7.110 Notice that in either case bids remain aligned with valuations, in the sense of expressing the bidder's relative valuation between various outcomes. However, where a bidder is budget constrained it may not be possible to express its valuations for every option. In the first case above, the bidder is focussing on expressing its valuation between the alternatives of winning the smaller and larger packages; in the second case it expresses its valuation between the alternatives of winning the smaller package and winning nothing.

A 7.111 In forming a decision about which aspects of expressing their valuations to prioritise, the CCA can help budget constrained bidders to identify which packages they are likely to win within their budget (i.e. the smaller or larger). This

¹¹¹⁷ For example, DotEcon notes (Document 20/32 – Annex 12) that while there may be some potential bias towards bidding for smaller packages, unlike the simple clock auction, it would still expect budget constrained bidders to make full use of whatever budget they do have to bid for large packages.

allows bidders to focus on these packages and adjust bids to improve their chances of winning their preferred affordable package given their budget. The aggregate demand information provided at the end of each clock round may also allow bidders to calculate an upper bound on the price they may need to pay for the package they bid in the final clock round, especially under the relaxed activity rules adopted for the MBSA, which may also help in formulating the best strategy for deploying a limited budget..¹¹¹⁸

A 7.112 The relaxed activity rules and exposure prices¹¹¹⁹ are especially helpful with this decision-making process and reduces the extent to which final prices might exceed the clock prices at the end of the clock stage. The mitigation caused by the relaxed activity rules and exposure prices is not just a theoretical point. For example, the UK 4G Auction in 2013 did not provide for relaxed activity rules and the final primary bid round ended with two unsold 800 MHz lots and 5 unsold 2.6 GHz lots and the winning outcome after the supplementary bids round varied significantly from what occurred at the end of the primary bids round. In the proposed CCA, the final primary packages should be much closer to the winning outcome than the final primary packages obtained absent those rules.

A 7.113 Further, it is worth reiterating that budget-constrained bidders face difficulties in most auction formats and these arise in different ways and different stages. As noted by DotEcon, regardless of the format, there will typically be some need for bidders to assess what they can realistically win within their budget, and possibly to update such an assessment in the course of the auction.¹¹²⁰ In particular, within multiple lot auctions, it becomes necessary for a budget-constrained bidder to anticipate whether or not it is likely to win a particular outcome before deciding to compete for it.

A 7.114 In relation to Eir's view that a SMRA or SCA would better deal with budget constraints because a bidder may bid until the point at which price exceeds either the budget or valuation, ComReg notes and agrees with the views of DotEcon¹¹²¹:

- a) in an SMRA or clock auction, a budget constrained bidder has a complex decision about competing for a larger number of lots, because it may need to contract to a smaller number of lots later due to reaching its budget

¹¹¹⁸ DotEcon Report, Document 20/122a, p89.

¹¹¹⁹ As noted by DotEcon (Document 20/32) if there turns out to be under-sell in the final clock round, there is no guarantee that a package can be secured at the exposure price applying in that round. Indeed, in some cases it may be necessary for a bidder to increase its final clock bid in order to guarantee winning its final clock bid if there is under-sell (a so-called knock-out bid). This is because rivals can place all-or-nothing bids that include both unsold lots and the bidder's package.

¹¹²⁰ Document 20/32, DotEcon report on Exposure Pricing, p61.

¹¹²¹ Document 19/124a, p40.

constraint, but could by then have already raised prices to the extent that it can no longer afford fewer lots; and

- b) similarly, in a SCA (Simple Clock Auction) with multiple lots in a single category, if a bidder has a budget constraint that prevents it bidding its full value for a larger number of lots, this may lead to increased incentives for strategic demand reduction. The bidder may ultimately compromise for a (possibly inefficiently) small number of lots because it does not expect its bids for larger amounts to be competitive.

A 7.115 Furthermore, DotEcon also notes that where budget constraints arise bidders will not be able to fully represent their valuation structures (or bid for their most valued package in the final outcome) under any format, including the SCA, and this is not a problem purely related to the CCA. Moreover, combinatorial auctions, such as the CCA, allow bidders to compete for a range of packages in a way that might not be feasible under other formats such as the SCA.¹¹²²

A 7.116 In relation to a SMRA with bid withdrawals, it is difficult for bidders to bid within their budget constraints because all bids may be re-activated at any time during the auction due to withdrawals submitted by other bidders. In this way, it is difficult for bidders to contract demand in response to price increases in a manner that truly reflects their budget constraints. Therefore, while the extent to which budget constrained bidders can express their valuations in the CCA is not perfect (compared to unconstrained bidders) it is nevertheless superior to that in the SMRA and clock auctions.

A 7.117 As noted by ComReg in the Auction Format RIA, these issues are less likely to be less relevant in a CMRA because bidders pay the amount of their winning bids and prices are determined by competition with other bidders. However, that format increases the incentives for strategic demand reduction and bid shading across all bidders. In any event, ComReg notes that Eir does not support the use of a CMRA and instead suggests an “Iterative CCA” which is discussed separately in the Auction Format RIA.

A 7.118 ComReg also discusses budget constraints further in the Auction Format RIA and notes that the choice of an award format is based on ComReg’s broader assessment of award formats in line with its objectives, which considers the incentives of all bidders under each of the potential award formats in line with its objectives

Unsold lots at the end of the primary bids round

A 7.119 In relation to Eir’s claim that bidding in the 3.6 GHz and MBSA1 awards could be

¹¹²² DotEcon Report, Document 20/122a, p91.

interpreted as [✂ [REDACTED] ✂], ComReg notes that such situations do not necessarily arise because of [✂ [REDACTED] ✂]. Such situations could arise because [✂ [REDACTED] ✂]. As noted by DotEcon¹¹²³, in circumstances where a CCA is appropriate, bidders are likely to have increasing marginal valuation, and so may drop demand by multiple lots in one step, and the purpose of the supplementary bids round is to prevent these lots going inefficiently unsold.

- A 7.120 There are scenarios where some bidders could [✂ [REDACTED] ✂]. This could limit the extent to which bidders can use the information from the clock stage when determining their final set of bids, as when the value of lots in excess supply in the final clock round is significant, the maximum price that a bidder might possibly need to pay for some packages may be materially above final clock prices.
- A 7.121 However, the relaxed activity rules adopted for the proposed award reduce the extent to which final prices might exceed the clock prices at the end of the clock stage, and also the scope for bidders to artificially create situations of excess supply in the final clock round without facing adverse constraints when submitting their final set of bids in the supplementary bids round.
- A 7.122 For example, such strategies would be more effective for larger reductions in demand in order to create more unsold lots. However, this could reduce a bidder's ability to be assigned additional lots in the supplementary bids' rounds given the constraints. Further, it would be a risk for a bidder to bid above its requirement and then drop back given that all bids are binding, and the clock rounds could end at any point (meaning a bidder could end up winning unwanted lots).
- A 7.123 Further, ComReg notes and agrees with DotEcon¹¹²⁴ that if bidders were genuinely dropping demand in the final primary bid round (with the intention of buying it back in the supplementary bids round) just to increase the knockout bid for others, that shouldn't be of particular concern. In particular, if there is an expectation that unsold lots dropped in the final primary bid round will just be included back into other bidders' final primary packages, then these can be discounted from the knockout bid calculation. In this way, bidders in the supplementary bids round should bid in the same way (i.e. as if there were no unassigned lots at the end of the Primary Bids Round).

¹¹²³ DotEcon Report, Document 20/122a, p104.

¹¹²⁴ DotEcon Report, Document 20/122a, p104.

Additional Information

A 7.124 ComReg notes Eir's request for further information in addition to that already provided by Exposure Pricing (in order to further assist with the budget constraints issue provided above). In particular, Eir requests the following:

- (i) The minimum bid that the bidder could make for its final primary package in the supplementary bids round for that bid to win; and
- (ii) The minimum bid that the bidder would need to make for its final primary package in the supplementary bids round for that bid to win if no other supplementary bids were made by any other bidder.

A 7.125 In relation to (i), ComReg notes and agrees with DotEcon¹¹²⁵ that bidding at this amount would not provide any guarantees to the bidder that it would win its final primary package, and it is unclear why calculating this amount would be helpful. Further, the assumptions suggested by Eir, are only that, and there are no guarantees other bidders would behave this way.

A 7.126 In relation (ii), ComReg notes and agrees with DotEcon¹¹²⁶ that this information is based on a very specific assumption of what other bidders will do and does not appear to provide any information that would help the bidder to maximise its chance of winning the final primary package. In effect, ComReg would be providing this information based on an assumption of what other bidders might do (i.e. what bid would be required if no supplementary bids were made) and it is not clear how that would help the bidder to win its the final primary package.(i.e. other bidders might bid differently).

A 7.127 More generally, ComReg is of the view that any information it provides during the auction needs to be accurate and non-assumption based in order to be helpful to all bidders. ComReg is conscious that such information would be available to all bidders and while Eir may have some unspecified use for this information, others may not, and it could lead to bidding errors and claims that ComReg provided misleading information at the time of the award (i.e. if the assumptions used to calculate the information turned out to be incorrect).

A 7.128 Finally, ComReg notes that it already intends to provide additional information compared to previous award, including Exposure Pricing and the EAS will also be updated to assist bidders in performing these 'knockout' calculations by also reporting the value of any unsold lots in the final Primary Bid Round at final Primary Bid Round prices and at reserve prices.

¹¹²⁵ DotEcon Report, Document 20/122a, p104.

¹¹²⁶ DotEcon Report, Document 20/122a, p104.

Complexity

- A 7.129 ComReg previously addressed concerns in relation to complexity including the two time slice approach in Document 19/124R (paragraph 4.100) and more recently in Chapter 4 of this document where ComReg was of the view that the two time slice approach involves no more complexity than the requirement to bid on a given lot in both time slices rather than one. Further, given the use of package bidding there is no risk of bidders winning a subset of those lots.
- A 7.130 ComReg's assessment of auction complexity more generally as an Award Risk is set out in detail in the Auction Format RIA.

Aggregation Risk and complementarities

- A 7.131 In relation to Three's suggestion that aggregation risks are the result of Time Slices and that with the removal of Time Slices a SMRA could handle the aggregation risk¹¹²⁷, ComReg has addressed concerns in relation to Time Slices in Chapter 4.
- A 7.132 Furthermore, ComReg already clarified in Chapter 6 of Document 19/124 that even if Time Slices were not required in this award, it would still be minded to provide for a package bidding format given the likely complementarity of lots in the Proposed Award. In particular, DotEcon notes that it does not agree with Three that the only significant complementarities are across bands, as aggregation risk also arises because of, minimum requirements within a band, complementarities between bands, between Frequency-Generic and Frequency Specific Lot categories within the same band.¹¹²⁸
- A 7.133 In relation to Three's view that bidders are likely to have descending values for lots¹¹²⁹ and that ComReg needs to form views on whether or not bidders are likely to have incremental ascending values that are pivotal to auction outcome, ComReg notes that its assessment on the potential for complementarities are outlined in the Background section of the Auction Format RIA (See Section 7.5).
- A 7.134 For the avoidance of doubt, ComReg is of the view that in the Proposed Award bidders may potentially have ascending incremental values for lots, which could be pivotal to award outcomes which ComReg cannot preclude (See Complementarities discussion in the Auction Format RIA.).
- A 7.135 ComReg notes Three's view that valuations for second lot at 700 MHz may be ascending but that such valuations are "unlikely" to be pivotal¹¹³⁰. However,

¹¹²⁷ Three's Response to Document 19/124, p9 (published in ComReg Document 20/56s).

¹¹²⁸ DotEcon Report, Document 20/122a, p138.

¹¹²⁹ Three's Response to Document 20/56, p26 (published in ComReg Document 20/78).

¹¹³⁰ Three's Response to Document 19/124, p15 (published in ComReg Document 20/56s).

ComReg notes that Three has no solid basis for its view that such values are “unlikely” to be pivotal as bidders’ valuations for second and third lots are likely to vary across bidders. Setting aside the possibility of more than three bidders securing lots at 700 MHz, the valuation of a second 700 MHz lot is pivotal for any outcome in which a 3-2-1 assignment of sub-1 GHz lots is efficient and ComReg notes four such combinations are possible within the competition cap. ComReg cannot base its award design on assumptions in relation to bidders’ valuations which could limit potentially efficient outcomes, which are within the competition cap.

A 7.136 In relation to Three’s view that synergies are present in most spectrum auctions¹¹³¹ and ComReg’s approach would imply that the CCA should be used in all spectrum awards, ComReg notes that it does not favour any specific approach for assigning spectrum rights of use and considers each award on its merits. There are different auctions formats available and the most appropriate format for a particular award will, of course, be the one which best addresses the specific facts and circumstances that apply to the spectrum bands available for assignment. In assigning rights of use, and where an auction is considered appropriate, ComReg determines which auction format would best meet its statutory objectives and duties and, in particular, ensure the efficient use and effective management of the radio spectrum.

A 7.137 This is clearly demonstrated by the fact that the last three spectrum awards (in the last 3 years) have all used a different format with different pricing rules. ComReg used:

- a) a Simple Clock Auction for its 400 MHz Award in 2019 (pay-as-bid);
- b) a Sealed Bid Combinatorial Auction for its 26 GHz Award in 2018 (second price rule); and
- c) a Combinatorial Clock Auction for its 3.6 GHz Award in 2017 (second price rule).

A 7.138 For example, in the 400 MHz Decision, ComReg notes that “*While ComReg has used opportunity cost pricing in previous auctions these awards were characterised by complex lot structures with experienced bidders that provided end services to consumers. In this context, for those previous awards ComReg used different (and more complex) auction formats than the format proposed for this 400 MHz award, where opportunity cost pricing was an important feature of the particular formats implemented for incentivising bidders to submit bids for a*

¹¹³¹ Three’s Response to Document 19/124, p14 (published in ComReg Document 20/56s).

range of packages at the maximum price they would be willing to pay."¹¹³²

- A 7.139 Further, in Document 19/124, ComReg observed that it typically assesses the likelihood of such risks on a case by case depending on the circumstances pertaining to a particular award. For example, in the 2019 400 MHz Award, ComReg acknowledged that the award format (SCA with exit bids) was susceptible to inefficiently unsold lots (even with the use of exit bids). However, such a risk was relevant to Part B only (Part A had only one 2 x 3 MHz lot), and it concerned a small amount of spectrum (ten 2 x 100 KHz lots) where alternative frequencies were available. Importantly, it was not used to provide downstream services that could harm consumers. In that regard, ComReg considered the inefficiency risk and associated impacts to be small in that award.
- A 7.140 However, in the current case the risk of inefficiency and the impacts of same are orders of magnitude higher. How the bands are assigned will be critical to the development of wireless services in Ireland for the next 20 years, affecting, in general terms, not only the attainable levels of efficiency, innovation and quality in these services, but also the competitive position of operators as well as the interests of all mobile users. ComReg is therefore of the view that these concerns are particularly important for this award process.

Price Driving

- A 7.141 Concerns in relation to the potential for price driving in the CCA are discussed in the Auction Format RIA.
- A 7.142 However, ComReg agrees with DotEcon's previously stated views in Document 20/32, that it is not enough to simply identify ways in which bidders can theoretically raise rivals' prices. Any price driving bids (in order to affect other bidders) would need to be at a sufficiently high level. If the bidder is not certain that such bids would fail to win, it would be taking a risk in making these bids, because, it could end up winning those lots which would likely be above the level at which that bidder valued those lots.
- A 7.143 Price-driving strategies are risky because bidders are unlikely to have enough information on rival bidders' valuations or the extent to which rival bidders may be sufficiently budget constrained. Such considerations are important because the risk of price driving strategies increases if budget constrained bidders are participating. (i.e. not only would the price driving bid be set at below valuation but also below rivals' budget). The bidder therefore needs to determine whether the risk of paying a high price and failing to win its most preferred package of spectrum is worth the unspecified gain it may perceive from pushing up the prices paid by competitors. Therefore, ComReg remains of the view that concerns in

¹¹³² ComReg Document 19/69, p22.

relation to price driving in a CCA are small, particularly relative to the overall gains provided by the CCA.

A 7.144 In relation to Three's view that bidders have some understanding of rival bidders' demand (e.g. 2.1 GHz and 700 MHz), ComReg notes that even within such bands there a range of outcomes possible and a bidders preferred package at any time depends on the evolution of prices during the award and the surplus it can obtain. For example:

- a) in the 700 MHz Band, Eir and Vodafone are likely to be interested in securing 2 or 3 lots and the preferred package will depend on competition during the award; and
- b) in the 2.1 GHz Band the range of potential outcomes is greater given that more rights of use are available. Further, given that 2.1 GHz rights of use are substitutable with other bands any understanding of other bidder's demand is likely to change over the course of the award.

A 7.145 In any event, bids in relation those bands are likely to overlap with that bidders preferred range of package such that it would be happy to win them (even if unlikely to arise). In this way, these bids are efficiency enhancing from the perspective of the award since price driving generally involves increasing the price of spectrum for rivals (i.e. the bidder engaging in price driving would prefer to not to win the lots subject to the price driving).

A 7.146 In that regard, DotEcon does not find it plausible that bidders would have a clear view of rivals' valuations as to be able to price drive at little risk. DotEcon is of the view that the greater effect of the cap comes from it being sufficiently tight to rule out bids for packages that bidders would not have inherent value for, or that might not be consistent with an efficient outcome, meaning that it reduces the incentives and scope for submitting price driving bids (irrespective of the risks of such bids being accepted if they could be submitted), and increases the probability that any bids for large packages are a result of 'legitimate' competition rather than predatory bidding¹¹³³. ComReg has weighed up the relevant submissions, including the views of DotEcon, and considers that the latter provide a more sound basis upon which ComReg ought to take its decision in respect of this issue.

A 7.147 In relation to Three's views that RTR (the Austrian Regulator) is opting for simpler clock based formats over the CCA when conducting its 3.6 GHz and 2020 multiband award, and that this decision of the RTR is evidence of the fact that

¹¹³³ DotEcon Report, Document 20/122a, p103.

previous CCAs suffered from price driving¹¹³⁴, ComReg notes that such concerns are a matter for RTR and the particular facts and matters before it, and circumstances applying to the national sector that it is tasked with regulating. ComReg has assessed a number of different formats having regard to circumstances pertaining to the Irish situation. ComReg notes Three's acknowledgement, of DotEcon's view¹¹³⁵, that on the basis of publicly available information, it cannot be concluded that the pricing asymmetry in the Austrian Auction was a result of price driving. ComReg would also note that while this CCA is similar to the versions used by ComReg the Austrian version had a significantly different information policy whereby aggregate demand information was hidden and bidders were essentially bidding absent such information.

A 7.148 It is important to note that there is no "one size fits all" approach to spectrum assignments, ComReg clearly has discretion under the regulatory framework as to how it goes about assessing whether its proposed actions might reasonably be expected to achieve its objectives. This may differ from authorities in other jurisdictions who may be undertaking a review of the wireless markets for a different purpose and/or to deal with circumstances which are different to those that exist in Ireland at this time.

A 7.149 In relation to Three's views that DotEcon is not impartial and is invested in the CCA format, ComReg reiterates that it is ComReg, and not DotEcon, that is the relevant decision-maker; the parts of this decision concerning an appropriate auction format rests with ComReg. While DotEcon has provided expert advice to ComReg on relevant issues, the final decision rests with, and has been taken by ComReg, having considered all relevant material, including submissions from respondents to consultations and such expert advice has been obtained by ComReg. The expert advice obtained from DotEcon is weighted up by ComReg in the context of all other relevant material. DotEcon's expert advice is published by ComReg, with minimal redactions.

A 7.150 In any event, ComReg considers that Three has disclosed no basis for its claim that DotEcon is not impartial and that DotEcon is invested in the CCA format. There is no evidence that DotEcon is invested in the CCA format. In Ireland, DotEcon has advised against the use of CCA in two recent spectrum awards:

- a) in relation to the 400 MHz Award (2019) DotEcon advised that "*The CCA or CMRA would also be suitable for this award, but we do not believe that the benefits they would offer over the proposed format*

¹¹³⁴ In relation to the Austrian Award referred to in Document 20/32, Three accepts that the high prices cannot be attributed to price driving (DotEcon noted that it is not clear how such bidding behaviour can be differentiated from bidders simply having value for larger packages of spectrum and competing for those).

¹¹³⁵ Document 20/32, Annex 12, p72.

- would be sufficient to justify the additional complexity*¹¹³⁶; and
- b) in relation to the 26 GHz Award (2018) DotEcon advised that *“If an open auction were required, a good candidate would be the CMRA. This could be used with either frequency-specific or frequency-generic lots. The CCA is a good alternative if the case of frequency-generic lots, though might work less well with frequency-specific lots.”*¹¹³⁷

Moreover, as noted by Three itself, DotEcon has recommended alternatives to a CCA in the Netherlands to suit the circumstances of that jurisdiction.¹¹³⁸

Asymmetric pricing and competition caps

A 7.151 ComReg notes that concerns in relation to asymmetric prices were previously addressed in Section 7.3.4 of Document 19/59R. Therein, ComReg noted that:

- a) a situation where bidders pay comparable amounts is not an objective of the Proposed Award in its own right. Rather, one of ComReg’s main objectives is to ensure the efficient assignment and use of the radio spectrum;
- b) uniform pricing (i.e. all bidders paying a common price per lot) may not be compatible with an efficient assignment as it is likely to boost incentives to distort bidding behaviour to moderate prices and soften competition; and
- c) a uniform price (i.e. the same per lot price for all bidders) may result in lots going unsold unnecessarily or being assigned inefficiently to a bidder who is not the bidder that values them most, simply because in some cases it is impossible to achieve an efficient outcome with uniform prices when there are complementarities between lots.

A 7.152 Similarly, ComReg’s view on why the interaction of the CCA with the competition cap are not discriminatory are set out detail in paragraph 6.54 – 6.68 of Document 19/124. In summary:

- a) Three is not starting from the same position as the other bidders, because it already has access to more spectrum than the other operators and therefore valuations (and prices) are likely to vary as a result; and
- b) Three could impose less of an opportunity cost on other bidders compared to the opportunity cost that others impose on Three. However, this arises not because of the award format but because of Three’s existing spectrum

¹¹³⁶ Document 18/92a, p66.

¹¹³⁷ Document 17/85a, p56.

¹¹³⁸ Three Response to Document 19/124, p23-24.

holdings which need to be considered in order to avoid an accumulation of spectrum rights that could distort downstream competition.

A 7.153 Three holds the view that ComReg and DotEcon misunderstand Three's position and that it is the combination of caps (which restricts its ability to express valuations) and the CCA that create the asymmetry concerns. In that regard, ComReg is of the view that it has not misunderstood Three's concerns and it was fully aware of Three's concerns and addressed same under the heading "*Asymmetric pricing and competition caps*" and Paragraph 6.198 of Document 19/124.

A 7.154 Three submits that the following views held by ComReg (as stated by ComReg in Document 19/124)¹¹³⁹ cannot be squared¹¹⁴⁰:

"This means that each winner (and group of winners) needs to pay at least its opportunity cost, otherwise there would be alternative higher value users and an efficient assignment would not have been achieved";

"At some point, (where some bidders can bid for more spectrum and Three cannot) this will result in Three imposing less of an opportunity cost on those bidders compared to the opportunity cost others impose on Three."

A 7.155 In that regard, ComReg notes that there is no contradiction between requiring that each winner (and group of winners) pay at least the opportunity cost and Three imposing less of an opportunity cost on others because of the competition cap. Three omitted the preceding sentence to the first paragraph set out above, where ComReg had expressly noted that "*ComReg's primary concern is efficient assignment of spectrum, **subject to ensuring downstream competition is effective.***" The opportunity cost refers to bids that all bidders are permitted to make under the competition caps and bids that are not permissible are clearly irrelevant in the price determination process. The efficient assignment only has in mind bids permitted under the competition cap since any assignment (efficient or otherwise) which could result in extreme asymmetric outcomes would not be in line with the promotion of competition and ComReg's broader statutory objectives.

A 7.156 Further, ComReg would note that this is a logical extension of any competition cap (i.e. it prevents bidders making bids for lots that could result in extreme asymmetric holdings). This restriction applies to all bidders, particularly those with existing holdings because bidders start from different positions and face different levels of competition from each other. ComReg notes that Three is not starting from the same position as the other bidders, because it already has

¹¹³⁹ ComReg Document 19/124, paragraphs 6.59 and 6.63 respectively.

¹¹⁴⁰ Three's Response to Document 19/124, p21 (published in ComReg Document 20/56s).



access to more spectrum than the other operators and therefore valuations (and prices) are likely to vary as a result.

A 7.157 Further, ComReg notes and agrees with DotEcon's view¹¹⁴¹ that moving away or adjusting opportunity costs is incompatible with reasonable bidding incentives (an important feature of CCA).

A 7.158 ComReg assesses the potential impacts arising from any pricing asymmetry separately in the Auction Format RIA (Chapter 7).

Missing Bids

A 7.159 In relation to Three's views (in response to Document 20/32) that DotEcon understates the risk of missing bids, ComReg agrees with DotEcon that detailed bidder training significantly mitigates such concerns arising in practice. In that regard, ComReg again refers to the extensive bidder training programme implemented as part of the 3.6 GHz Award. Further, ComReg notes that errors and mistakes can arise under any auction format and it is unlikely that a bidder would omit important efficient relevant bids in error, noting that missing bids should not impact the efficient assignment unless bidders omit efficiency-relevant packages. In that regard, exposure prices should provide additional assistance to helping bidders in identifying their efficiency-relevant packages (and within budget where relevant).

A 7.160 In relation to Three's view that Annex 6 of the Draft IM provides a textbook example of defensive incentives for overbidding in a CCA, ComReg notes that this annex was provided as a very simple example of the winner and price determination process. In any event, ComReg is aware of the issues raised by Three, and in particular cases where there are no [ ].¹¹⁴² However, as noted in the Auction Format RIA, the impacts arising from such situations even if they occurred are limited by the relaxed bidding constraints and such bids can only be made at a certain level. In effect, even if such a strategy was effective the most bidders would be required to pay would be the bids expressed in the final primary bid round which would be at or below valuation (with a resulting surplus) and at worst similar to those prices that would arise under a SCA or a SMRA.

A 7.161 Furthermore, such bids are not entirely risk free. As noted by DotEcon¹¹⁴³, ComReg maintains the right to make a deposit call after the supplementary bids round and in the case that one or more bidders failed to meet this deposit call it is possible that their bids could be excluded from the determination of winning

¹¹⁴¹ DotEcon Report – Document 20/122a, p154.

¹¹⁴² DotEcon addressed these concerns in detail in Section 4.2.4 of Document 20/32 – Annex 12.

¹¹⁴³ ComReg Document 20/32, Annex 12.

bids altering the number of provisionally unassigned lots as of the end of the primary bid rounds. This means that such bids (“price driving bids”) made by bidders could end up being winning bids under the associated reassignment rules. DotEcon notes that while this is a small risk, it provides some control on supplementary bids, as there was some risk that a significant number of lots could come into play if a bidder was eliminated, leading to the potential for additional lots being won.

A 7.162 In addition, ComReg notes that, while such instances are rare there have been recent examples of bidders withdrawing bids after they have been made but prior to the conclusion of the award (though binding bids should reduce this with regard upfront fees). For example, in 2014 Polish 4G award, NetNet, which offered the highest price for a single block of 800 MHz withdrew its previously submitted bids and the block was instead assigned to T-Mobile.¹¹⁴⁴ Therefore, bidders need to consider the possibility of potential bid withdrawals (even if for a relatively small number of lots) in making any supplementary bids (ComReg provides bidders with this cautionary remark in Annex 7 of the Draft IM (Document 20/32, paragraph A7.41).

A 7.163 ComReg agrees with Vodafone that missing bids should not be a concern if enough bids are permitted and time allowed in the Proposed Award. In that regard, as set out in Section 4.2.3 of the Draft IM (Document 20/32), there will be at least three clear working days between the last primary bid round and the start of the supplementary bids round (see Section 4.2.3 of this document). Further, supplementary bids may contain bids for up to 1,000 packages which should be more than sufficient to cater for bidders’ potential requirements in the supplementary bids round.

Smaller Bidders

A 7.164 In relation to Three’s submission that the CCA benefits larger bidders and that there is a bias against smaller bidders¹¹⁴⁵ (and Imagine’s view that any changes should account for smaller bidders), ComReg notes that its approach to the Proposed Award is not designed with any particular bidder in mind. Rather, ComReg is conscious that it should not preclude or discourage participation of any interested party through the choice of an auction format or specific auction design features that might expose such parties to greater risks than necessary. ComReg notes that the CCA provides a potential bidder with good incentives to compete for additional spectrum without fear of increasing the price that such a

¹¹⁴⁴ Kus (2020), ‘Polish experience from first-ever spectrum auction’, [Telecommunications Policy Volume 44, Issue 7](#), August 2020.

¹¹⁴⁵ Three’s Response to Document 19/124, p9 (published in ComReg Document 20/56s).

bidder might pay.

A 7.165 ComReg observes that Three views the benefit of different auction formats in a very narrow way. Three appears to be primarily concerned with the financial outcome that bidders may achieve relative to those obtained by competitors. Not paying more than other winners on a per lot basis appears to be given more emphasis by Three than the absolute price level or maximising the surplus a bidder could obtain (i.e. maximising the difference between their valuation of the lots they win, and the prices they pay). ComReg notes that since the valuation bidders have for spectrum is typically and fundamentally based on discounted cash flows with and without incremental spectrum, maximising bidders' surplus provides them with greatest opportunity to compete downstream. It is unclear why bidders would settle for a potentially lower surplus in order to achieve the "benefit" of achieving similar prices to other bidders.

A 7.166 As set out in the Auction Format RIA, while all bidders would prefer to minimise the price paid bidders may be satisfied to pay more than other bidders on a per lot basis (while maximising their surplus):

- a) if that higher relative price is lower than any uniform price under an alternative format; or
- b) if that higher relative price allowed a bidder to obtain a different and preferred set of rights of use (e.g. more rights of use because lots were inefficiently unsold) compared to those assigned; or
- c) if that higher relative price resulted in the assignment of any rights of use that would not have been assigned in a uniform price format (i.e. such a bidder may have been outbid in an alternative format and left with no rights of use).

A 7.167 Such concerns are likely to be particularly relevant for smaller bidders and New Entrants who likely have a small range of packages and for whom winning no rights of use is a more realistic possibility compared to larger bidders. The main aim for such bidders is to be assigned usable rights of use at or below valuation. These bidders are unlikely to be concerned with per lot comparisons with larger bidders who are in objectively different situations in terms of existing spectrum holdings, the services they would provide and market maturity (in terms of New Entrants). For example, FWO or NDOs would likely prefer a format or pricing rule that provides them with the best opportunity to be assigned rights of use at or below valuation.

A 7.168 In relation to the 3.6 GHz Award, Imagine and Airspan won rights of use, Three appears to simplistically assume under an alternative format both would have won rights of use and paid the same as other bidders. However, there are no

guarantees than both would have been assigned any rights of use under an alternative never mind at a lower uniform price. Both were both assigned rights and both expressed satisfaction with same.

A 7.169 Importantly, ComReg notes and agrees with DotEcon that even if such an entrant is unlikely to participate or win spectrum, it is still appropriate for ComReg to support competition by providing the opportunity for entry. If anything, this is even more important than ever as the increased licence duration means there will be fewer opportunities for entry in future.¹¹⁴⁶

A 7.170 In relation to Three's view that there is a pricing bias against Eir¹¹⁴⁷, ComReg refers to Paragraph A 7.166 above. In addition, ComReg notes Eir's views in response to Document 20/56:

*"eir does not believe that Three's concern regarding the potential for asymmetric pricing of 700MHz spectrum is a relevant or material consideration."*¹¹⁴⁸

A 7.171 Further, Eir's preferred auction format of 'an iterative CCA' (Option 6 in Auction Format RIA) would still use Vickrey-nearest minimum core pricing, rather than be pay-as-bid and therefore potentially be subject to asymmetric pricing.

A 7.172 In relation to Three's view that the likelihood of an entrant is greater under a SMRA because larger bidders might engage in strategic demand reduction creating room for an entrant to obtain¹¹⁴⁹, ComReg notes that such an approach is inappropriate for a number of reasons:

- a) it relies on a feature of the SMRA that reduces incentives to compete for spectrum in order to promote entry;
- b) it is potentially inefficient because larger bidders may have been assigned those rights of use if they competed for same;
- c) it ignores the factor that smaller bidders and New Entrants would have the same incentives to reduce demand and would be more likely to do so in the first instance as noted above; and
- d) larger bidders would be highly unlikely to engage in such a strategy if there was a risk of new entry.

A 7.173 In addition, as noted by DotEcon¹¹⁵⁰ ComReg is of the view that the CCA is an

¹¹⁴⁶ DotEcon Report, Document 20/122a, p32.

¹¹⁴⁷ Three's Response to Document 19/124, p19 (published as ComReg Document 20/56s).

¹¹⁴⁸ Eir's Response to Document 20/56, p3 (published as ComReg Document 20/78).

¹¹⁴⁹ Three's Response to Document 19/124, p16 (published as ComReg Document 20/56s).

¹¹⁵⁰ DotEcon Report, Document 20/122a, p88.

'entrant friendly' award format, especially when there is a large number of lots. This is because a CCA allows bidders to bid for a wide range of packages of interest to them and to maximise the chances that one of those bids will fit in with the demand of the larger bidders. In this way, an entrant with a sufficiently high valuation for its preferred package is able to compete. The 3.6 GHz award (completed in 2017 using a CCA) has already demonstrated that bidders other than the MNOs (in that instance Imagine and Airspan) can be successful.

A 7.174 Finally, as noted by ComReg in Document 19/124¹¹⁵¹, there is no reason to suggest that asymmetric prices are discriminatory and not in line with ComReg's statutory objectives (as noted by Three) if they arise because bidders start from different positions and face different levels of competition from each other. Conversely, ComReg considers that if it sought to impose a constraint that bidders winning similar packages, but facing different amounts of competition, paid similar amounts, this would be incompatible with the objective of efficient assignment.

A 7.175 In relation to Three's submission that DotEcon cautioned against the use of the second price rule where asymmetric caps were in effect and even in the presence of strong synergies, ComReg has already set out its views in relation to the Dutch Award in Section 6.1.4 of Document 19/124. However, ComReg notes that the specific recommendation of a hybrid SMRA in the Dutch case was based on the view there were no significant synergies between the lots on offer and no explicit concern about possible complementarities for New Entrants.

Sunk costs

A 7.176 In relation to Three's view that spectrum fees are not sunk and may limit an operator's willingness to compete on price, ComReg notes and agrees with the views of DotEcon¹¹⁵² that when operators decide how to price their services, spectrum costs are a fixed and largely sunk cost (e.g. only annual SUFs would be avoided) and prices will be determined by conditions of competition, not by how much was spent for spectrum.

A 7.177 In that regard, ComReg notes that the SUF component of the minimum price is partly avoidable since any licensee retuning rights of use would not have to pay future SUFs related to the licence. However, this is irrelevant to the argument of Three in relation to asymmetric pricing as the SUF remains the same regardless of the competition during the award and the auction is used to determine the Spectrum Access Fee, which would not be refunded if retuned to ComReg.

A 7.178 In this respect, ComReg agrees with DotEcon that the (SAF) component of

¹¹⁵¹ See Section 6.1.3 and 6.1.4.

¹¹⁵² DotEcon Report, Document 20/32 Annex 12, p8.

spectrum rights are likely to be largely sunk being more difficult to recover than the SUF since any licensee returning rights of use has already paid the non-refundable SAF in its entirety. A licensee wishing to recoup the SAF may do so only through the sale or leasing of its rights of use which are a highly industry and firm specific asset and therefore may not achieve the full auction price¹¹⁵³. A licensee therefore accepts with some probability that a significant portion of the SAF may in fact be non-recoverable.

A 7.179 The SAF appears therefore to largely be a sunk cost to the extent that once in use the incentives to seek out revenues in order to cover the cost of the spectrum are strong and the cost incurred from adding additional customers or continuing to provide ECS is not impacted by the SAF itself (i.e. it would not compete differently downstream once rights of use have been assigned). For example, in the very long run most spectrum rights of use will depreciate and have little value increasing the incentives to compete for customers throughout the duration of the licence.

‘Enhanced’ SCA

A 7.180 In response to Three’s suggestion in relation to an ‘Enhanced’ SCA, ComReg notes that this format (with only 2.1 GHz Time Sliced) is not assessed in the Auction Format RIA¹¹⁵⁴ because it is not consistent with ComReg’s view on the need for Time Slices across all bands. However, this format (with time slices for all bands) is included as Option 2 (c) in the Auction RIA. In that regard, ComReg notes that DotEcon’s views on this auction format is the same whether or not the 2.3 GHz and 2.6 GHz bands are time sliced.¹¹⁵⁵ Therefore, the assessment of the ‘Enhanced’ SCA against other formats is discussed in the Auction RIA and does not require further consideration here.

Relative caps

A 7.181 In relation to Eir’s views that DotEcon appear to have identified a lacuna in the rules used in MBSA1, ComReg notes that matters in relation to the detailed auction rules as set out in the draft IM (Document 20/32) will be assessed in due course in response to that Document.

A 7.182 However, in order to provide clarity to Eir and other interested parties, ComReg notes that the rules described in Annex 12 of Document 20/32 (i.e. the structure of the relative caps that are created during the primary bid rounds) are not new and simply reflect those used in the 2012 MBSA. Annex 12 of Document 20/32 provides a detailed explanation of same in order to provide clarity to bidders

¹¹⁵³ A purchaser, if found, may not require the full mix of the rights of use of the licensee or be unwilling to pay to pay the full auction price.

¹¹⁵⁴ An alternative format with Time slices in other bands is assessed in the Auction Format RIA.

¹¹⁵⁵ DotEcon Report, Document 20/122a, p134.

about how these rules would operate in practice.

NERA Examples

A 7.183 ComReg refers to Annex A of the DotEcon Report and the assessment of each of the examples laid out in the NERA report provide by Three in response to Document 19/124.

A 7.184 Prior to assessing the main examples, ComReg makes the following background observations on the valuations used across all examples.

Valuations

A 7.185 The valuations set for the three MNOs are chosen by NERA. However, DotEcon notes they are not set by reference to any realistic model of valuations. In particular, DotEcon observes the following:

- a) NERA itself says that “[w]e assume all three MNOs have equivalent valuations for 2x10 MHz. We set this at a robust [REDACTED]
[REDACTED]
[REDACTED] [REDACTED]”;¹¹⁵⁶
- b) Canada has typically demonstrated especially high spectrum prices by international standards, so this is not a useful comparator;
- c) While it is reasonable to set valuations in their examples [REDACTED]
[REDACTED]
[REDACTED] [REDACTED] while the reserve price in the proposed award is €9m.

A 7.186 Therefore, the examples referred to by NERA should be treated cautiously and with the above considerations in mind.

Examples

A 7.187 ComReg does not repeat the full detail of each example provided by DotEcon – However, ComReg does highlight what it considers to be the main points. In doing so, ComReg notes that it does not find the examples persuasive in terms of demonstrating the need for an alternative auction format. The level of the pricing asymmetries outlined in the NERA report are very unlikely to arise given the assumptions on which the valuations and bidding strategies of bidders are based. Furthermore, in some cases the examples merely [REDACTED]
[REDACTED]

¹¹⁵⁶ Nera report, p36 – provided as part of Three’s response to Document 19/124.

[REDACTED] [REDACTED]] In that regard, ComReg notes the following:

a) [REDACTED] [REDACTED]]

b) further, all winners pay significantly less in the CCA compared to a SCA or SMRA as a result of the minimum revenue core price setting winning prices at the minimum possible level subject to each winner (and group of winners) pay at least its opportunity cost.

c) [REDACTED] [REDACTED]]

d) [REDACTED] [REDACTED]]

e) Examples 4 & 5 form the centrepiece of NERA’s claim that they have identified a material risk that gaming behaviour could exaggerate price asymmetry and/or undermine the efficiency of the auction. DotEcon considers that this example is greatly over-interpreted by NERA:

i. [REDACTED] [REDACTED]]

ii. [REDACTED]

a) [REDACTED]

b) [REDACTED]

iii. [REDACTED] ✂]

f) Example 6 illustrates the amendments proposed by Three to the CCA. ComReg has previously assessed these options in the Auction RIA and the examples provide nothing that would cause ComReg to change its view that these additional rules would create distortions to competition.

g) [✂ [REDACTED]

h) [REDACTED] ✂]

A 7.188 In light of the above, ComReg notes and agrees with DotEcon that the NERA

Annex: 8 Indoor Mobile Voice and Text Coverage RIA

Introduction

- A 8.1 Consumers regularly use their mobile phones for voice, text and data services indoors (e.g. at home or work). However, the increasing use of modern building materials,¹¹⁵⁷ and certain types of insulation to improve energy performance, is resulting in a rise in the attenuation of signals in penetrating buildings reducing the coverage available indoors. For example, all new buildings since 1 November 2019¹¹⁵⁸ require a minimum A2 BER rating.¹¹⁵⁹
- A 8.2 While such coverage issues affect voice, text and data services, this Annex considers the regulatory options in relation to improving mobile voice call and text services indoors.¹¹⁶⁰ Voice calls and texts are an important mobile service and indoor voice and text coverage appears to be increasingly important to consumers as most voice calls and texts on mobile devices are made indoors while fixed line usage is declining.¹¹⁶¹
- A 8.3 This Annex sets out the 'Indoor mobile voice and text coverage' RIA and informs ComReg's consideration of appropriate licence obligations to address indoor mobile voice and text coverage as set out in Chapter 8 of this paper.
- A 8.4 The focus of this RIA is to identify the impact of the regulatory options under consideration on stakeholders (including existing operators, potential New Entrants, and consumers) and on competition and, in so doing, to identify the option that would best achieve ComReg's objectives. ComReg notes that the adoption of one of these options as an obligation would only apply to operators providing voice call and text services.

RIA Framework

- A 8.5 The purpose, structure and scope of the RIA framework is discussed at the commencement of the 'Spectrum for Award' RIA which is set out in Annex 4 and

¹¹⁵⁷ The Effect of Building Materials on Indoor Mobile Performance, published April 2018, Document 18/05.

¹¹⁵⁸ European Union (Energy Performance of Buildings) Regulations 2019.

¹¹⁵⁹ <https://www.housing.gov.ie/housing/building-standards/energy-performance-buildings/energy-performance-buildings>

¹¹⁶⁰ For indoor mobile data service coverage, ComReg observes that with rollout of the availability of fixed broadband services to all premises in Ireland under the NBP, consumers will be able to improve their indoor mobile data services through the use of Wi-Fi with a fixed broadband connection.

¹¹⁶¹ Although this has increased again in recent quarters, potentially as a result of COVID-19.

is not repeated here.

Policy Issues

A 8.6 Indoor voice and text coverage is important to consumers. As demonstrated by the 2019 Mobile Consumer Experience survey, inside the home is the location where consumers most use their mobile phones for voice, text and data and the area where they most experience service/coverage issues. For example:

- nearly 65% use their mobile phone for voice or text in the house daily¹¹⁶²;
- about one third of all respondents experienced various service issues for calls/texts during the past month in the home,¹¹⁶³ the highest of all locations assessed;
- the incidence of experiencing service issues in the home or part thereof for calls/text and data (c. 35%) is higher than the incidence of the same service issues that occur outside the home (c.17%)¹¹⁶⁴;
- rural consumers experience higher rates of service issues regardless of location with higher levels of service issues arising in the home or part thereof (i.e. indoors).¹¹⁶⁵

A 8.7 All four of the biggest service issues consumers endure relate to voice calls and not data usage. For example, of respondents who experienced service issues, 44% noted that the quality of reception deteriorated when on a call, 47% could not make a call, 36% could not receive a call and 35% experienced a dropped call.¹¹⁶⁶ Similarly, service issues relating to SMS¹¹⁶⁷ or 'text' were experienced more frequently than for data usage.¹¹⁶⁸ According to the survey, while consumers can experience connectivity issues regardless of their location, performance issues occur more frequently while indoors and in more rural parts of the country.¹¹⁶⁹

A 8.8 As discussed in Chapter 7 of Document 19/124 and summarised in Chapter 8 of

¹¹⁶² Mobile Consumer Experience Survey 2019, Document 19/101, Slide 59.

¹¹⁶³ Ibid, Slide 73.

¹¹⁶⁴ Ibid, Slides 74, 81 & 82.

¹¹⁶⁵ Ibid, Slides 74 & 75.

¹¹⁶⁶ Ibid, Slides 87, 88, 89 & 90.

¹¹⁶⁷ SMS (Short Message Service) is a text messaging service component of most telephone, Internet, and mobile device systems. It uses standardised communication protocols to enable mobile devices to exchange short text messages.

¹¹⁶⁸ For example, 26% of service issues experienced indoors were related to being unable to send a 'text' compared to 16% relating to being unable to use 4G data.

¹¹⁶⁹ Mobile Consumer Experience Survey 2019, Document 19/101, Slides 78 & 79.

this document, ComReg is of the view that it is necessary to consider whether measures may be required in order to address consumers' indoor mobile voice and text connectivity issues noted above. Therefore, the purpose of this RIA is to consider what measures, if any, could be attached to spectrum rights of use in the Proposed Award in order to address concerns surrounding indoor mobile voice and text connectivity.

Objectives

A 8.9 The focus of this RIA is to assess the impact of the proposed measure(s) (i.e. various regulatory options) on stakeholders, competition and consumers. In that way, it allows ComReg to identify and implement the most appropriate and effective means to set appropriate obligations, while still allowing ComReg to achieve its objectives. In considering the above policy issue, ComReg is guided by what it considers to be the most relevant statutory objectives, including:

- to assign rights of use in accordance with the EC Decisions and other relevant legislation;
- to ensure that all end users, including disabled users, derive maximum benefit in terms of choice, price and quality;
- to encourage the efficient use and ensure the effective management of spectrum; and
- to ensure there is no distortion or restriction of competition in the electronic communications sector.

A 8.10 Of further relevance to the issue of voice obligations are:

- Decision (EU)2017/899¹¹⁷⁰ for 700 MHz rights of use which, among other things, obliges Member States to:
 - take due account of the need to achieve the target speed and quality objectives set out in Article 6(1) of Decision No 243/2012/EU,
 - assess the need to attach conditions to the rights of use for frequencies within the 700 MHz frequency band and, where appropriate, to consult relevant stakeholders in that regard;
- The Mobile Phone and Broadband Taskforce Focus Group Report on Mobile Coverage¹¹⁷¹ set out recommended actions, including the

¹¹⁷⁰ DECISION (EU) 2017/899 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2017 on the use of the 470-790 MHz frequency band in the Union.

¹¹⁷¹ MPBT - [Focus Group Report on Mobile Coverage](#) .

2017 Action Point 39¹¹⁷² updated to 2018 Action point 14 to the effect that “All mobile operators to introduce WiFi calling to enable mobile users to make phone calls over 4G”. While this is a 2018 Action Point, it remains important particularly since these network features and functionality enhancements remain unavailable for certain consumers.

A 8.11 ComReg’s overall powers, functions, duties and objectives in relation to the management of the radio frequency spectrum in Ireland are set out in Annex 2.

Identifying the regulatory options

A 8.12 ComReg has identified the following options:

- **Option 1** – Do not attach specific indoor mobile voice and text coverage and quality of service obligations.
 - This would mean that all licensees have full flexibility to choose the levels of mobile voice and text coverage and quality of service they would provide indoors.
- **Option 2** – Attach specific indoor mobile coverage and quality of service obligations to improve indoor mobile voice and text services.
 - This would involve an ‘Outdoor-In’ approach where the licensee would be obliged to provide a sufficient signal strength from outdoor base stations to penetrate indoors to ensure indoor mobile voice and text coverage replicates coverage provided outdoors.
- **Option 3** – Attach a Native Wi-Fi (including VoWi-Fi) obligation to rights of use to improve indoor mobile voice and text coverage and quality of service. Specifically:
 - If a licensee provides a mobile voice and/or text service using rights of use in one or more of the Proposed Bands, then:
 - i. it would be obliged to use Native Wi-Fi technology on its network in respect of the Proposed Bands to which it holds rights of use to under its licence; and
 - ii. it would be obliged to make available Native Wi-Fi voice and/or text services (as appropriate to the type of mobile service/s provided by the licensee) to all customers on its

¹¹⁷² 2017 Action Point 39: *All operators will introduce WiFi calling, VoLTE and other network feature and functionality enhancements at the earliest juncture and report on progress to the Taskforce Implementation Group.*”

network (including third party customers, such as MVNO customers), where those customers:

- have established for themselves a suitable Wi-Fi connection; and
- have a Native Wi-Fi/Wi-Fi Calling-enabled mobile device.

Impact on stakeholders

A 8.13 There are several key industry stakeholders in relation to the matters considered in this chapter:

- Existing MNOs;
- potential New Entrants who do not currently provide voice or text services using spectrum in the State. This group may include companies that are already otherwise engaged in the electronic communications sector in the State, in other Member States or further afield; and
- MVNOs who may be reliant on MNOs for wholesale access.

A 8.14 The views of these stakeholders are assessed for each option below under the following headings:

- Mobile Network Operators (MNOs);
- MVNOs; and
- potential New Entrants.

Option 1

MNOs

A 8.15 Under Option 1, MNOs would have full flexibility to choose how extensive their indoor network coverage would be and what QoS standards would apply to indoor mobile voice calls and text. In that regard, MNOs may be of the view that the provision of outdoor coverage obligations would provide sufficient indoor coverage, and additional measures would be unnecessary to improve same. Alternatively, MNOs may be of the view that other technological solutions to improve indoor mobile voice and text coverage (for instance Native Wi-Fi & repeaters) could be deployed by them but without any specific obligation to do so.

- A 8.16 However, given that nearly 65% of consumers use their mobile phone for voice or text in their homes daily,¹¹⁷³ MNOs may prefer some obligation to ensure that their consumers are able to make and receive calls from indoors (including to/from those on other networks who may otherwise have poor coverage). Given the on-going decline in fixed line usage (although it has been slowed by COVID-19 as fixed line usage rose in Q1 and Q2 2020),¹¹⁷⁴ assuming this effect of COVID-19 is temporary (usage has started to fall again in Q3 2020 with a decrease of 11.9% compared to Q2 2020) then MNOs are likely to have an increasing need from consumers to make indoor voice calls from their mobile device.
- A 8.17 Certain operators have also made investments in providing for indoor mobile voice and text coverage already (See Option 3 below), however because a voice call requires a good connection at both ends, if another operator does not provide sufficient indoor mobile voice coverage then some of their consumers may be unavailable to call operators and their consumers regardless of any investments made. Further, even if connections can be made, the voice call QoS is likely to be significantly lower compared to a call made or received outdoors due to building penetration losses.¹¹⁷⁵
- A 8.18 If consumers experience a poor-quality mobile voice call service, it is often not clear to consumers which network does not have a sufficient mobile voice call QoS standard. The 2019 Mobile Consumer Experience Survey shows that 27% of consumers choose their current provider based on their reputation and 15% based their decision on word-of-mouth about good coverage from that provider.¹¹⁷⁶ Therefore, MNOs would likely prefer that all operators had increased capability to receive calls and texts indoors in order to retain favourability with consumers.
- A 8.19 In that regard, ComReg notes Vodafone's view in response to Documents 19/59R and 19/124 that a Native Wi-Fi obligation is appropriate. Notwithstanding the above, in response to Document 19/59R, Eir and Three both appeared to favour Option 1 whereby no specific obligations would be required to improve indoor mobile voice and text coverage. ComReg assessed Eir's claims that the provision of VoLTE and Native Wi-Fi services are competitive differentiators which ComReg should not eliminate in Chapter 8 of Document 19/124 and also under 'Impact of competition' below. ComReg notes that no further views were

¹¹⁷³ Mobile Consumer Experience Survey, Document 19/101, Slide 60.

¹¹⁷⁴ For example, fixed voice traffic in Q4 2019 was just over 594 million minutes, which was a 4.3% decrease on Q3 2019 and also a fall of 20.1% since Q4 2018. But in Q1 2020 and Q2 2020 there was a quarterly increase of 8.2% and 12.7% in fixed voice traffic respectively. Source: ComReg Quarterly Key Data Portal. <https://www.comreg.ie/industry/electronic-communications/data-portal/>

¹¹⁷⁵ The Effect of Building Materials on Indoor Mobile Performance, published April 2018, Document 18/05.

¹¹⁷⁶ Mobile Consumer Experience survey, Doc 19/101, Slide 37.

received from Three and Eir in relation to Native Wi-fi in response to Document 19/124 (or Document 20/32).

New Entrants

- A 8.20 New Entrants may prefer Option 1 if their network rollout plans (initially at least) focus on the provision of outdoor coverage. Under Option 1, New Entrants would have the same flexibility as the MNOs in determining what level of indoor coverage to provide.
- A 8.21 Alternatively, New Entrants may be of the view that some obligation would be needed to provide good incentives for all operators to maintain a good indoor mobile voice call standard. New Entrants may also be of the view that such conditions improve the perception of the network and such benefits are likely to exceed any compliance costs. Further, any measures to improve indoor mobile voice and text coverage could be introduced in tandem with the rollout of its network, thereby reducing long term costs.
- A 8.22 Thus, on balance New Entrants would be unlikely to prefer Option 1.

MVNOs

- A 8.23 MVNOs would likely prefer the option that maximises the indoor mobile voice call and text QoS that would be available to its consumers. Under Option 1, MVNOs would be exposed to the risk that consumers may consider its service to be inferior because either its host network or the receiving network cannot adequately provide for indoor mobile voice calls and texts. Further, MVNOs would be less likely to choose a host operator that provided poor indoor mobile voice and text coverage, reducing competition in the wholesale market for access.
- A 8.24 Therefore, MVNOs would be unlikely to prefer Option 1.

Option 2

MNOs

- A 8.25 Indoor mobile coverage obligations would require a licensee to provide coverage of a particular standard inside buildings. Option 2 would aim to achieve this through an 'outside-in' solution where the user receives a mobile signal from a network outside of the building i.e. from the existing outdoor network. However, MNO's are unlikely to prefer this option due to the significant challenges that would need to be overcome, some of which are outside the control of the MNO.
- A 8.26 **First**, providing indoor mobile voice and text coverage using an 'outside in' solution would require a significantly densified network, which would entail

significant costs,¹¹⁷⁷ in order to provide for penetration of buildings.

- A 8.27 A solution based on this approach could not be achieved rapidly, given the need to rollout many additional base stations. Moreover, it would not be uniformly effective, given the variations in construction materials and building geometries as discussed in ComReg's Building Materials Report.¹¹⁷⁸ Given the evolution of building standards and variability of existing building stock any prediction or measurement of coverage would be fraught with difficulty and potentially provide a fertile ground for dispute.
- A 8.28 In effect, the required investment would likely be inefficient. In particular, and depending on the coverage level set, networks would need to provide for significant losses suffered by radio waves penetrating buildings, both on the up and down links to ensure effective indoor mobile coverage in most insulated buildings. This would require operators to significantly densify their networks without guarantee that the densification would have a positive impact on the indoor mobile coverage experience.
- A 8.29 **Second**, there is no guarantee that a densified outdoor network would provide good indoor mobile voice and text coverage, regardless of the number of additional base stations and cost of same (see below). There will always be some exceptional buildings with difficult construction material, few windows and/or shallow angle of incidence that outdoor solutions will have difficulty penetrating. All materials reduce the strength of signals to some extent but modern building materials that are designed to minimise heat loss increase the signal loss. The variation in building design and the use of efficient insulation materials means that in effect, an indoor mobile coverage obligation might provide a good reception for one house but not another even if they are near each other.
- A 8.30 This issue is likely to be made more difficult in the future given the incentive for homeowners to install high levels of insulation in their homes through energy efficiency grants. MNOs would find it increasingly difficult for mobile network signals to penetrate buildings due to the increasing requirement for better insulated houses to make an important contribution to the reduction of greenhouse gas emissions. For example, ComReg notes that since 2011 all new buildings required a minimum A3 BER rating and since 1 November 2019¹¹⁷⁹ the requirements to improve the energy performance of buildings has been

¹¹⁷⁷ The cost of network expansion is dominated by site CAPEX (i.e. civil works, acquisition) and OPEX. The Oxera Connectivity Report (Document 18/103c) estimates Capex of €250,000 per site and €15,000 Opex per annum.

¹¹⁷⁸ The Effect of Building Materials on Indoor Mobile Performance, published April 2018, Document 18/05.

¹¹⁷⁹ European Union (Energy Performance of Buildings) Regulations 2019.

increased to a minimum A2 BER.¹¹⁸⁰

A 8.31 Further, where major renovations (defined as a renovation where more than 25% of the surface envelope of the building undergoes renovation) are carried out on a building, the building should achieve a cost optimal energy performance equivalent to a B2 BER. In effect, the new housing stock will be A2 rated and older stock not already subject to A3 standard will be upgraded over a period to a minimum B2 BER (up to 1.2 per cent of housing stock is renovated annually).¹¹⁸¹

A 8.32 **Third**, it would be difficult to ensure that any indoor mobile coverage obligation is achieved in practice due to the difficulty in measuring indoor coverage. Indoor mobile coverage obligations are typically approximated on foot of an outdoor drive test. This is done by estimating an additional margin depending on the penetration loss of the building materials (i.e. external wall, multiple indoor walls). However, as previously noted, mobile signal indoors can vary significantly between buildings and even between rooms within a single building, thus making it impractical to estimate a loss that would accurately reflect indoor mobile reception.¹¹⁸² Therefore, even if operators are attempting to meet the obligations they may fall short of the desired levels of indoor mobile coverage, without realising, due to the difficulty measuring. Similarly, this makes it difficult to enforce from a regulatory perspective so would have limited effect in practice.

A 8.33 This view is supported by ComReg's 'Connectivity Studies' which were of the general view that an 'outside-in' approach was unlikely to be sustainable. For example:

a) DotEcon notes that "it is not feasible to expect to address indoor coverage problems by setting tougher requirements on outdoor signal levels or extending the geographical area where outdoor services must be available; this is unlikely to be a successful or sustainable solution."¹¹⁸³

b) Oxera notes that the 'provision of indoor mobile connectivity can be promoted through complementary solutions other than mobile

¹¹⁸⁰ <https://www.housing.gov.ie/housing/building-standards/energy-performance-buildings/energy-performance-buildings>

¹¹⁸¹ <https://www.irishtimes.com/news/politics/new-energy-rules-for-home-renovations-and-extensions-1.4031816>

¹¹⁸² Future Mobile Connectivity in Ireland - a report (Document 18/103c) from Oxera Consulting LLP ("Oxera"), with Real Wireless Ltd – p7, p3.

¹¹⁸³ Coverage obligations and spectrum awards a report from DotEcon Ltd, Document 18/103d – p9.

network roll-out, for example through Wi-Fi calling or mobile repeaters.¹¹⁸⁴; and

- c) Frontier notes that “providing guaranteed indoor connectivity using mobile networks is not practical or effective since mobile signal performance will vary”.¹¹⁸⁵

A 8.34 Further, the view that MNOs are unlikely to prefer Option 2 is supported by the response of stakeholders to Ofcom’s 2018 proposal for a ‘premises obligation’ in its consultation on coverage obligations in the 700 MHz spectrum band:

- a) BT/EE argued that a solution requiring the build of new macro sites might not be proportionate given the availability of alternative solutions, such as Native Wi-Fi calling.¹¹⁸⁶
- b) Vodafone suggested that other technologies could be used to deliver indoor mobile coverage, whilst noting that the cost per premises of such an obligation could be high.¹¹⁸⁷
- c) O2 noted that the costs for an indoor mobile coverage obligation would be highly dependent on the specific premises involved and coverage requirements, and that this presented a challenge for further cost analysis.¹¹⁸⁸
- d) BT/EE also said it was concerned that “a cost benefit analysis is unlikely to be positive for rolling out indoor coverage where customers have outdoor mobile coverage and a good fixed broadband service”.¹¹⁸⁹

A 8.35 Therefore, ComReg is of the view that MNOs are unlikely to prefer Option 2.

New Entrants

A 8.36 New Entrants would face similar challenges to those facing MNOs. Therefore, ComReg is of the view that Option 2 is unlikely to be preferred by New Entrants.

¹¹⁸⁴ Future Mobile Connectivity in Ireland – a report, Document 18/103c from Oxera Consulting LLP with Real Wireless Ltd – p.7.

¹¹⁸⁵ Frontier Economics, Meeting Consumers’ Connectivity Needs” – a report (Document 18/103b) - p45.

¹¹⁸⁶ <https://www.ofcom.org.uk/consultations-and-statements/category-2/700-mhz-coverage-obligations>

¹¹⁸⁷ Ibid.

¹¹⁸⁸ Ibid.

¹¹⁸⁹ Ofcom, Award of the 700 MHz and 3.6-3.8 GHz spectrum bands, Annex 17.

MVNOs

A 8.37 While it is possible that MVNOs would prefer Option 2 due to the benefits from the increased signal strength from additional base stations, the cost would likely be passed on in the form of higher wholesale access charges. Further, this higher cost would represent poor value in the provision of indoor mobile voice and text coverage as there would always remain consumers who would not receive sufficient indoor mobile coverage.

A 8.38 Therefore, ComReg is of the view that MVNOs are unlikely to favour Option 2.

Option 3

MNOs

A 8.39 As described above, MNOs may prefer an obligation to provide indoor mobile voice and text coverage due to the importance of indoor voice calls and texts to their customers and also the damage to their reputation caused by a lack of consistent voice call quality across different networks. However, as outlined earlier, an 'outside in' obligation is likely to prove too costly and not be effective in providing indoor mobile voice and text coverage on a consistent basis. In that regard, Native Wi-Fi provides several benefits to MNOs over Option 2, including:

- a) it provides an effective and cost-efficient means of providing consumers with indoor mobile voice and text coverage.
- b) if operators already intend to rollout VoLTE they will have deployed an IP Multimedia System¹¹⁹⁰ and the costs of introducing Native Wi-Fi will be marginal.¹¹⁹¹
- c) Native Wi-Fi provides seamless handover with LTE as the 3GPP defines interfaces between the LTE core network and the Wi-Fi network, meaning Native Wi-Fi can be offered alongside VoLTE to complement the operator's voice service.¹¹⁹²

¹¹⁹⁰ The IP Multimedia Subsystem (IMS) provides the technical means for operators to transfer core services (voice, video and messaging) to an all-IP LTE environment.

¹¹⁹¹ VoLTE / VoWiFi — capacity, reach, and capability Deloitte Consulting.

<https://www2.deloitte.com/ie/en/pages/technology-media-and-telecommunications/articles/tmt-pred16-telecomm-volte-vowifi-capacity-reach-capability.html>

¹¹⁹² Einashar, A & A. El-Saidny, M (2018), 'Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G: 1st Edition' Wiley, p212 – 213, p7-8.

- d) Native Wi-Fi offers a consistent voice quality experience comparable to VoLTE (12.65 kbps) meaning the associated QoS would be superior to calls currently made/received on 2G/3G networks.¹¹⁹³
- e) Native Wi-Fi provides for indoor mobile voice and text coverage using Wi-Fi frequencies freeing-up the usage of the operators' own frequencies to provide more capacity for outdoor calls, text and data use.

A 8.40 Further, MNOs will over time be able to provide near ubiquitous indoor mobile voice and text coverage¹¹⁹⁴ which would not be possible under Option 2 (as some parts of the outdoor population will always be unserved by mobile¹¹⁹⁵). In particular, the rollout of the National Broadband Plan (NBP) should see access to high speed broadband services being made available to all businesses and households in Ireland which would allow consumers to take advantage of improved broadband connectivity indoors. Further, the natural replacement cycle of phones should allow most consumers to be able to benefit from Native Wi-Fi over a relatively short period. Around 10% of consumers have phones that are over 5 years old.¹¹⁹⁶ These older phones are less likely to have this capability.¹¹⁹⁷

A 8.41 Finally, ComReg notes that two MNO's (Vodafone¹¹⁹⁸ and Eir¹¹⁹⁹) are already offering Native Wi-Fi calling in Ireland. Three is continuing to evaluate the potential introduction of Wi-Fi calling,¹²⁰⁰ but ComReg notes that Three's sister company is providing Native Wi-Fi over its network in the UK¹²⁰¹. Further, given Three's public commitments to introduce VoLTE in Ireland, the rollout of Native Wi-Fi is unlikely to impose additional significant costs on Three.

A 8.42 Notwithstanding, in response to Document 19/59R, Three stated it did not agree with the proposal to include a Native Wi-Fi calling obligation and submits that ComReg should let licensees decide whether or when it is most appropriate to introduce this service (e.g. when they are sure that the customer experience will be as good as it is with circuit-switched voice).

A 8.43 While Eir does not favour a Native Wi-Fi obligation in its response to Document

¹¹⁹³ Ibid.

¹¹⁹⁴ Subject to consumers having broadband and Wi-Fi that provides effective coverage throughout their homes.

¹¹⁹⁵ In that regard, ComReg has set a precautionary outdoor coverage obligation of 95%.

¹¹⁹⁶ Mobile Consumer Experience Survey 2019, Document 19/101 slide 46.

¹¹⁹⁷ For example, Eir customers with Samsung phones only have native Wi-Fi capability if their handset model was released after the Samsung S6 (2015). <https://www.eir.ie/wificalling/>

¹¹⁹⁸ <https://n.vodafone.ie/network/wi-fi-calling.html>

¹¹⁹⁹ <https://www.eir.ie/wificalling/>

¹²⁰⁰ Mobile Phone & Broadband Taskforce Implementation Review 2018, p23.

¹²⁰¹ http://www.three.co.uk/discover/Three_inTouch/ios-wifi-calling

19/59R as it views it as a 'competitive differentiator' (discussed below), it is likely that it would prefer Option 3 to Option 2 as the costs are significantly lower.

- A 8.44 Vodafone in its response to Document 19/59R stated that it believes a Native Wi-Fi obligation is useful to promote the best services to customers. Also, in response to Document 19/124, Vodafone agrees with the inclusion of a native Wi-Fi obligation. Therefore, Vodafone would likely prefer Option 3 for the reasons stated above.
- A 8.45 Therefore, while MNOs are generally unlikely to prefer Option 2, they are likely to have differing positions regarding Options 1 or 3 depending on their own commercial strategies.

New Entrants

- A 8.46 A potential New Entrant is likely to prefer an option which gives it maximum flexibility in its choice of business model in line with its commercial strategy and therefore Option 1 could be preferred over Option 3. However, as noted in the 'Voice Call Services' RIA' in Annex 12 such an entrant would be unlikely to rollout a 2G/3G network to provide voice services, rather it would likely rollout VoLTE in tandem with the rollout of its network more generally in order to provide voice services.
- A 8.47 As previously noted, the costs associated with rolling out Native Wi-Fi when VoLTE is already provided are low and New Entrants would therefore likely provide Native Wi-Fi services along with VoLTE.
- A 8.48 Consequently, ComReg is of the view that New Entrants are likely to favour Option 3.

MVNOs

- A 8.49 MVNOs would likely prefer the option that maximises the amount of services that would be available to its consumers. In that regard, MVNOs would likely prefer Option 3 as this would provide indoor mobile voice and text coverage sooner and across a greater number of consumers than either Option 1 or Option 2.
- A 8.50 Therefore, ComReg is of the view that MVNOs are likely to favour Option 3.

Impact on competition

Option 1

- A 8.51 Competition in the retail mobile communications market is multi-faceted and operators compete across a range of factors including, price, handsets, bundles, and coverage. Network operators have clear competitive incentives to improve

indoor mobile voice and text coverage in order to attract new subscribers and increase the benefits of all subscribers using the network. However, consumers report indoor mobile voice and text coverage issues across all operators (23% of consumers are dissatisfied with indoor mobile voice text, and data connectivity)¹²⁰² illustrating the difficulty all operators have in improving indoor mobile coverage.

- A 8.52 Under Option 1, operators would retain flexibility on how to best optimise their network to improve indoor mobile voice and text coverage. The release of the 700 MHz Band and the associated coverage obligations could improve indoor mobile voice and text coverage to some degree but this would still be significantly curtailed due to the difficulties a mobile network signal has penetrating indoors, particularly with modern building materials, as discussed above. Alternatively, MNOs would be able to deploy other technological solutions. For example, mobile phone repeaters can be deployed by MNOs as part of managing ongoing network performance¹²⁰³. More pertinently, as noted above, Vodafone and Eir have already rolled out Native Wi-Fi as a means of improving mobile voice and text coverage for consumers.
- A 8.53 Given the importance attached to indoor mobile voice calls and texts by consumers, normal competitive forces should encourage MNOs to provide sufficient levels of indoor mobile voice and text coverage (as ably demonstrated by the recent initiatives of Eir and Vodafone). Thus, it may not be necessary to impose any obligation to improve indoor mobile coverage. However, even in competitive markets there is no guarantee that competition will deliver and maintain an acceptable level of indoor mobile voice and text coverage across the country. It cannot be ruled out that such measures would not be provided for all consumers and across all operators. Operators (including New Entrants) may decide to focus on data (e.g. low-cost unlimited data plans) to capture market share rather than improvements to indoor mobile voice coverage (which would also impact other operators).
- A 8.54 Even where competition between MNOs takes place it may not prevent certain customers being disadvantaged by inefficient and/or poor quality services. In some cases, it is helpful to attach licence conditions which reassure network operators that they will not face the risk of one or more operators compromising the ability of the market to deliver a benefit to consumers across the entire market. This may maintain incentives for those operators to invest in infrastructure to promote indoor mobile coverage improvements and ensure the efficient use of the radio spectrum.
- A 8.55 Option 1 maintains the status quo and to date appears to have delivered sub-

¹²⁰² Mobile Consumer Experience Survey 2019, Document 19/101, Slide 94.

¹²⁰³ See <https://www.comreg.ie/consumer-information/mobile-phone/mobile-phone-repeaters/>

optimal indoor mobile voice and text coverage outcomes to the detriment of consumers. There is no reason to assume that this position would change materially in the absence of intervention. Therefore, ComReg is mindful that Option 1 is not an appropriate solution to the indoor mobile coverage issues described above.

Option 2 v Option 3

A 8.56 ComReg assesses the relative impact of Option 2 and Option 3 under the following headings:

- distortions to the spectrum award;
- efficient investment;
- efficient use of the radio spectrum;
- new entry; and
- competitive differentiation.

Potential distortions to the spectrum award

A 8.57 Under Option 2, an 'outside in' obligation designed to improve indoor mobile voice and text coverage would run the risk of extending outdoor coverage beyond the limits that competition alone might deliver. In particular, given the difficulties associated with providing indoor mobile coverage from outside, operators are already likely to be close to the limits of what can be delivered indoors¹²⁰⁴ using external base stations as any additional base stations would only be cost effective in delivering competitive outdoor coverage as described in the Oxera Report.

A 8.58 In effect, any 'outside in' obligation would likely go beyond what operators would be willing to provide commercially as the number of base stations required would significantly exceed the number of base stations needed to provide outdoor coverage, as described in the 'Coverage' RIA. Such obligations are referred to as 'interventionist coverage obligations' and have been discussed previously in Documents 19/59R, 19/124 and again in Chapter 8 and in the '700 MHz Coverage' RIA in Annex 9 of this document. Depending on the form and manner of such an obligation, it may distort spectrum awards and reduce competition in a number of ways. These are discussed in detail in the '700 MHz Coverage' RIA and are not repeated here. Alternatively, Option 3 would run little risk of distorting the spectrum award as Native Wi-Fi is likely to be provided commercially.

¹²⁰⁴ Dissatisfaction with indoor mobile voice and text connectivity is broadly consistent across all MNOs.

A 8.59 Similarly, raising the power limits on individual base stations would not be prudent as it would be unlikely to remedy indoor mobile voice and text coverage and/or it could create unintended consequences. For example, base stations should be optimised to provide coverage efficiently, but indiscriminately raising the power limits in an attempt to address indoor mobile coverage would likely increase inter-cell interference, thereby compromising outdoor mobile coverage (voice and data). Although it is possible that raising the power limits would partially remedy indoor mobile coverage issues with regard to downlink (albeit with the unintended consequences mentioned), it would in no way solve any issues for indoor uplink connectivity. This is because uplink connectivity is limited by the handset used and will not be improved by raising individual base station limits.

Efficient investment

A 8.60 Option 2, would require the rollout of additional base stations substantially increasing the costs associated with providing indoor voice coverage. Alternatively, Option 3 would promote efficient investment and innovation in new and enhanced infrastructures by avoiding investments that would otherwise be incurred in rolling out additional sites, where those sites are not required for coverage and capacity purposes. Further, Option 3 would be more beneficial for consumers (see impact on consumers below). In that regard, Option 3 would be a less onerous, more effective and more proportionate means by which ComReg could achieve its objectives.

Efficient use of the radio spectrum

A 8.61 A key objective in designing and carrying out this award process is to encourage the efficient use and ensure the effective management of the radio frequency spectrum in order to promote competition and maximise the benefits for consumers in terms of price, choice and quality. In that regard, an 'outside in' obligation would likely result in the inefficient use of the radio spectrum in a number of ways.

A 8.62 **First**, the additional base stations would be rolled out to increase the possibility of mobile signals penetrating indoors. However, the rollout of additional base stations would result in the over provisioning of the network outdoors, essentially creating capacity outdoors where no such demand exists. This could be particularly inefficient in rural areas with low population densities. Further there is no guarantee the use of the radio spectrum in this way would be effective in providing indoor mobile coverage.

A 8.63 **Second**, in order to satisfy the indoor mobile coverage obligation, MNOs could divert resources that would otherwise be deployed to deliver capacity, where it is actually required. This could be particularly damaging to competition if MNOs

are unable to deploy spectrum resources where they are needed most and respond to rivals or the needs of its consumers in particular areas.

A 8.64 **Third**, operators can typically identify areas of their network that require additional capacity and either add new sites or spectrum. In effect, scarce spectrum resources can be efficiently targeted at areas that require additional capacity or coverage the most. However, in providing for the rollout of additional indoor mobile voice and text coverage, MNOs would find it difficult to determine whether any additional base stations would (a) penetrate a sufficient number of homes and (b) whether those homes even need improvements in indoor mobile voice and text connectivity as these homes could already be receiving adequate indoor mobile coverage. In effect, MNOs are somewhat blind as to the effect of rolling out additional base stations in particular areas for indoor mobile voice and text coverage.

A 8.65 Alternatively, Option 3 would provide full flexibility for MNOs to utilise their resources in line with the demand for services in all areas. Further, the provision of voice services using Native Wi-Fi utilises the Wi-Fi frequency ranges (i.e. 2.4 GHz and 5 GHz). This reduces the load on the mobile network and makes licensed rights of use more available for the provision of data services. This is likely to be particularly beneficial in higher density areas where capacity constraints could arise and need to be managed. In this way, it would promote the efficient use of the radio spectrum by allowing services to be delivered efficiently using both the operators licenced spectrum and the Wi-Fi frequencies and facilitating the rollout of mobile networks in an efficient manner. Further, recent developments to the Wi-Fi standards such as Wi-Fi 6 will enhance the consumer experience even further.¹²⁰⁵

New entry

A 8.66 Option 2 would also be unlikely to encourage new MNO entry. While ComReg could include an appropriately reduced indoor mobile coverage obligation for such entrants, any obligation that does not appear proportionate to potential entrants creates long run uncertainty about the nature of regulation discouraging new entry. Alternatively, as noted above, Option 3 would be dimensioned to provide integrated VoLTE and Native Wi-Fi services.

Competitive differentiation

A 8.67 In that regard, ComReg would note that while such an obligation might appear unnecessary, given that two operators have already rolled out Native Wi-Fi (notably for some, but not all customers) and the same outcome for indoor mobile

¹²⁰⁵ Wi-Fi 6, or 802.11ax is the newest version of the 802.11 standard for wireless network transmissions that people commonly call Wi-Fi. It's a backward-compatible upgrade over the previous version of the Wi-Fi standard, which is called 802.11ac.

voice and text coverage might be achieved through normal competition, Option 3 can play an important role in protecting potential risks to competition as described above.

- A 8.68 ComReg notes that Option 3 would not involve ComReg eliminating competitive differentiation (as submitted by Eir), rather, ComReg would be providing the necessary protection that an important service that satisfies a clear consumer need and that would be expected anyway from well-functioning competition between network operators and would be delivered over an appropriate period. This is supported by the earlier stakeholder analysis and operator's own commitment to rollout Native Wi-Fi. In effect, such an obligation is little different to precautionary coverage obligations which may be met or exceeded by operators but play an important role in preventing any competitive distortions.
- A 8.69 As noted by DotEcon,¹²⁰⁶ "if all networks were not timely in offering native Wi-Fi calling, despite the population of enabled handsets growing, this would prima facie suggest a possible competitive failure". These possibilities may not arise, however Option 3 would provide reassurance in preventing such adverse outcomes, with little risk of the obligation itself creating unintended distortions or imposing costs.
- A 8.70 In light of the above assessment, ComReg is of the view that Option 3 would better promote competition.

Impact on consumers

Option 1

- A 8.71 Indoor mobile voice and text coverage is a key issue for consumers. Further, ComReg notes that consumer experience with regard to voice coverage has deteriorated since 2017. In 2019, 33% of consumers experienced coverage issues throughout the home compared to 28% in 2017¹²⁰⁷ and issues regarding calls indoors are higher than for data or text (58% compared to 21% and 16% respectively)¹²⁰⁸.
- A 8.72 Given all of the above, it is unlikely consumers would favour Option 1 as this would reinforce the status quo which up to this point has provided a level of indoor mobile voice and text coverage with which some consumers express dissatisfaction. Consumers would receive some indoor mobile coverage benefits from the outdoor coverage obligation, as outdoor coverage would penetrate indoors to a certain extent. However, as noted above, it would make little

¹²⁰⁶ Document 18/103d, 'Coverage obligations and spectrum awards a report from DotEcon Ltd, published November 2018 – Section 2.2.2.

¹²⁰⁷ Mobile Consumer Experience survey 2019, document 19/101, Slide 73.

¹²⁰⁸ Ibid, Slide 87.

difference to the large and increasing cohort of consumers who make use of better building insulation materials (e.g. foil-backed insulation, windows with metallic components and coatings, etc.) and the consequent reduction in indoor signal penetration. Further, under this option consumers would potentially have to sacrifice indoor mobile connectivity for more energy efficient homes.

- A 8.73 While two of the three operators are currently offering Native Wi-Fi services, these are only available across selected plans. Further, as noted above ('Impact on competition') there remains a risk that the rollout of Native Wi-Fi to all consumers and operators could be delayed absent measures to encourage same. Therefore, consumers are likely to welcome conditions that could encourage the timely and effective rollout of measures that would improve indoor mobile voice and text coverage.

Option 2

- A 8.74 Consumers might prefer Option 2 if they were of the view that this approach would remedy the ongoing indoor mobile voice and text coverage issues, in a timely manner with little increase in prices. However, as noted earlier (Impact on Stakeholders) an 'outside in' obligation is unlikely to be effective or timely and there is a risk that the MNOs would be unable/unwilling to meet the obligations due to the excessive costs and uncertainty. Furthermore, as noted above, while such an obligation may improve the indoor mobile coverage experience for some consumers there would always be others without indoor mobile voice and text coverage due to indoor penetration issues that could not be overcome regardless of network densification.

- A 8.75 Further, under Option 2, the significant additional costs of network densification could be passed onto consumers or alternatively other more valued services would not be provided or provided to a lesser degree (e.g. better outdoor coverage, QoS, handsets). Consumer surveys suggest a very limited willingness to pay¹²⁰⁹ for coverage enhancement, which is unsurprising given coverage problems fall disproportionately on a subset of consumers (i.e. all consumers would be required to pay for indoor mobile coverage issues experienced by some and there is no guarantee that those coverage issues would be resolved). More generally, consumers are unlikely to favour an option that results in the unnecessary rollout of additional mobile sites and towers across the country. Further, and similar to above, under this option consumers would have to sacrifice indoor mobile coverage for more energy efficient homes.

- A 8.76 Therefore, ComReg is of the view that consumers are unlikely to prefer Option

¹²⁰⁹ The Mobile Consumer Experience survey 2017 has shown that most consumers (especially those in urban areas who would not benefit from the obligations) have a low willingness to pay for improved coverage. Consumers in urban areas would be willing to pay on average only an additional €1.50 a month to improve indoor coverage. Document 17/100a, slide 78.

2.

Option 3

A 8.77 ComReg observes that the ability to use Native Wi-Fi is likely to be the most effective mechanism to improve indoor voice and text coverage in the long run. In that regard, Native Wi-Fi offers a number of benefits to consumers, including that it:

- a) offers a voice quality above what is currently provided by 2G/3G and an experience comparable to VoLTE (12.65 kbps);
- b) should provide near universal indoor mobile voice coverage in line with the rollout of the NBP;
- c) offers a seamless user experience for mobile voice and text messaging and can use Wi-Fi calling at any location (e.g. work or at home) that has suitable Wi-Fi access;
- d) does not require the installation of mobile phone repeaters or specialised equipment/base stations. It only requires that consumers have access to Wi-Fi over a broadband connection and Wi-Fi calling enabled phones¹²¹⁰;
- e) does not require consumers to sacrifice indoor mobile coverage for more energy efficient homes as could be the case under Option 1 and Option 2; and
- f) is unlikely to result in additional charges to consumers as the costs of meeting this obligation should be minimal, particularly if VoLTE is already planned or deployed.

A 8.78 Further, greater availability of Public Wi-Fi in areas of existing low connectivity will allow consumers to make voice calls over such networks. For example, as part of the Mobile Broadband Taskforce, the BCP (Broadband Connection Points) programme, will provide free public Wi-Fi access at 300 locations nationwide within the amber intervention area.¹²¹¹ Through the Digital Innovation Programme (DIP), the government has provided funding to a number of initiatives around the country that provide Wi-Fi services to the public free of charge.¹²¹²

A 8.79 Finally, it provides consumers greater transparency over the source of any

¹²¹⁰ This feature is typically available on smartphones of 2 years old or less.

¹²¹¹ <https://www.gov.ie/en/publication/660db-mobile-phone-and-broadband-taskforce-progress-reports-2019/>

¹²¹² [ibid](#)

connectivity issues (i.e. if a consumer is aware of the benefits of Native Wi-Fi and indoor mobile voice experience is still poor, it is more likely to be a result of issues related to the other caller).

A 8.80 ComReg would note that several factors lie outside the control of the mobile operators, including that certain consumers:

- a) regardless of mobile operator, do not have a Native Wi-Fi enabled mobile device;
- b) particularly rural consumers, may not have an internet connection sufficient to benefit from Wi-Fi calling regardless of operator or handset availability; and
- c) may not have access to the internet at all. For example, 8% of households do not have internet access.¹²¹³

A 8.81 However, these reasons seem likely to become less relevant over time, although certain households may never choose to have internet access. In particular, NBP is a Government wide initiative to deliver access to high speed broadband services to all businesses and households in Ireland and this will address point two above. Over the same period, the natural replacement cycle of phones should allow most consumers to be able to benefit from Native Wi-Fi. However, in the meantime the use of repeaters is likely to be of benefit to those consumers who face mobile reception issues indoors.

A 8.82 Therefore, considering the above, ComReg is of the view that consumers would likely prefer Option 3 over Option 1 and Option 2.

Overall Preferred Option

A 8.83 In light of the above, ComReg is of the view that Option 3 is the overall preferred option because, among other things it would:

- a) improve indoor voice and text coverage:
 - i. by using the most effective radio frequencies for indoor connectivity (i.e. unlicensed Wi-Fi spectrum bands inside the home), it would provide better indoor coverage levels compared to Option 2 which would use “outdoor” mobile spectrum which would suffer significant penetration loss because of, among other things, modern building materials and therefore have lower levels

¹²¹³ Information Society Statistics - Households 2020.

<https://www.cso.ie/en/releasesandpublications/ep/p-isshh/informationstatistics-households2020/>

of indoor voice and text coverage;

- ii. further, the coverage advantages of Option 3 over Option 2 identified above are likely to increase over time as more existing homes are retrofitted with modern building materials, new homes required to be built with modern building materials, and any changes to the Building Regulations which would increase penetration loss from outdoor signals;

b) improve indoor (and outdoor) voice and text **quality of service**:

- i. by using the most effective radio frequencies for indoor coverage (i.e. unlicensed Wi-Fi spectrum bands), it would provide better indoor coverage levels and, by implication, quality of service compared to Option 2 which would use “outdoor” mobile spectrum which would suffer penetration loss because of, among other things, modern building materials and therefore have lower levels of indoor voice and text quality of service;
- ii. the relevant “outdoor” mobile spectrum which would have otherwise been used to attempt to provide the (poorer) indoor voice or text service is now freed (by virtue of Wi-Fi offload) and this additional capacity can therefore be used to provide a better quality of service to a licensee’s **outdoor** customers;
- iii. it would avoid requiring handsets operating at increased power in attempting to make a connection with outdoor base stations (under Option 2), which would provide increased battery life and benefit the environment - noting also that there is also an inherent limitation in this regard; and
- iv. it offers a voice quality above what is currently provided by 2G/3G and an experience comparable to VoLTE (12.65 kbps).

c) promote the **effective and efficient use of frequencies**:

- i. it would make more *effective* use of radio frequencies by entailing the use of the frequencies best suited to providing indoor voice and text connectivity (i.e. unlicensed Wi-Fi spectrum in within the premises);
- ii. it would make more *efficient* use of the unlicensed Wi-Fi spectrum bands, which may be relatively less congested than the relevant “outdoor” mobile frequencies (including the frequencies relevant to the Proposed Award) that would otherwise be used to provide the indoor voice and text service;

- iii. it would make more *effective* use of radio frequencies by entailing the use of the frequencies best suited to providing outdoor mobile services (i.e. the mobile frequencies, including the frequencies relevant to the Proposed Award);
 - iv. it would make more *efficient* use of the relevant “outdoor” mobile spectrum because they would be freed from providing (poorer) indoor voice or text services (by virtue of Wi-Fi offload) and this additional capacity can be used to provide the outdoor mobile services to which it is better suited; and
 - v. it would avoid the inefficient investment and inefficient spectrum use (i.e. additional base stations being deployed for the “outdoor” mobile bands and/or operating at potentially higher power levels in an attempt to deliver an attenuated signal indoors) that would otherwise be incurred in trying to provide a (poorer if at all) indoor voice and text service with such frequencies.
- d) More generally, and considering the above, Option 3 would:
- i. better reflect the increasing availability of high-speed Wi-Fi networks and, indeed, the impending roll-out of the NBP means that Option 3 could provide the above identified benefits across the entire population;
 - ii. better ensure that users derive maximum benefit in terms of choice, price and quality;
 - iii. better support increasing the energy efficiency of mobile networks and of mobile users, noting the challenges with mobile battery usage;
 - iv. be unlikely to result in a distortion or restriction of competition to the detriment of users; and
 - v. would be suitable for the achievement of the legitimate objectives as there do not appear to be less onerous means by which these objectives and principles could be achieved.

Annex: 9 Final Coverage RIA

Introduction

- A 9.1 Telecommunication services are constantly evolving and the widespread adoption of consumer devices which offer ever more advanced features and applications has changed how and where consumers communicate. Connectivity is achieved by an overlapping set of networks, devices and technologies whose use depends on the services being provided and where those services are required. Mobile is an important element of providing connectivity to consumers and the 700 MHz Duplex rights of use will be important in this regard given its excellent propagation characteristics.
- A 9.2 The 700 MHz Duplex is the only band included in the Proposed Award which can provide wide area coverage and will be an important part of the solution to address the unremitting demand in Ireland for wireless broadband services and increased connectivity. This Annex sets out ComReg's Coverage RIA and addresses different approaches to coverage obligations for the new 700 MHz rights of use.

RIA Framework

- A 9.3 The purpose, structure and scope of the RIA framework is discussed at the commencement of the 'Spectrum for Award' RIA which is set out in Annex 4 and is not repeated here.

Identify the policy issues and identify the objectives (Step 1)

Background and Policy Issues

- A 9.4 As described in Chapter 8 of Document 19/59R, Chapter 7 of Document 19/124 and further considered in Chapter 8 of this document, ComReg is of the view that:
- a) a coverage obligation should **focus on delivering coverage to the population** rather than a focus on geographic or area coverage;
 - b) there are good and improving solutions for providing indoor coverage (i.e. Native Wi-Fi and mobile phone repeaters) and, as such, a coverage obligation should **focus on outdoor coverage only**; and

- c) in terms of quality of service, the proposed outdoor population coverage should primarily focus on **a minimum data rate of 30 Mbit/s for a single user at cell edge.**

Identify and describe the regulatory options (Step 2)

A 9.5 At paragraph 9.6 of Document 19/124, ComReg proposed the following options for consideration:

- **Option 1** - Impose no coverage obligation.
 - This would mean that each licensee would have full flexibility to choose how extensive their rollout would be regardless of the amount of 700 MHz Duplex rights of use it was assigned. For example, a licensee could choose to provide no services, only to provide services in high density areas, or choose to differentiate itself as a provider with an extensive network footprint using its 700 MHz Duplex rights of use;
- **Option 2** - Impose a coverage obligation to provide a minimum level of coverage sufficient to serve between 70% and 90% of the population, together with a minimum data rate of 30 Mbit/s for a single user at cell edge. Option 2 was informed by, among other things:
 - in the 2012 MBSA, a 70% coverage obligation was considered necessary given there was no guarantee that market forces alone would ensure the efficient use of spectrum, and that this level would at the very least prevent cherry picking (such as in densely populated areas)¹²¹⁴; and
 - Oxera's view that operators providing coverage of 90% population at 30 Mbit/s appeared likely¹²¹⁵ even if no coverage obligation was set;
- **Option 3** - Impose a coverage obligation to provide a minimum level of coverage to serve between 90% and 95% of the population, together with a minimum data rate of 30 Mbit/s for a single user at cell edge. This option was informed by Oxera's view that such a coverage obligation was possible for an Existing MNO to meet; and
- **Option 4** - Impose a coverage obligation to provide a minimum level of coverage to serve 95 - 99.5% of the population, together with a minimum data rate of 30 Mbit/s for a single user at cell edge. This option, which is

¹²¹⁴ 70% of the population corresponds to all cities and towns including towns under 500 population but with at least 50 inhabited houses.

¹²¹⁵ Document 18/103c page 62.

informed by the Oxera modelling would provide high speed services to very high levels of the population.

- A 9.6 ComReg has no new information and has not received any submissions from interested parties that would call into question the suitability of these options. Accordingly, the following section assesses the relative impact of each of these options on stakeholders, competition and consumers.
- A 9.7 As discussed in Chapter 8, ComReg proposes to impose Native Wi-Fi and VoLTE obligations separately.

Impact on industry stakeholders, competition and consumers (Steps 3 and 4)

- A 9.8 The following sections of the 'Coverage RIA' consider the impact of each of the regulatory options on:
1. industry stakeholders (being existing operators and potential New Entrants);
 2. competition; and
 3. consumers.
- A 9.9 To the extent that ComReg has received views from stakeholders which are relevant to this RIA, ComReg considers them in the assessment below. Otherwise, ComReg sets out what it believes would be the likely views of stakeholders based on the Oxera Report, its industry knowledge and expertise and on relevant information available.

Impact on industry stakeholders

- A 9.10 Industry stakeholders can generally be split between those operators that are currently active in the electronic communications sector and potential New Entrants that may be considering entry into the electronic communications sector in the State.
- A 9.11 At the outset, ComReg observes that stakeholder views are likely to be informed by the costs of delivering coverage above existing levels. In particular, the Oxera Report¹²¹⁶ found that, while certain levels of coverage can be achieved with low levels of investment, the cost of coverage rises exponentially at high levels of coverage (across all scenarios). The figure below shows how the cost of providing 30 Mbit/s population coverage rises exponentially after 95% coverage.

¹²¹⁶ ComReg Document 18/103c.

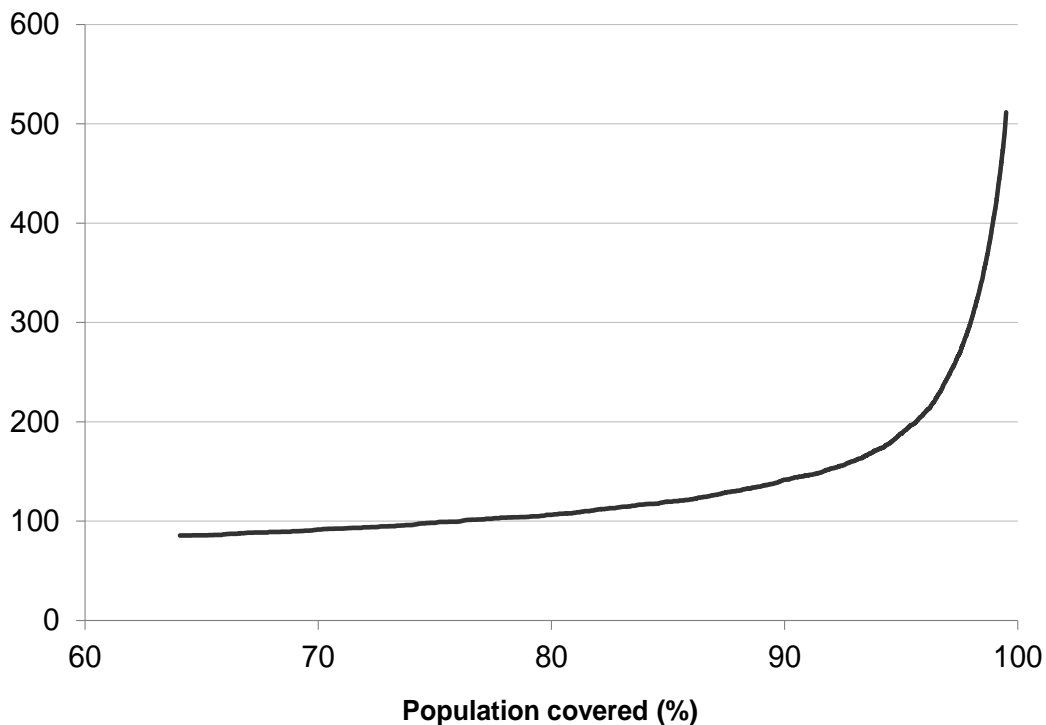


Figure 17. Estimated cost of targeting 30 Mbit/s population coverage, starting 2020¹²¹⁷

A 9.12 ComReg assesses the actual or likely views of various stakeholders below.

Option 1 – no coverage obligation

Incumbent MNOs

A 9.13 Under Option 1, a winning bidder would have full flexibility to choose how extensive their network coverage would be and what QoS standards (e.g. speed) would apply. In that regard, ComReg notes that MNOs are already providing 30 Mbit/s coverage in various parts of the State. For example, the Oxera Model predicted that the synthetic mobile network operator used in its analysis would have achieved 64% population coverage of 30 Mbit/s by 2020^{1218 1219} (62.4% in 2017)¹²²⁰. Given the potential for new entry (e.g. a mix of spectrum above and below 1 GHz), Existing Operators are likely to favour some form of obligation in order to ensure that potential New Entrants do not cherry pick more profitable areas thereby forcing MNOs (who price on a national basis) to compete against the New Entrant's lower price in those areas.

¹²¹⁷ Future Mobile Connectivity in Ireland - a report (Document 18/103c) from Oxera Consulting LLP ("Oxera"), with Real Wireless Ltd – p.6.

¹²¹⁸ Ibid, p. 61.

¹²¹⁹ However ComReg notes the updated assessment of the current state of the operators 30 Mbit/s coverage levels, where operators have made notable improvements in their networks since 2017 bringing their 30 Mbit/s SUTP coverage levels to be between approximately [X █████ X] range.

¹²²⁰ Ibid, table 4.3.

A 9.14 In that regard, it is apparent from submissions to Document 19/59R, Document 19/124 and Document 20/32 that all three MNOs favour the imposition of some coverage obligation although they are not in agreement as to what the level of that obligation should be (see below).

A 9.15 Therefore, on balance, MNOs are unlikely to prefer Option 1 as 30 Mbit/s services are already provided at population percentages between approximately [\times █████ \times] and a New Entrant may use rights of use to cherry pick if the obligation is set too low or if no obligation is set.

New Entrants

A 9.16 Potential New Entrants are likely to prefer an option with as low a rollout obligation as possible, and therefore Option 1 could be their preferred option. This would give an entrant maximum flexibility in its choice of business model, including potentially allowing it to offer services focused on limited geographical areas, such as services targeting more profitable urban areas. However, given that such entrants would likely wish to rollout a network covering a greater part of the population, regardless of any obligation, a New Entrant might be indifferent between Option 1 and Options that mandate rollout coverage at 30 Mbit/s (or lower where it is assigned less than 2×30 MHz) in line with its commercial strategy.

MVNOs

A 9.17 MVNOs would likely prefer the option that maximises the level of coverage that would be available to provide to their customers. In that regard, they are unlikely to prefer Option 1 as this could lead to sub-optimal levels of coverage as described in 'Impact on Competition' below.

Assessment of Options 2, 3 and 4

A 9.18 Before assessing each of the remaining options individually, ComReg first sets out some relevant information that would form part of each assessment. The extent to which a stakeholder would likely prefer an option is largely dependent on the extent to which an obligation would be commercially achievable in a competitive market. In that regard, the remainder of the stakeholder assessment refers to Oxera's observations on likely commercial deployment by MNOs following an award process for 700 MHz Duplex rights of use. Oxera's observations were informed by several factors, including:

- the availability of three-band carrier aggregation from mid-2020 and deployment of same by operators using 2×10 MHz of 700 MHz

spectrum, 2 × 10 MHz of 800 MHz spectrum, and 2 × 10 MHz of 900 MHz spectrum^{1221 1222};

- the number of additional sites and upgrades to existing sites required to provide a given level of coverage;
- the cost of rollout at a given annual rollout rate (i.e. 2.5% up to mid-2020 and 8.04% from mid-2020 onwards to allow the roll-out to be completed within 10 years);
- interviews with stakeholders and historic investment trends of Irish MNOs.¹²²³

A 9.19 ComReg notes that Oxera's observations on likely commercial deployment referred to all incumbent MNOs regardless of their existing network. As noted above, the assessment was based on historic investment trends and interviews with MNOs. Further, the synthetic network was based on the licensed site numbers, site locations, and licensed frequency bands of Vodafone and Eir. In particular, the starting number of base stations in the synthetic network (1,890) was almost identical to Eir's (1,876) and slightly below Vodafone's (1,931) at that time.¹²²⁴ Finally, according to Oxera, achieving up to 95% coverage requires an additional 378 sites targeting the extension of coverage, [REDACTED] In effect, Oxera's observations could be achieved by all MNOs regardless of size.

A 9.20 ComReg further notes that the current site numbers for each of the operators is notably greater than that of the synthetic network modelled by Oxera in 2017 [REDACTED] ComReg notes that while not all of these sites would be targeting coverage, coverage has expanded for each of the operators over this time.

A 9.21 MNO's views on the merits of each option are likely to be informed by a number of factors including:

¹²²¹ The 700 MHz band and Carrier Aggregation reduces the cost of providing coverage (as site upgrades cost less than building new sites).

¹²²² ComReg notes Three's submission to Document 19/124 that sub-1 GHz three band carrier aggregation may not be readily available at this juncture due to networks supporting legacy 2G/3G connections. However ComReg notes that these features are available in 3GPP Release 15 and that, over time, sub-1 GHz carrier aggregation will be available to operators, perhaps initially using 2 bands extending to 3 depending on business case (Oxera Report footnote 57).

¹²²³ Mobile investment data used was from the European Commission (European Commission 'Telecommunications data files'). These figures included investments other than improving the coverage of connectivity and therefore represent an upper-bound estimate of the historical level of capital investment in improving mobile coverage.

¹²²⁴ Document 18/103c – Table 4.1.

¹²²⁵ [REDACTED]

- a) The likely level of network investment that would be required to be spent on improving mobile coverage. Based on historic investment data, Oxera estimated that this would require an annual investment to improve mobile coverage of circa €8m – €19m, for each MNO.¹²²⁶
 - i. The €8m - €19m investment range is the same for each option below.
- b) The total capex cost to rollout coverage to certain levels of population. Total Capex arises from investment in new sites and upgrades to existing sites.
 - i. The total Capex cost varies across each option below.
- c) The total number of sites and upgrades required over specified periods.
 - i. The number of sites and upgrades varies across each option below.
- d) When might coverage levels be achieved? Oxera used a rollout rate of 2.5 % which was based on historical site rollout following the 2012 MBSA.¹²²⁷
 - i. The rollout rate is the same for each option below.

A 9.22 The remaining options are assessed against the extent to which the Capex costs required fall within the likely coverage investment range.

Option 2 – 70 to 90% population at 30 Mbit/s cell-edge

MNOs

A 9.23 Oxera considered that it was **likely** that MNOs would expand coverage up to 90% of population (based on purely commercial incentives). Oxera formed this view based on the observation that the incremental cost of expanding 30 Mbit/s coverage from 2017 levels (i.e. circa 65%) to 90% is low (compared to the incremental cost at higher levels of coverage) and it is likely that the commercial case for expanding 30 Mbit/s coverage would exceed the costs of doing so. The investment required was likely to be well within that which was invested by MNOs in the period 2010–16, implying that the level of investment is not unprecedented:

¹²²⁶ Using a conservative estimate of only 10 – 20% of network investment being spent on improving mobile coverage.

¹²²⁷ Based on a four-year growth rate (2013–2017) of licensed sites in the frequency bands with the highest number of sites (i.e. the 900 MHz Band for Vodafone and the 900 MHz and 2100 MHz bands for Meteor).

- a) a total Capex cost of €44m would be required to rollout to 90% of population over a 3 to 4 year period¹²²⁸;
- b) an annual investment of €11m (at the lower end of the €8m - €19m investment range) would achieve 90% coverage;
- c) targeting coverage to 90% would require 270 new sites and 825 upgrades to the 2017 network^{1229 1230}; and
- d) coverage to 80%, 85% and 90% would be achieved in 2022, 2023 and 2024 using the historical rollout rate¹²³¹.

A 9.24 Only at low levels of annual investment within the €8 – €19m investment range (i.e. €10m or less per year) would 90% coverage not be achieved. This seems highly unlikely to arise¹²³² given an operator's decision to invest in 700 MHz rights of use (2 × 10 MHz is likely to exceed €50m)¹²³³ and competition between operators to provide better coverage and higher quality of service.

A 9.25 Therefore, MNOs may very well prefer Option 2 over other options because it largely coincides with likely commercial rollout, would therefore impose little if any additional cost and could be achieved using a rollout rate consistent with what was achieved after the 2012 MBSA.¹²³⁴ Indeed, at least one MNO, Vodafone¹²³⁵, has indicated a preference for Option 2 over other options.

New Entrants

A 9.26 Given the need to provide coverage on a new network rather than an existing one, New Entrants are likely to prefer a lower coverage obligation compared to Existing MNOs.

A 9.27 In order to assess a New Entrant's likely commercial rollout, Oxera modelled two variants^{1236 1237} for the network evolution of a New Entrant targeting 30 Mbit/s

¹²²⁸ €16m would be required for 80% coverage and €27m for 85% coverage.

¹²²⁹ Coverage to 80% would require 204 sites and 363 upgrades. Coverage to 85% would require 227 sites and 568 upgrades.

¹²³⁰ ComReg notes that Eir and Vodafone have increased their overall site numbers by [redacted] respectively since 2017.

¹²³¹ Based on current coverage estimates Existing MNO's coverage levels are between approximately [redacted].

¹²³² Ibid

¹²³³ See Section 4.2.2 Document 18/103d.

¹²³⁴ Increasing coverage from 64% to 90% would require an additional 98 sites and 565 upgrades to existing sites, noting however that Existing MNO's have notably advanced their coverage levels and in some cases have [redacted].

¹²³⁵ In its submission to Document 19/59R and 19/124.

¹²³⁶ Document 18/103c – Figure A3.8.

¹²³⁷ This corresponds to a New Entrant winning 2 × 10 MHz (700 MHz) and 2 × 20 MHz (2.6 GHz). See Document 18/103c – Table 4.6.

(moderate and aggressive). Oxera was of the view that an initial rollout across both scenarios of 1,084 macrosites would correspond to coverage of:

- 75% population in 2 years;
- 85% population in 5 years; and
- 90% population in 9 years.

A 9.28 Therefore, an entrant competing directly with Existing MNOs with a national network is unlikely to be significantly constrained by Option 2, as it would anyway choose to provide these coverage levels (albeit over a slightly longer time horizon than Existing MNOs). An obligation set within this range reflects the likely network rollout of a New Entrant targeting 30 Mbit/s.

MVNOs

A 9.29 MVNOs are likely to prefer Option 2 over Option 1 as 30 Mbit/s coverage would likely be provided across a wider area than under Option 1.

Option 3 - 90 to 95% population at 30 Mbit/s cell-edge

MNOs

A 9.30 Oxera considered that expanding coverage up to 95% of population is **possible** for MNOs given cost and network roll-out considerations. However, the incremental cost (i.e. cost of serving additional population) increases exponentially as the coverage rises (especially above 90%), as more investments (particularly in new sites) are required to achieve incremental increases in coverage, as illustrated in Figure 15 above:

- a) a total Capex cost of €82m would be required to rollout to 95% of population over a 7-year period.¹²³⁸
- b) an annual investment of around €12m (at the lower end of the €8m - €19m investment range) would achieve 95% coverage.
- c) coverage to 95% would require an additional 378 new sites and 1,197 upgrades to the 2017 network targeting coverage.
- d) coverage to 95% would be achievable by 2027 applying the historical rollout rate.

A 9.31 Only at low levels of annual investment within the €8 – €19m investment range

¹²³⁸ €16m would be required for 80% coverage, €27m for 85% coverage and €44m for 90% coverage. See Document 18/103c – Table 5.8.

(i.e. €11m or less per year) would 95% coverage not be achieved. At these levels, investment would be €77m over a 7-year period which is less than the €82m Capex that would be required. Alternatively, an annual investment of €12m over 7 years would result in an overall investment of €84m, i.e. above the investment level required to achieve 95%.

A 9.32 While there is less certainty that the commercial case for expanding 30 Mbit/s coverage to 90-95% would exceed the costs of doing so, these costs are likely to be within the range of what operators have invested historically. In that regard, MNOs may be willing to compete in terms of coverage of up to 95% of the population given that coverage of up to 90% is highly likely in any event¹²³⁹. Each MNOs make their own network rollout plans and some might prioritise greater coverage levels and in different areas than others. However, all operators compete against each other in the same market and, over time, it is reasonable to expect all operators to reach a broadly similar coverage range¹²⁴⁰.

A 9.33 Further, some important features of the market that have limited existing levels of coverage may be remedied over time. In particular, the Mobile Broadband Taskforce has identified constraints which can impede connectivity and its activities are therefore important in removing bottlenecks and improving efficiency, reducing the costs of roll out. Actions include:

- a) streamlining planning processes for the deployment of telecommunications infrastructure¹²⁴¹;
- b) installing ducting on new national primary/secondary roads¹²⁴²; and

¹²³⁹ Noting that current coverage estimates for Existing MNO's are between approximately [redacted].

¹²⁴⁰ [redacted].

¹²⁴¹ ComReg notes that the impact of this, a per Action 14, has been completed (see Q2 2019 quarterly report). <https://www.gov.ie/en/publication/660db-mobile-phone-and-broadband-taskforce-progress-reports-2019/>

¹²⁴² Latest available extract from MPBT (as of Q3 2019) – "TII's standards have been updated to require the installation of ducting on all new roads, not just motorways. A number of schemes are currently being constructed that would not previously have required ducts to be installed. These include the: • N4 Colloney to Castlebaldwin • N5 Westport to Turlough and • N22 Ballyvourney to Macroom. The installation of ducting on non-motorway national roads at present is determined by where new road schemes are being constructed; we do not install ducts on existing sections of national road. There are legacy gaps on the motorway network and the prioritisation of works on these sections is determined by: (a) Interest from industry players on potential use of such ducting, (b) TII's own ducting and communications requirements to service Intelligent Transportation Systems (ITS) needs". <https://www.gov.ie/en/publication/660db-mobile-phone-and-broadband-taskforce-progress-reports-2019/>

- c) developing and publishing a policy for all local authorities around access to and use of State infrastructure¹²⁴³.

A 9.34 The implementation of these actions should remove constraints that would have limited the extent to which coverage could be extended beyond 90% (and have restricted the extent to which operators have extended coverage to date). As noted by DotEcon, coverage roll-out will be encouraged by the reduction of such impediments.¹²⁴⁴ In particular, access to road ducting should provide opportunities for operators to expand road coverage. Additional road coverage would also lead to incidental coverage in terms of both population and geography.

A 9.35 Further, ComReg notes that, in their responses to Documents 19/59R and 19/124 two of the three MNOs (Three and Eir) supported the view that mobile operators could, on the basis of competitive tension alone, achieve coverage up to 95%.¹²⁴⁵ For example:

- a) In response to Document 19/59R, Eir agreed with coverage obligations set on a precautionary basis and supports such an obligation being set at 95% of the population¹²⁴⁶.
- b) In response to Document 19/59R, Three supported ComReg's proposals in this regard but noted that such obligations are at the upper-end of what network operators could be expected to meet under competitive commercial conditions. It contended that any further obligations would likely act as a deterrent to bidders in the auction.
- c) In response to Document 19/124, Three agreed with ComReg's overall approach to adopt precautionary rather than interventionist roll-out and coverage obligations, and noted that the overall target is consistent with this (though it separately notes that the effect of overstating the required received power would move the coverage obligation from precautionary to interventionist).

¹²⁴³ Latest available extract from MPBT (implementation review 2018) – “*This action has been integrated into Action 19 and will be carried forward into 2019 as part of a coordinated effort to agree a standardised access policy to state and publicly-owned infrastructure for use by telecommunications companies to improve mobile phone coverage and access to high-speed broadband.*” <https://www.gov.ie/en/publication/1c0a1-mobile-phone-and-broadband-taskforce-progress-reports-2018/>

¹²⁴⁴ DotEcon Report (Document 18/103d), p 35.

¹²⁴⁵ Though both have concerns around the use of -95dBm as a metric for a 30 Mbit/s service. These concerns are addressed separately in Chapter 8.

¹²⁴⁶ Note that Eir's concerns raised in response to Document 19/124 over the appropriate RSRP level is considered in Chapter 8 above.

- d) Vodafone contended¹²⁴⁷ that there is no commercial incentive to roll-out coverage beyond a figure in the lower 90% range of population which would be the likely final figure reached without intervention.
- e) In response to Document 19/124, Vodafone noted that Oxera's position is that 90 – 95% is "feasible" for an operator to achieve but that the coverage level is not precautionary.

A 9.36 The updated assessment of the current state of MNO 30 Mbit/s coverage levels is set out in Chapter 8. ComReg notes that operators have made notable investments in their networks since 2017 bringing their 30 Mbit/s SUTP coverage levels to between approximately [\times ██████████ \times] at this time and are therefore arguably well advanced in terms of achieving a 95% population coverage level.

A 9.37 ComReg notes Three's¹²⁴⁸ and Eir's¹²⁴⁹ views that a coverage obligation of 95% is likely achievable under competitive commercial conditions. Though, ComReg agrees that such obligations are likely at the upper end of what could be achievable and obligations above 95% (while possibly achievable by some) would likely risk distortion to the award process¹²⁵⁰.

A 9.38 In relation to Vodafone's view, ComReg would note the following:

- a) at paragraph 16 of its response to Document 19/59R, Vodafone has quoted an extract from ComReg Document 18/103 which is based on a rollout period of five years, while Option 3 (95%) refers to a rollout period of 7 years. Under Option 3, a 5 year rollout rate would correspond to a rate of coverage of 92%¹²⁵¹ meaning the difference between Option 3 and Vodafone's assessment is relatively small.
- b) Vodafone claims to already achieve a 98% population coverage¹²⁵² for a basic 4G connection (i.e. not equivalent to 30 Mbit/s), meaning that the coverage footprint already exists and where a potential option for Vodafone would be to implement carrier aggregation at sites in order to satisfy the QoS aspect of the obligation (i.e. 30 Mbit/s).
- c) as noted in Chapter 8, the Existing MNOs' current 30 Mbit/s SUTP percentage coverage levels is estimated to be between approximately

¹²⁴⁷ In its response to Document 19/59R and Document 19/124.

¹²⁴⁸ Submission to Document 19/59R.

¹²⁴⁹ Submission to 19/59R where "eir also agrees with the proposed scenario 2 specification of the coverage obligation as set out in Table 17".

¹²⁵⁰ See DotEcon Report 18/103d, Chapter 8 of Document 19/59R and Chapter 7 of Document 19/124.

¹²⁵¹ ComReg also note that 92% is within "the lower 90 percentile range of population" referred to in Document 18/103.

¹²⁵² <https://n.vodafone.ie/aboutus/press/vodafone-ireland-extends-5g-network-test-bed-as-it-prepares-for-.html>

[[REDACTED]], whereas Vodafone's is approximately [[REDACTED]] which is well advanced in terms of achieving population coverage in the range 90 - 95%; and

- d) rival operator Eir which has both a lower market share and a less developed network¹²⁵³ acknowledges that a 95% rate is commercially achievable. It is not plausible that an operator which considers itself to be the leading voice and data mobile provider in the country¹²⁵⁴ would, on a commercial basis, provide coverage at materially lower rates than a smaller rival.

A 9.39 Therefore, while Vodafone may prefer Option 2 over Option 3, it seems reasonable to conclude that it is commercially viable for Existing MNOs to rollout coverage to more than 90% of the population.

New Entrants

A 9.40 As noted earlier, a New Entrant coverage obligation of 75% population would likely be possible over a 2-year period, increasing to 90% over 9 years. In that regard, a coverage obligation set above 90% would likely exceed what a credible New Entrant could commercially achieve over a 10-year period. New entrants are therefore unlikely to prefer Option 3 over Option 1 and Option 2.

MVNOs

A 9.41 MVNOs are likely to prefer Option 3 over Option 2 as 30 Mbit/s coverage would likely be provided across a wider area than under Option 2.

Option 4

MNOs

A 9.42 Oxera considered that expanding coverage beyond 95% of the population, absent external intervention (e.g. government procurement/subsidy), is **unlikely** for MNOs given cost and network roll-out considerations. Under Option 4, the incremental cost of expanding coverage is much greater than that for increasing coverage at lower levels because more investment in new sites is required as opposed to upgrades of existing sites:

¹²⁵³ [[REDACTED]]

¹²⁵⁴ Didier Clavero, Vodafone Ireland CTO, recently noted that Vodafone "continually work(s) hard to maintain our position as the leading voice and data mobile provider in the country".

<https://n.vodafone.ie/aboutus/press/vodafone-ireland-extends-5g-network-test-bed-as-it-prepares-for-.html>

- a) a total Capex cost of €82 - €397m would be required to rollout to 95 – 99.5% of population over a 7 year period.¹²⁵⁵
- b) an annual investment at the extreme end of the €8 - €19m investment range) could achieve marginal coverage gains beyond 95% (over a 7 year period) but this is subject to uncertainty.
- c) achieving population coverage of 99.5% would require an additional 1,466 sites and 1,603 upgrades to the existing network.
- d) achieving population coverage of 99.5% would be achievable by 2042 applying the historical rollout rate. Increasing the speed of rollout would increase costs substantially.

A 9.43 Only at the outer boundary of the €8 – €19m investment range might 99.5% coverage be achieved commercially and this would only likely be achieved by 2042. This is unlikely to arise commercially given previous historical investment, the low levels of additional population such rollout would cover and that competition between operators is unlikely to drive it to such levels. Option 4 would potentially involve constraining the commercial choices of at least some network operators and likely force coverage in excess of what would be competitively determined levels.

A 9.44 Oxera was of the view that these costs arise because the cost of providing coverage increases exponentially for the last 5% of population¹²⁵⁶. While the last 5% will be the costliest 5% of coverage given the falling population density, the increase in cost is exponential when targeting 30 Mbit/s population coverage. Further, while the cost of serving the last 5% is significantly higher, the additional revenue likely to be generated from serving the additional population is considerably lower.¹²⁵⁷ It is therefore much less likely that the commercial case for expanding 30 Mbit/s coverage will exceed the costs of doing so. In addition, the investment required may exceed that which was invested by the Irish MNOs in the period 2010–16, implying that the required level of investment seems unlikely.

¹²⁵⁵ €16m would be required for 80% coverage, €27m for 85% coverage, €44m for 90% coverage and €83m for 95% coverage. (“Oxera”), with Real Wireless Ltd – Table 5.8.

¹²⁵⁶ This arises because the last percentages of the population live in the least dense areas which tend to be topographically challenging, and the cost of expanding the network to those areas is greater. For example, the last 3% of the population live in 28% of the area of Ireland meaning the cost per population increases and more base stations are needed to cover the same number of households.

¹²⁵⁷ As noted by DotEcon (Document 18/103d), MNOs are unable to discriminate in pricing between customers who benefit from the coverage increment and those who do not. MNOs would need to raise prices slightly for all customers to extract any of the additional value created by its greater coverage footprint, which means it will potentially lose some customers who do not value the additional coverage. The Mobile Consumer Experience Survey Document 19/101 suggests that consumers have a very limited willingness to pay more for a service even if it did have greater coverage.

A 9.45 Further, coverage levels above 95% would take significant periods of time to deliver. For example, increasing coverage from 95% to 97.6% would take around 4 years, the same time required to go from 64% to 90% of population. Operators are also unlikely to continually rollout additional sites to increase coverage at these high levels, particularly where each site is associated with ever decreasing levels of population. Therefore, while some MNOs with high levels of investment may marginally extend coverage beyond 95%, MNOs are unlikely to prefer Option 4 over other options particularly if such an obligation was to be symmetric¹²⁵⁸.

New Entrants

A 9.46 New Entrant coverage of 75% population would be possible over a 4-year period, increasing to 90% over 9 years. In that regard, a coverage obligation set above 95% would likely exceed what a credible New Entrant could reasonably achieve commercially, over the same period (for the same reasons noted in relation to incumbent MNOs above). New Entrants are therefore unlikely to prefer Option 4 over other options.

MVNOs

A 9.47 While MVNOs may prefer Option 4 over Option 3 as 30 Mbit/s coverage would be provided across a wider area it is likely that the costs of providing coverage beyond what is commercially viable would be passed on to MVNOs. Therefore, MVNOs are unlikely to prefer Option 4 over other options.

Impact on Competition

Background information

A 9.48 ComReg first sets out some background information that is relevant to the competition assessment of each of the regulatory options below.

A 9.49 Competition in the retail mobile communications market is multi-faceted and operators compete across a range of factors including, price, handsets, bundles, and coverage. Network operators have clear competitive incentives to build out coverage in order to attract new subscribers and increase the benefits of all subscribers using the network. Normally, precautionary type coverage obligations imposed by regulators are exceeded as coverage is driven by competition between network operators.

A 9.50 For example, in the 2012 MBSA, Existing MNO winning bidders were obliged to achieve and maintain a minimum coverage obligation of 70% of the population

¹²⁵⁸ See DotEcon Report Document 18/103d, Chapter 8 of Document 19/59R and Chapter 7 of Document 19/124.

of Ireland within 3 years from the commencement date of the licence. ComReg's Summer 2016 Drive Test confirmed that all operators were in compliance with their licence conditions after three years, with coverage in excess of the 70% obligation.¹²⁵⁹ The results of the most recent round of Drive Testing, indicate that the minimum coverage by population achieved during the Drive Test was greater than 90%¹²⁶⁰.

A 9.51 Thus, it may not be necessary to impose a coverage obligation where competition itself can be expected to push coverage to desired levels. However, even in competitive markets there is no guarantee that competition will deliver and maintain an acceptable level of coverage across the country, particularly when requiring coverage with higher download speeds. DotEcon¹²⁶¹ also noted that coverage obligations may still be necessary to reduce the risks of competitive failures for several reasons, including but not limited to (i) tacit collusion and (ii) cherry picking.

(i) Tacit Collusion

A 9.52 DotEcon noted that MNOs could have collective incentives to come to a tacit understanding to maintain the status quo and avoid making significant network investments, such as might be needed to increase coverage. Tacit collusion may be more prevalent with repeated interaction between a stable set of competitors unchallenged by new entry with high levels of transparency about the conduct of rivals. For example:

- a) The Irish market has in recent years been reduced from four to three MNOs and if no New Entrant arose from this proposed award, new entry by an additional MNO is unlikely to be possible for quite a number of years and even as long as 2030 when new rights of use (particular coverage spectrum) will be assigned.
- b) MNOs are likely to be able to monitor any significant coverage expansion by a rival operator (indeed operator coverage is already publicly monitored by ComReg)¹²⁶².

A 9.53 Operators are likely to benefit from expanding coverage where the costs of incremental increases in coverage are relatively low and each base station serves a relatively large population. However, as the cost per population increases, so do the incentives for operators to collude tacitly to avoid or delay

¹²⁵⁹ Document 16/113, 'Assessment of Mobile Network Operators' Compliance with Licence Obligations (Coverage) Summer 2016' published December 2016.

¹²⁶⁰ Document 20/16, 'Assessment of Mobile Network Operators' Compliance with Licence Obligations (Coverage) Winter 2019' published March 2020.

¹²⁶¹ Document 18/103d, 'Coverage obligations and spectrum awards a report from DotEcon Ltd, published November 2018 – Section 2.2.2.

¹²⁶² <https://www.comreg.ie/outdoor-mobile-coverage-map/>

the cost of network investments that they would otherwise have had to make.¹²⁶³ This would have the effect of keeping coverage levels below that which would have been achieved absent any such collusion.

- A 9.54 Table 23 below shows that at higher levels of coverage the cost of each additional percentage of coverage increases, meaning that more base stations are needed to cover the same number of households and therefore the cost per population increases. Therefore, the risk of tacit collusion is higher at higher levels of coverage and network cost.

Table 23. Sites, Upgrades & Costs required for incremental coverage per operator¹²⁶⁴

Coverage	Sites	Upgrades	Network Cost, €m
85%	23	205	11
90%	43	257	17
95%	108	372	38

- A 9.55 Coverage obligations are required to guard against tacit collusion which deters investment to extend coverage in order to save on the costs of network rollout.

(ii) Cherry Picking

- A 9.56 DotEcon also observed in Document 18/103d¹²⁶⁵ that coverage obligations can protect against the possibility of one network operator ‘cherry-picking’ by covering only the most profitable locations (e.g. urban areas). There are two forms of cherry picking relevant to the assessment in this RIA:

- Coverage ‘cherry picking’ where coverage is provided in urban areas such as cities or large towns but not provided elsewhere. In the 2012 MBSA, ComReg considered it appropriate to set a 70% population coverage obligation as, among other things, this would prevent cherry picking by focussing on densely populated areas.

¹²⁶³ DotEcon (18/103d) notes that the costs involved in expanding coverage in certain cases may create incentives not to be a first-mover and only to respond if others move first. When costs get to a certain level, operators may wait to see what other operators do i.e. it would only be worth expanding coverage if other operators were there first.

¹²⁶⁴ Document 18/103d - based on Table 5.8.

¹²⁶⁵ Document 18/103d, ‘Coverage obligations and spectrum awards a report from DotEcon Ltd, published November 2018.

- Quality of Service (QoS) 'cherry picking' where an MNO only provides high speed service (30 Mbit/s) in urban areas and a basic service elsewhere. Given that MNOs are already serving large portions of the population with basic 4G services, the possibility arises that higher speed services could be provided only in urban areas while consumers in rural areas receive more basic 4G connectivity.

A 9.57 ComReg therefore assesses below the impact of each option on competition under the following headings: tacit collusion, cherry-picking, new entry and commercial viability.

Option 1

A 9.58 Option 1 would impose no coverage obligation and operators would have full flexibility to choose how extensive their rollout would be.

Tacit Collusion

A 9.59 MNOs could come to a tacit understanding to avoid making network investments to increase coverage to certain levels in order to save on network rollout costs. While certain levels of coverage can be achieved with low levels of investment, the cost of coverage rises exponentially at higher levels of coverage increasing the potential benefits from a tacit arrangement. In that regard, requirements to roll-out services to a certain level within a certain timeframe may be enough to destabilise tacit understandings to delay or reduce rollout.

Cherry Picking

A 9.60 In relation to 'cherry picking' and given that incumbent MNOs are already providing a service to a high percentage of the population, cherry picking refers to QoS 'cherry picking' where an operator only provides high speed services (30 Mbit/s) in urban areas and a basic service elsewhere. As noted by DotEcon in Document 18/103d, there could be a risk of the mode of competition changing to one where the emphasis is on targeting urban customers with higher speed services.

A 9.61 Such a strategy can undermine provision to rural areas as such an operator would not be exposed to the costs of expanding into the less profitable rural areas, but rivals would nevertheless need to compete against the lower price in the urban areas. A coverage obligation can protect against the possibility of one or more MNOs only delivering a 30 Mbit/s services to higher density areas to the detriment of more rural areas.

New entry

A 9.62 Tacit understandings are unlikely to be relevant to New Entrants whose main

priority would be rolling out a new network. Further, Option 1 could promote competition because it would not run the risk of precluding new entry through setting an obligation that could not reasonably be obtained by a New Entrant. However, there would be a risk of a New Entrant only serving the more profitable urban areas i.e. coverage 'cherry picking'. Such entrants would not be exposed to the costs of expanding into the less profitable rural areas, but Existing MNOs (which price on a national basis) would nevertheless need to compete against the cherry-picker's lower price in the urban areas. If a New Entrant was permitted to cherry pick in this way, other MNOs would need to compete against the cherry-picker's lower price in the urban areas thereby undermining the viability of extending coverage to rural areas to the extent that this relies on cross-subsidisation¹²⁶⁶ from urban areas. Therefore, some form of coverage obligation is also necessary to prevent coverage 'cherry picking' by a New Entrant.

Commercial viability (MNOs)

A 9.63 There are no concerns about the commercial viability of Option 1 since no obligation would be imposed.

ComReg's view on Option 1

A 9.64 While ComReg considers competition could very well drive actual coverage to high levels, it is nevertheless appropriate to set a coverage obligation given that there is no guarantee that market forces alone would ensure optimal coverage outcomes. Setting a coverage obligation would prevent QoS 'cherry picking'¹²⁶⁷ and reduce the incentives for tacit collusion to keep coverage lower than should be reasonably expected from a well-functioning market.

A 9.65 Therefore, ComReg is of the view that Option 1 would risk distortions to competition that result in sub-optimal coverage outcomes to the detriment of consumers, particularly those in less dense areas beyond the major urban centres.

Option 2

Cherry picking

A 9.66 Under Option 2, the opportunities for QoS 'cherry picking' are reduced as an MNO would be obliged to provide 30 Mbit/s population coverage to between 70 and 90% of the population. A coverage obligation, particularly at the higher end

¹²⁶⁶ A coverage obligation can be used as a tool to encourage the provision of coverage of rural areas. There is a strong argument for applying a precautionary coverage obligation homogeneously to all licensees so as not to distort service market competition. All operators would face similar constraints on the pricing of services created by the same coverage obligation and would compete to dispatch the obligation at least cost.

¹²⁶⁷ It would also prevent coverage cherry picking by a New Entrant.

of the 70 – 90% range would remove the incentive for operators to cherry pick the most profitable high-density areas and provide higher speed service in urban areas only. For example, urban areas with a population of at least 50 households account for 70% of the population.¹²⁶⁸ Therefore, setting the coverage obligation at levels beyond 70% would likely result in coverage of all towns with a population of at least 50 households.

- A 9.67 While parts of the remaining 10% - 30% of the population could be served under effective competition, these are the least profitable areas given the lower population densities and would unlikely be a target for a cherry-picking strategy. Because, under Option 2, the obligation includes a requirement to provide speeds of 30 Mbit/s, an obligation set at the higher end of the range (i.e. closer to 90%) would also reduce the possibility of only providing a high speed 30 Mbit/s in more densely populated areas and a basic service elsewhere (i.e. QoS cherry-picking) (although there remains a residual risk of this particularly at the lower end of the range). For example, if the obligation was set at 70% of population an operator could target all towns above a population of 50 with a high speed service (30 Mbit/s) and a lower speed service (3 Mbit/s) in more rural areas, including terrestrial routes. However, given that 70% of the population is located in just 3% of the area of Ireland, there could still be large parts of rural Ireland that would not be served with a 30 Mbit/s service if the obligation was set in this range.

Tacit collusion

- A 9.68 The risk of tacit collusion is highest for higher levels of coverage because the network costs to be avoided (for lower levels of incremental coverage) are higher. In the 90 – 95% range operators would retain a higher level of costs compared to lower levels of coverage. For example, the cost of extending coverage at 30 Mbit/s from 90% to 95% is circa double the cost of going from 65% to 90%, thereby providing incentives for operators to keep coverage at around 90%. Under Option 2 there would remain a risk of tacit collusion between network operators to defer investment and not extend coverage beyond 90%.

New entry

- A 9.69 Higher levels of coverage run the risk of acting as a barrier to entry for New Entrants. Nevertheless, as noted above, 30 Mbit/s coverage of 75 - 90% over 3 to 9 years is likely to be achievable, on a commercial basis, for a New Entrant. In effect, Option 2 is unlikely to act as a barrier to entry provided the overall timeframe set for meeting the obligation was appropriate.
- A 9.70 Further, Option 2 would prevent any New Entrant from cherry picking urban areas and avoiding the costs of expanding into the rural areas.

¹²⁶⁸ Census 2016.

Commercial viability (MNOs)

A 9.71 As noted above in 'Impact on Stakeholders' a coverage obligation set in the 70 – 90% range would not be in excess of what could be provided commercially by MNOs given the factors assessed by Oxera, including the availability of carrier aggregation, cost of rollout, previous network investments and stakeholder interviews.

View on Option 2

A 9.72 While Option 2 would be better for competition than Option 1 there are residual risks that competition could be weakened when compared with Option 3 (see below). While Option 2 (particularly at the higher end) largely addresses cherry picking concerns, there remains a risk of tacit collusion resulting in sub-optimal levels of coverage to the detriment of consumers, particularly those in more rural areas.

Option 3

Cherry Picking

A 9.73 The type of cherry picking identified above does not exist under Option 3 since an operator would be obliged to provide 30 Mbit/s population coverage up to 95% of the population which is close to the coverage limits that competition alone would achieve. The remaining 5% or so would be unlikely to be profitable providing no further opportunities for cherry picking.

Tacit collusion

A 9.74 Under Option 3, no real opportunity for tacit collusion aimed at avoiding or delaying the costs of expanding coverage would likely exist as all operators would be required to provide up to 95% population coverage. Opportunities for tacit collusion are likely to be limited since 95% is already probably approaching the limits of competition in a well-functioning market. Indeed, under Option 3 the incentive for operators would be to reach 95% rather than expanding beyond it.

New entry

A 9.75 Option 3 would likely act as a barrier to entry over the time periods considered in Chapter 7 (i.e. as coverage set at these levels would be above what Oxera considered possible for a New Entrant (75 - 90% over 3 to circa 9 years).

Commercial viability (MNOs)

A 9.76 As noted above in 'Impact on Stakeholders' a coverage obligation set in the 90 – 95% range would not be in excess of what could be provided commercially by

MNOs given the factors assessed by Oxera.

View on Option 3

- A 9.77 In relation to Existing MNOs, Option 3 would better promote downstream competition than Option 2. However, Option 3 would likely be too high for new entrants (over the 10-year period considered in Chapter 8) and a lower coverage obligation would likely be needed to promote new entry.

Option 4

Cherry picking and tacit collusion

- A 9.78 Under Option 4, tacit collusion and/or cherry picking would be very unlikely as operators would be obliged to provide coverage at levels above what would likely be provided on a commercial basis under effective competition.

New entry

- A 9.79 New Entrant coverage of 75% population would be possible over a 4-year period, increasing to 90% over 10 years. In that regard, a coverage obligation set above 95% would likely exceed what a credible New Entrant could reasonably achieve commercially, even over an extended period (for the same reasons noted in relation to incumbent MNOs above). Option 4 is therefore likely to raise barriers to entry when compared to other options.

Commercial Viability (MNOs)

- A 9.80 Given the factors assessed by Oxera, a coverage obligation set in the 95% + range would run the risk of being in excess of what could be viable for MNOs. Oxera noted that the incremental cost of expanding coverage is much greater than that for increasing coverage to the levels specified in the other options. It is therefore much less likely that the commercial case for expanding 30 Mbit/s coverage will exceed the costs of doing so.
- A 9.81 For example, the estimated cost of increasing coverage from 99.0% to 99.5% is €102m. This is over four times greater than the estimated cost of increasing coverage from 97.0% to 97.5%, which is €24m¹²⁶⁹. Further, the investment required may exceed that which was invested commercially by the Irish MNOs in the period 2010–16, implying that the required level of investment to support such coverage levels appears unlikely.
- A 9.82 While some MNOs may marginally extend coverage beyond 95%, the extent of this is likely to be limited given the costs on rollout. Further, other MNOs with

¹²⁶⁹ Document 18/103d, p72 -73.

alternative commercial footprints may be able to effectively compete at around 95% and a higher obligation would possibly favour some MNOs over others. Therefore, an obligation set above 95% would run the risk of extending coverage beyond the limits that competition alone might deliver. DotEcon referred to such obligations as 'interventionist coverage obligations' and they are discussed below.¹²⁷⁰

Interventionist coverage obligations

A 9.83 DotEcon noted that 'interventionist' coverage obligations may distort spectrum awards and reduce competition in several ways including:

- i. the cost of providing the coverage obligation could be in excess of the value of the spectrum to which the obligation is imposed, resulting in lots going inefficiently unsold¹²⁷¹;
- ii. some bidders may be better able to meet the obligations than others, leading to reduced competition¹²⁷² for any coverage lots (allowing an operator to pick up spectrum below its value) and possibly leaving a portion of the spectrum unsold.¹²⁷³
- iii. spectrum being sold at a price which no longer ensures its optimal use or represents poor value in the procurement of coverage (i.e. reduced competition from a limited field of potential suppliers);¹²⁷⁴
- iv. a coverage obligation may need to be bundled with a disproportionately large share of the available spectrum to ensure the obligation can be met and has positive value for at least some bidders, leading to a possible skewed and inefficient distribution of the available spectrum¹²⁷⁵; and
- v. uncertainty about the value of coverage lots could make it difficult to set reserve prices, depriving the auction designer of a useful instrument against gaming and collusion within the proposed spectrum award.¹²⁷⁶

A 9.84 In relation to (i), the likely value of the 700 MHz Band is small relative to the cost of extending coverage beyond 95%. As noted by DotEcon, benchmarks suggest that it would be unlikely for the market price of a 2 × 10 MHz block at 700 MHz to exceed €50m.¹²⁷⁷ In contrast, Oxera estimated the cost of extending one

¹²⁷⁰ Document 18/103d, Section 2.4.

¹²⁷¹ Ibid, p58.

¹²⁷² The reduction in competition arises regardless of the auction format, being ultimately due to the harsh coverage obligation.

¹²⁷³ Document 18/103d, p 48.

¹²⁷⁴ Ibid, p3.

¹²⁷⁵ Ibid.

¹²⁷⁶ Ibid.

¹²⁷⁷ Ibid, p47.

mobile network to 99.5% population coverage at 30 Mbit/s would be in the order of €500m or €1.8 billion over a ten year period. Even small coverage increases above 95% could quickly erode the value of the spectrum. For example, and even using historical rollout rates, the cost of extending coverage beyond 97% could exceed the value of unencumbered spectrum.

A 9.85 In relation to (ii) and (iii), the point at which population coverage ceases to be commercially viable is likely to be different for different operators.¹²⁷⁸ It should be noted that although modelling usefully provides a broadly representative picture of population coverage at a generic network level, in reality, the point at which individual MNOs determine commercial viability is likely to be different. Under Option 4, some, but not all, operators may have a reduced value, or no value at all for 700 MHz rights of use. This would create a risk of spectrum going unsold and/or spectrum being sold to alternative bidders at a price that would not ensure its optimal use because it benefitted from a lack of competition due to a high coverage obligation.

A 9.86 Even where high coverage obligations were assigned to some but not all operators this could create significant distortions to competition downstream. For example, in a three operator market (A, B & C), where Operator A and B are able to meet the coverage obligation¹²⁷⁹ (e.g. 99%) and Operator C is not because the costs of providing that coverage significantly exceed the value of the spectrum to it¹²⁸⁰. Operators A and B would obtain all rights of use (subject to competition caps) while Operator C would obtain no rights of use, when it would likely have done so if the obligation was set at the 90 – 95% level. This would create a significant bifurcation in the market with Operators A and B able to provide significantly improved coverage and speeds. In particular, Operators A and B would be able to increase 30 Mbit/s population coverage to 99% while Operator C would not be able to use 700 MHz spectrum to expand its coverage, when it would have been able to provide 30 Mbit/s population coverage to 95% population if the coverage obligation had been more modest.

A 9.87 In relation to (iv), the coverage obligation could be attached to a larger block of spectrum in order to reduce the costs of providing a high coverage obligation.¹²⁸¹

¹²⁷⁸ For example:

- an operator might be at an advantage in trying to obtain the coverage lot if it has widespread fixed infrastructure.
- asymmetries might arise because one mobile network operator already has greater coverage or more spectrum than others, reducing the incremental cost of meeting a coverage obligation.

¹²⁷⁹ i.e. because such operators may have a higher coverage level to begin with.

¹²⁸⁰ Such a scenario could arise if the starting point of Operators is different or the commercial plans are somewhat though not significantly different i.e. Operator C may want to provide broad coverage while Operators A and B would prefer expansive coverage.

¹²⁸¹ As noted in the 'Spectrum for Award' RIA, the construction of base stations deploying more radios and antennas as well as extending additional backhaul links to new sites is expensive and typically costs substantially more (in the order of multiples) than adding additional spectrum rights to existing base stations.

However, this could lead to additional competition problems if only one bidder is capable of meeting the obligation, as it could lever its strong position to win additional spectrum it might not otherwise have won, potentially distorting competition.¹²⁸² As noted by DotEcon, in auctions with package bidding, coverage obligations could create an opportunity for operators willing to exploit their position in competing for the coverage lot to leverage its cost advantage to obtain more spectrum e.g. bidding only for the coverage lot if it is packaged with a large amount of other spectrum.¹²⁸³ Such a situation would restrict the ability of ComReg to select an auction format that ensures the efficient use of the radio spectrum more generally. Readers are referred to Chapter 7 and Annex 7 of this document, Chapter 7 of Document 19/59R and Chapter 6 of Document 19/124 where the benefits of package bidding are explained in more detail.

- A 9.88 In relation to (v), spectrum fees for rights for ECS are an important tool by which ComReg can ensure the efficient use of such rights. Efficient spectrum assignment generally requires rights of use to be assigned to those users able to make the best economic use of it, and for the users of the assigned spectrum to make use of it in the way that generates the greatest social benefit. Appropriate spectrum fees can help to establish the efficient assignment of spectrum amongst bidders, based on bidders' willingness to pay and establish the opportunity costs of the assignment, setting suitable spectrum usage fees at a level encourages the winning bidder(s) to utilise the spectrum more efficiently.¹²⁸⁴
- A 9.89 Under Option 4, it would be difficult for ComReg to make an assessment of an appropriate reserve price that accurately reflects the value of the obligation compared to the spectrum (i.e. competitive benchmarks are based on awards without excessive obligations). This is exacerbated to the extent that usage fees, if any, prescribed under Option 4 are unlikely to encourage the licensee to return unused or underused spectrum if they do not reasonably reflect the opportunity cost of the reserved use. As such, under Option 4 long-term competition could be restricted because there is less of an incentive to return the spectrum over the duration of the licence.
- A 9.90 Finally, to the extent that services in the future may require extended connectivity, DotEcon noted¹²⁸⁵ that there is a strong argument that it would be

¹²⁸² Document 18/103d, p 3.

¹²⁸³ Document 18/103d, p 48.

¹²⁸⁴ In the long run, spectrum usage fees (SUFs) serve an important role in ensuring the efficient use of spectrum by incentivising and encouraging the return of unused or underutilised spectrum rights. In order for SUFs to be effective, they should be set at a level that reflects the opportunity cost of holding the spectrum rights. In terms of the SUF, this cannot be known prior to the award (as SUFs are paid at a future date). However, in setting the SUF as a proportion of the minimum price, and ultimately the final price, which would reflect the opportunity cost of the spectrum, the SUF should encourage return of unused or underused spectrum to ComReg.

¹²⁸⁵ Document 18/103d.

better to wait and see what competition between network operators can deliver, subject to a precautionary coverage obligation, and then intervene selectively to address specific, observed coverage failures if and when they emerge.

View on Option 4

A 9.91 Therefore, and for the reasons outlined above, ComReg is of the view that Option 3 would have a more positive impact on competition than Option 4.

Impact on Consumers

A 9.92 The Mobile Consumer Experience Survey¹²⁸⁶ highlighted a number of issues that impact consumer's connectivity experience. In particular,

- the incidence of service issues is higher indoors with circa one third of consumers experiencing service issues indoors in the past month.
- the biggest service issues indoors and outdoors relate to the ability to make a call.¹²⁸⁷

A 9.93 ComReg has earlier considered that such issues could be more appropriately dealt with through obligations on licensees in the Award Bands that would oblige licensees to (a) enable Native Wi-Fi on its network, under certain conditions within 2 years of licence commencement and (b) provide VoLTE services, under certain conditions within 2 years of licence commencement.¹²⁸⁸ Both of these measures are in addition to the population coverage obligation assessed in this RIA.

A 9.94 The remainder of this section is cognisant of service issues experienced by consumers while outdoors. While consumers would prefer widespread coverage, their views will primarily relate to the localities where they live, work and travel. In that regard, the Mobile Consumer Experience Survey provides information across five different 'Samples' in different geographic areas of decreasing density (Sample 1 – most dense Sample 5 – least dense). This is helpful to determine service issues and likely views of consumers in different areas. In that regard, ComReg notes that¹²⁸⁹:

- Samples 1 and 2 covers up to 75% of the population and would cover all urban areas.

¹²⁸⁶ Mobile Consumer Experience Survey 2019, Document 19/101.

¹²⁸⁷ Mobile Consumer Experience Survey 2019, Document 19/101 – Slides 87 & 90.

¹²⁸⁸ Chapter 8 considers in detail these proposed obligations.

¹²⁸⁹ Ibid, Slide 6.

- Sample 3 approximately covers the next 15% of the population and cover both urban and rural areas.
- Samples 4 and 5 approximately covers the remaining 10% of the population which would be mostly rural.

Option 1, 2 and 3

- A 9.95 It can be assumed that what is good for competition, and what promotes investment in infrastructure, is, in general, good for consumers. This is because increased competition between operators brings benefits to their customers in terms of price, choice and quality of services. Therefore, options that are identified above as being preferred in terms of their impact on competition are likely to be preferred by consumers. For example, the distortions to competition discussed earlier (tacit collusion and/or cherry picking) could have important impacts on consumers as coverage would be lower / of poorer quality than would have been the case under effective competition. Given that MNOs already provide coverage to around 97% of the population, consumers would prefer options that best provide for the upgrade of existing services to 30 Mbit/s.
- A 9.96 Under Option 1, there is no minimum level of coverage an operator would need to provide and the distortions to competition described above could reduce service provision in certain areas. While urban areas are likely to be covered regardless of any coverage obligation, consumers in these areas also experience service issues (though at a lower level than rural areas). For example, data usage is the only service where urban areas (Samples 1 and 2) have similar levels of service issues than rural areas (Samples 4 and 5).¹²⁹⁰ This likely relates to the increased load on the network in certain urban areas due to higher population densities. Such areas are likely to benefit from a 30 Mbit/s obligation which utilises additional spectrum to improve the QoS associated with data usage.
- A 9.97 For areas outside of the main towns and cities (e.g. Samples 4 and 5) service issues occur regardless of location. The impact of QoS 'cherry picking' could be particularly high in these areas occurring across a relatively wide area. For example, the 5 cities and suburbs account for a third of the population (covering 1% of area), while 70% of the population is located in towns with greater than 50 households (covering 3% of area).¹²⁹¹ An operator may decide only to provide higher speed services (30 Mbit/s and above) in high density areas or choose to

¹²⁹⁰ Of respondents who experienced services issues in another location 24% and 30% of respondents cited reasons related to data usage in samples 1 & 2, compared to 30% in Sample 5. See Slide 82.

¹²⁹¹ In Census 2016, 63% of the population is located in urban areas. Urban areas are defined as areas where the population in the **Aggregate Town Area** (defined as those persons living in population clusters) is 1,500 or more inhabitants. For this purpose a **town** with a legally defined boundary is classified on the basis of its total population including any suburbs or environs.

differentiate itself as a provider with an extensive network footprint or alternatively provide higher speed services only in urban areas and basic services on a national basis. Separately, a New Entrant may decide to cherry pick urban areas only or expand into rural areas at a much slower rate, or not at all. This could result in a sub-optimal outcome with some consumers receiving a high-speed service (e.g. 30 Mbit/s) in urban areas with the remainder of the population receiving an inferior service (e.g. 3 Mbit/s).

- A 9.98 All consumers but particularly rural consumers also have service issues when travelling in a car or bus and/or while visiting other locations away from the home. For example, all samples experienced a loss of signal (or no/poor signal/coverage) while in another location or when travelling in a car/bus for voice call and texts (32%). However, such service issues were highest in the most rural samples, Samples 4 and 5 (46% - 55%)¹²⁹². If 30 Mbit/s coverage is targeted in urban areas only, the provision of 30 Mbit/s coverage on terrestrial routes would be similarly impacted where a lower speed service may be deemed sufficient by MNOs. Because population coverage by its nature leads to incidental coverage of roads, lower population coverage would lead to reduced road coverage. In particular, while most of the population lives in urban areas most of the road network is located in rural areas and QoS 'cherry picking' or other distortions (e.g. tacit collusion) that reduce coverage would severely limit the rollout of high-speed services on terrestrial routes.
- A 9.99 As previously noted, such distortions are less likely to arise under Option 2 (particularly at the higher end of the range) compared with Option 1. However, even under Option 2, there would remain areas where coverage would normally be provided, that could be avoided through a tacit understanding. This would be more likely to occur in respect of rural areas given the relatively higher avoided costs of not providing coverage to those areas. In particular, the areas most likely not to be covered in such a scenario would be the most rural areas (i.e. the last 10% of population – Samples 4 and 5).
- A 9.100 Alternatively, Option 3 would oblige operators to provide coverage that is sufficiently close to what would be expected to be delivered under effective competition. While MNOs would be able to provide coverage above these levels, all MNOs would be obliged to serve this level of population at a minimum. Consumers are therefore likely to favour Option 3 over Option 2 since it minimises the risks of the above distortions associated with Option 2.
- A 9.101 Finally, while the last 5% of the population is unlikely to benefit from a 30 Mbit/s mobile service under Option 3, the provision of 30 Mbit/s to 95% of the population would result in incidental coverage that would provide some benefits to the last

¹²⁹² Mobile Consumer Experience Survey 2019, Document 19/101 – Slide 79.

5% of the population. For example:

- 99% of Ireland's population would receive incidental coverage of at least 3 Mbit/s; and
- 99% of primary roads and motorways would receive incidental coverage of at least 3 Mbit/s providing basic connectivity on transport routes.

A 9.102 Furthermore, the rollout of the National Broadband Plan aims to provide all households with the ability to access high-speed internet indoors and the rollout of Native Wi-Fi will provide for mobile calls to be made and received indoors.

Option 4

A 9.103 Consumers would likely prefer a coverage obligation that maximises the extent to which operators provide coverage across the widest possible area. Consumers may therefore, on first impressions, prefer Option 4 as this provides for a high rollout obligation across the widest possible area and would likely be in excess of levels delivered commercially.

A 9.104 However, while any winning bidder would be obliged to provide additional coverage, overall consumer welfare is unlikely to be improved for a number of reasons:

- a) under Option 4, it is very costly to reach the last 5% of the population which could reduce overall consumer welfare in several ways, including:
 - i. diverting investment away from providing connectivity in areas where people work and travel towards areas where few people live.
 - ii. likely increasing the price of mobile services, noting that for a rollout period of ten years the total cost would be €1.8 billion to serve 99.5% of the population¹²⁹³. In that regard, it should be recalled that consumers have a low willingness to pay for additional coverage.¹²⁹⁴
 - iii. that the cost of coverage would fall disproportionately on consumers who would not benefit from the increased

¹²⁹³ In order to compare costs across comparable periods Oxera used a 8.04% rollout rate (over a ten year period) which corresponds to a new site every two days or three upgrades per day.

¹²⁹⁴ In the Mobile Consumer Experience Survey 2017, the average willingness to pay for coverage throughout all of their home for consumers without a reliable service was on average €2.17 extra for calls/texts and €1.98 for data.

obligation (i.e. prices would increase across all subscribers¹²⁹⁵).

- b) it would be unlikely to address the provision of coverage where people work outside residential areas or along transport corridors. For example, increasing motorway coverage from 90% to 99.5% would have a similar cost compared to increasing population from 95% to 97% but would likely benefit more consumers;
- c) there is no guarantee that any operator would be willing to bid for 700 MHz rights of use with obligations that would run the risk of going beyond what would be provided under effective competition. As noted previously, the cost of providing additional coverage is not inconsiderable relative to the likely value of the spectrum. The consumer harm arising from 700 MHz rights of use not being assigned or delayed would be significant for all consumers including:
 - i. the large number (1,200) of upgrades at sites that would otherwise occur¹²⁹⁶, that would allow for 30 Mbit/s to be provided in more rural areas more cheaply would be delayed or not provided;
 - ii. 30 Mbit/s would only be provided in more urban areas while rural areas would continue to be provided with a lower speed service; and
 - iii. in that regard, ComReg notes the view of LS Telcom and the importance of the 700 MHz Duplex for rural connectivity in Ireland¹²⁹⁷.
- d) any increased coverage would only be delivered over a very long period compared to the consumer harm which would be more immediate. The base case assumption in the model is that the MNO builds new sites at a CAGR of 2.5% (which Oxera considered feasible for an MNO to achieve). At this roll-out rate, 99.5% population coverage for 30 Mbit/s would only be achieved in the year 2042 and corresponds roughly to one new site every week.

A 9.105 Therefore, and for the reasons outlined above, ComReg is of the view that Option

¹²⁹⁵ As noted by DotEcon (Document 18/103d), only a small fraction of consumers will directly benefit from the incremental coverage and might use services when in the newly covered area. The MNO needs to raise prices slightly for all customers to extract any of the additional value created by its greater coverage footprint, which means it will potentially lose some customers who do not value the additional coverage.

¹²⁹⁶ Noting that many new features/technologies are added to ETSI/3GPP standards over time and included in the latest equipment from equipment vendors and handset providers including carrier aggregation in sub-1 GHz bands.

¹²⁹⁷ See Annex 3 – Document 19/59R.

3 would have a more positive impact on consumers than Option 4.

The 'Coverage RIA: Assessment and the Preferred Option (Step 5)

A 9.106 In light of the above assessment, ComReg is of the view that more than one preferred option is necessary to account for the particular circumstances that might arise in the Award. In particular, an obligation suitable for incumbent MNOs would likely be excessive for New Entrants. In that regard, ComReg is of the view that preferred options are required for:

- Existing MNOs; and
- New Entrants.

A 9.107 In light of the above discussion, ComReg is of the view that Option 3 is the preferred option for Existing MNOs and Option 2 is the preferred option for New Entrants.

A 9.108 Chapter 8 (Licence conditions) provides further details on the specifics of each proposed coverage obligation and the associated rollout timelines

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Annex: 10 Specific Locations

Introduction

A 10.1 In Chapter 8, ComReg sets out the coverage obligations to apply to rights of use in the 700 MHz Duplex. One such obligation is to provide an **outdoor 30 Mbit/s single user throughput obligation in specific locations in the following categories:**

- **Business and Technology Parks:** the IDA provides a list of 31 Business and Technology Parks and 9 Strategic Sites. Absent other official sources, these locations are used to identify the locations of business and technology parks. The obligation thus includes adjacent business and technology parks to those of the IDA.
- **Hospitals:** the Health Service Executive (HSE) provides a list of 48 public hospitals and 17 private hospitals.
- **Higher Education Campuses:** the Higher Education Authority (HEA) provides a list of 8 Universities, 11 Institutes of Technology and 5 Other Colleges.
- **Ports (Air and Sea):** The Department of Transport, Tourism and Sports (DTTAS) provides a list of 7 airports and the Irish Maritime Development Office (IMDO) provides a list of 7 passenger seaports.
- **Principal Bus Stations:** Bus Éireann provides a list of the main 16 bus stations.
- **Train Stations:** The National Transport Authority (NTA) provides a list of 144 train stations.
- **Visitor Attractions – Information Centre:** Fáilte Ireland provides a list of the top 21 fee charging and top 21 free of charge visitor attractions¹²⁹⁸.

A 10.2 This annex provides additional detail on the specific locations, in particular:

- the names, locations and sources of the data informing the specific locations; and

¹²⁹⁸ By visitor numbers in 2017.

- details on how to access the geographic coordinates representing the boundaries of the specific locations (“Boundary Files”).

Detail of the Specific location categories (including names, locations and sources)

Business and Technology Parks

- A 10.3 ComReg provided further clarification in Document 19/124 with regard to the obligation relating to the specific locations for the business and technology parks. ComReg, in Document 19/59R, identified the IDA¹²⁹⁹ as being the relevant competent authority to identify the business and technology parks. ComReg noted that absent other official sources on other business and technology parks in the State at the time, the IDA locations would be used to identify these locations.
- A 10.4 Specifically, ComReg includes adjacent business and technology parks to those of the IDA, while excluding large green areas that have no development.
- A 10.5 The coverage obligation (as identified in the Boundary Files) apply to the outdoor areas around buildings, and adjacent car parks and thoroughfares within, as well as adjacent to IDA Business and Technology Parks and Strategic Sites.
- A 10.6 Table 24 below contains a list of the IDA Business and Technology Parks and strategic sites.

Table 24. IDA Business and Technology Parks including Strategic Sites

Business and Technology Parks	Location	Business and Technology Parks	Location
IDA Business and Technology Parks			
1. Dublin/East - College Park Dublin	College Park, Dublin	17. South East - Clonmel Business & Technology Park	Ballingarrane, Clonmel, Tipperary
2. Dublin/East - Grange Castle Business Park	Grange Castle, Dublin	18. South East - Dungarvan Business & Technology Park	Lisfennel, Dungarvan, Waterford
3. Mid East - Arklow Business & Technology Park	Ballynattin, Arklow, Wicklow	19. South East - Kilkenny Business & Technology Park	Loughboy, Kilkenny
4. Mid East - Navan Business & Technology Park	Athlumney, Navan, Meath	20. South East - Waterford Business & Technology Park, Butlerstown	Butlerstown, Waterford
5. Mid West - National Technology Park (NTP), Limerick	Plassey, Limerick	21. South East - Wexford Business & Technology Park	Sinnottstown, Wexford

¹²⁹⁹ <https://www.idaireland.com/>

Business and Technology Parks		Location	Business and Technology Parks		Location
6.	Midlands - Athlone Business & Technology Park	Dublin Road, Athlone, Westmeath	22.	South West - Carrigtwohill Business & Technology Park	Carrigtwohill, Cork
7.	Midlands - Mullingar Business & Technology Park	Ardmore, Mullingar, Westmeath	23.	South West - Cork Business & Technology Park	Model Farm Road, Cork
8.	Midlands - Portlaoise Business & Technology Park	Mountrath Road, Portlaoise, Laois	24.	South West - Fermoy Business & Technology Park	Fermoy, Cork
9.	Midlands - Tullamore Business & Technology Park	Srah, Tullamore, Offaly	25.	South West - Kerry Technology Park	Tralee, Kerry
10.	North East - Cavan Business & Technology Park	Killygarry, Cavan	26.	South West - Kilbarry Business & Technology Park	Kilbarry, Cork
11.	North East - Drogheda Business & Technology Park	Donore Road, Drogheda, Louth	27.	West - Ballinasloe Business & Technology Park	Roscommon Road, Ballinasloe, Galway
12.	North East - Dundalk Business & Technology Park	Finnabair, Dundalk, Louth	28.	West - Castlebar Business & Technology Park	Drumconlan, Castlebar, Mayo
13.	North East - Monaghan Business & Technology Park	Knockaconny Monaghan	29.	West - Galway Business & Technology Park	Parkmore, Galway
14.	North West - Carrick on Shannon Business & Technology Park	Keenaghan, Carrick-on-Shannon, Leitrim	30.	West - Roscommon Business & Technology Park	Gallowstown, Roscommon
15.	North West - Letterkenny Business & Technology Park	Lisnennan, Letterkenny, Donegal	31.	West - Tuam Business & Technology Park	Dunmore Road, Tuam, Galway
16.	North West - Sligo Business & Technology Park	Finisklin, Sligo			
IDA Strategic Sites					
1.	Mid East - Strategic Site Greystones	Charlesland, Greystones, Wicklow	6.	South West - Strategic Site Carrigtwohill	Ballyadam, Carrigtwohill, Cork
2.	Mid West - Strategic Site on the National Technology Park, Limerick	Plassey, Limerick	7.	South West - Strategic Site Ringaskiddy, County Cork	Ringaskiddy, Cork
3.	Mid West - Strategic Site, Raheen Business Park, Limerick	Raheen Business Park, Limerick	8.	West - Strategic Site Athenry	Athenry, Galway
4.	North East - Strategic Site Dundalk - Dundalk Science & Technology Park	Mullagharlin, Dundalk, Louth	9.	West - Strategic Site Oranmore	Oranmore, Galway
5.	South East - Strategic Site, Belview, Co. Kilkenny	Belview, Waterford Port, Kilkenny/Waterford			

Source: IDA, <https://www.idaireland.com/how-we-help/property>.

Hospitals

- A 10.7 Table 25 below contains a list of public and private hospitals obtained from the HSE. Where a hospital is located in more than one location, the coverage obligations apply to each of these locations.
- A 10.8 The coverage obligations apply to the hospital's buildings, adjacent car parks and key thoroughfares.

Table 25. Public and Private Hospitals

Hospitals	Location	Hospitals	Location
Public Hospital			
1. Bantry General Hospital	Cork	25. National Maternity Hospitals, Holles Street	Dublin
2. Beaumont Hospital	Dublin	26. Nenagh Hospital: UL Hospitals	Tipperary
3. Cappagh National Orthopaedic Hospital	Dublin	27. Our Lady Of Lourdes Hospital, Drogheda	Louth
4. Cavan Monaghan Hospital	Cavan, Monaghan	28. Our Lady's Hospital, Navan	Meath
5. Children's University Hospital, Temple Street	Dublin	29. Our Lady's Children's Hospital Crumlin	Dublin
6. Connolly Hospital Blanchardstown	Dublin	30. Portiuncula Hospital, Ballinasloe	Galway
7. Coombe Women's Hospital	Dublin	31. Roscommon County Hospital	Roscommon
8. Cork University Hospital	Cork	32. Rotunda Hospital	Dublin
9. Cork University Maternity Hospital	Cork	33. Royal Victoria Eye & Ear Hospital, Dublin	Dublin
10. Croom Hospital: UL Hospitals	Limerick	34. Sligo General Hospital	Sligo
11. Ennis Hospital: UL Hospitals	Clare	35. South Infirmary-Victoria Hospital, Cork	Cork
12. Galway University Hospitals	Galway	36. South Tipperary General Hospital	Tipperary
13. Kerry General Hospital	Kerry	37. St Columcille's Hospital, Loughlinstown	Dublin
14. Letterkenny University Hospital	Donegal	38. St James's Hospital	Dublin
15. Lourdes Orthopaedic Hospital, Kilcreene	Kilkenny	39. St John's Hospital Limerick	Limerick
16. Louth County Hospital, Dundalk	Louth	40. St Luke's General Hospital Carlow / Kilkenny	Kilkenny
17. Mallow General	Cork	41. St Luke's Hospital, Rathgar (Cancer Services)	Dublin
18. Mater Misericordiae University Hospital	Dublin	42. St Michael's, Dun Laoghaire	Dublin
19. Mayo General Hospital	Mayo	43. St Vincent's University Hospital, Elm Park	Dublin
20. Mercy University Hospital, Cork	Cork	44. Tallaght Hospital	Dublin
21. Midland Regional Hospital Mullingar	Westmeath	45. University Hospital Limerick	Limerick

Hospitals	Location	Hospitals	Location
22. Midland Regional Hospital Portlaoise	Laois	46. University Maternity Hospital: UL Hospitals	Limerick
23. Midland Regional Hospital Tullamore	Offaly	47. University Hospital Waterford	Waterford
24. Naas General Hospital	Kildare	48. Wexford General Hospital	Wexford
Private Hospital			
1. Aut Even Hospital	Kilkenny	10. Mount Carmel Hospital	Dublin
2. Barringtons Hospital	Limerick	11. Mater Private Hospital	Dublin, Cork
3. Beacon Hospital	Dublin	12. St. Joseph's Hospital	Sligo
4. Blackrock Clinic	Dublin	13. St John of God Hospital	Dublin
5. Bon Secours Health System	Cork, Dublin, Galway, Kerry	14. St Patrick's University Hospital	Dublin
6. Clane General Hospital	Kildare	15. St Vincent's Private Hospital	Dublin
7. Galway Clinic	Galway	16. Sports Surgery Clinic	Dublin
8. Hermitage Medical Centre	Dublin	17. Whitfield Clinic	Waterford
9. Highfield Healthcare	Dublin		

Source: HSE, <https://www.hse.ie/eng/services/list/3/acutehospitals/hospitals/hospitallist.html>, <https://www.hse.ie/eng/services/list/1/schemes/cbd/acchealthcareireland/>.

Higher Education Campuses

A 10.9 Table 26 below contains a list of higher education institutions encompassing universities, institutes of technology and other colleges as identified by the HEA. Where an institution is located in more than one location, the coverage obligations apply to each of these locations.

A 10.10 The coverage obligations apply to the institution's buildings (including accommodation), adjacent carparks and key thoroughfares

Table 26 Higher Education Campuses

Higher Education Institution	Location	Higher Education Institution	Location
University			
1. Dublin City University	Dublin	5. Trinity College Dublin	Dublin
2. University College Cork	Cork	6. University College Dublin	Dublin
3. National University of Ireland, Galway	Galway	7. University of Limerick	Limerick
4. Maynooth University - Kildare	Kildare	8. TU Dublin	Dublin
Institute of Technology			
1. Athlone Institute of Technology	Westmeath	7. Institute of Technology Sligo	Sligo
2. Cork Institute of Technology	Cork	8. Institute of Technology Tralee	Kerry
3. Dun Laoghaire Institute of Art and Design	Dublin	9. Letterkenny Institute of Technology	Donegal
4. Dundalk Institute of Technology	Louth	10. Limerick Institute of Technology	Limerick
5. Galway-Mayo Institute of Technology	Galway	11. Waterford Institute of Technology	Waterford
6. Institute of Technology Carlow	Carlow		
Other College			
1. Royal College of Surgeons in Ireland	Dublin	4. National College of Art and Design	Dublin
2. Royal Irish Academy	Dublin	5. Mary Immaculate College	Limerick
3. St Angela's College	Sligo		

Source: HEA, <http://hea.ie/higher-education-institutions/?v=l>.

Ports (Air and Sea)

A 10.11 Table 27 below contains a list of passenger focussed transport provided by airports and seaports. The list of airports is as set out by the Department of Transport, and the list of passenger seaports is as set out by the Irish Maritime Development Office (“IMDO”). Where a port as listed below contains more than one location, the coverage obligations apply to each of these locations as detailed in the Specific Location Boundary Files. For airports, the coverage obligations apply to areas where passengers will be waiting, embarking or disembarking, adjacent short term car parks and key passenger thoroughfares.

A 10.12 For passenger seaports, the coverage obligations apply to areas where passengers will be waiting, embarking or disembarking, adjacent car parks and key passenger thorough fares.

Table 27. Ports (Air and Sea)

Ports	Location	Ports	Location
Airport			
1. Dublin Airport	Dublin	5. Ireland West Airport Knock	Mayo
2. Cork Airport	Cork	6. Kerry Airport	Kerry
3. Shannon Airport	Clare	7. Waterford Airport	Waterford
4. Donegal Airport	Donegal		
Passenger Seaport			
1. Bantry Bay Port Company	Cork	5. Port of Galway	Galway
2. Dublin Port Company	Dublin	6. Rosslare Europort	Wexford
3. Dun Laoghaire Port Company	Dublin	7. Port of Waterford	Waterford
4. Port of Cork	Cork		

Source: IMDO, <https://www.imdo.ie/Home/site-area/business/maritime-ireland/maritime-ireland#Ports>

Principal Bus Stations

A 10.13 Table 28 below contains a list of Bus Éireann's 16 principal bus stations which also include information offices.

A 10.14 The outdoor coverage obligations apply to areas where passengers will be waiting, embarking or disembarking, and adjacent carparks.

Table 28. Principal Bus Stations

Bus Station	Location	Bus Station	Location
1. Athlone	Southern Station Road, Athlone	9. Galway	Ceannt Station, Eyre Square, Galway
2. Ballina	Kevin Barry Street, Ballina	10. Killarney	Fairhill, Killarney
3. Cavan	Farnham Street, Cavan	11. Letterkenny	Port Road, Letterkenny
4. Cork	Parnell Place, Cork	12. Limerick	Colbert Station, Parnell Street, Limerick
5. Drogheda	Donore Road, Drogheda	13. Monaghan	North Road, Monaghan
6. Dundalk	Long Walk, Dundalk	14. Sligo	Lord Edward Street, Sligo
7. Dublin	Busáras Central Station, Store Street, Dublin	15. Tralee	Casement Station, Tralee
8. Ennis	Clonroad More, Ennis	16. Waterford	The Quay, Waterford

Source: Bus Éireann, <https://www.buseireann.ie/pdf/1473240111-Network-Map.pdf>

Train Stations

A 10.15 Table 29 below contains a list of 144 train stations by descending passenger numbers¹³⁰⁰ as obtained from the NTA.

A 10.16 The outdoor coverage obligations apply to each station including areas where passengers will be waiting, embarking or disembarking (platforms), and adjacent carparks.

Table 29. Train Stations

Train Station	Location	Train Station	Location
1. Connolly	Dublin	73. M3 Parkway	Dublin
2. Pearse	Dublin	74. Sligo	Sligo
3. Heuston	Dublin	75. Longford	Longford
4. Tara Street	Dublin	76. Killarney	Kerry
5. Grand Canal Dock	Dublin	77. Kilcock	Kildare
6. Dun Laoghaire	Dublin	78. Dunboyne	Meath
7. Cork	Cork	79. Adamstown	Dublin
8. Bray	Wicklow	80. Glounthaune	Cork
9. Lansdowne	Dublin	81. Navan Road Parkway	Dublin
10. Malahide	Dublin	82. Wicklow	Wicklow
11. Maynooth	Kildare	83. Tralee	Kerry
12. Blackrock	Dublin	84. Waterford	Waterford
13. Greystones	Dublin	85. Manulla Junction	Mayo
14. Sydney Parade	Dublin	86. Enfield	Meath
15. Coolmine	Dublin	87. Ennis	Clare
16. Balbriggan	Dublin	88. Ballinasloe	Galway
17. Howth Junction and Donaghmede	Dublin	89. Hansfield	Dublin
18. Raheny	Dublin	90. Oranmore	Galway
19. Clontarf Rd	Dublin	91. Wexford	Wexford
20. Portmarnock	Dublin	92. Castlebar	Mayo
21. Limerick Junction	Tipperary	93. Clondalkin Fonthill	Dublin
22. Galway	Galway	94. Ballybrophy	Laois
23. Dalkey	Dublin	95. Carrick-on- Shannon	Leitrim
24. Docklands	Dublin	96. Muine Bheag	Carlow
25. Glenageary	Dublin	97. Edgeworthstown	Longford
26. Booterstown	Dublin	98. Carrigtwohill	Cork
27. Sallins and Naas	Kildare	99. Arklow	Wicklow
28. Skerries	Dublin	100. Clara	Offaly
29. Drumcondra	Dublin	101. Roscommon	Roscommon
30. Clonsilla	Dublin	102. Westport	Mayo

¹³⁰⁰ By number of passengers boarding and alighting on 16 November 2017 as published in NTA's 'National Heavy Rail Census Report 2017'

Train Station	Location	Train Station	Location
31. Kilbarrack	Dublin	103.Gorey	Wexford
32. Howth	Dublin	104.Dromod	Leitrim
33. Mallow	Cork	105.Gormanston	Meath
34. Bayside	Dublin	106.Monasterevin	Kildare
35. Donabate	Dublin	107.Kilcoole	Wicklow
36. Newbridge	Kildare	108.Ballymote	Sligo
37. Shankill	Dublin	109.Ballina	Mayo
38. Harmonstown	Dublin	110.Boyle	Roscommon
39. Salthill and Monkstown	Dublin	111.Charleville	Cork
40. Clongriffin	Dublin	112.Templemore	Tipperary
41. Sandycove and Glasthule	Dublin	113.Claremorris	Mayo
42. Limerick	Limerick	114.Ballyhaunis	Mayo
43. Drogheda	Louth	115.Millstreet	Cork
44. Killester	Dublin	116.Enniscorthy	Wexford
45. Sandymount	Dublin	117.Rushbrooke	Cork
46. Ashtown	Dublin	118.Castlereea	Roscommon
47. Portlaoise	Laois	119.Collooney	Sligo
48. Leixlip Louisa Bridge	Kildare	120.Rathdrum	Dublin
49. Killiney	Dublin	121.Woodlawn	Galway
50. Sutton	Dublin	122.Thomastown	Kilkenny
51. Castleknock	Dublin	123.Sixmilebridge	Clare
52. Rush and Lusk	Dublin	124.Rathmore	Kerry
53. Kildare	Kildare	125.Banteer	Cork
54. Athlone	Westmeath	126.Nenagh	Tipperary
55. Seapoint	Dublin	127.Craughwell	Galway
56. Carlow	Carlow	128.Carrigaloe	Cork
57. Portarlinton	Laois	129.Farranfore	Kerry
58. Leixlip Confey	Kildare	130.Clonmel	Tipperary
59. Thurles	Tipperary	131.Fota	Cork
60. Tullamore	Offaly	132.Rosslare Strand	Wexford
61. Midleton	Cork	133.Foxford	Mayo
62. Mullingar	Westmeath	134.Roscrea	Tipperary
63. Littleisland	Cork	135.Attymon	Galway
64. Dundalk	Louth	136.Gort	Galway
65. Hazelhatch and Celbridge	Kildare	137.Rosslare Euro Port	Wexford
66. Broombridge	Dublin	138.Castleconnell	Limerick
67. Cobh	Cork	139.Cahir	Tipperary
68. Athenry	Galway	140.Birdhill	Tipperary
69. Kilkenny	Kilkenny	141.Carrick-on- Suir	Tipperary
70. Athy	Kildare	142.Ardrahan	Galway
71. Parkwest and Cherry Orchard	Dublin	143.Cloughjordan	Tipperary
72. Laytown	Meath	144.Tipperary	Tipperary

Source: National Transport Authority, 'National Heavy Rail Census Report 2017', published July 2018, https://www.nationaltransport.ie/wp-content/uploads/2018/08/National_Heavy_Rail_2018_V8_Web.pdf

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Visitor Attractions - Information Centre

A 10.17 Table 30 below contains a list of the top 21 visitor attractions (for both fee charging attractions and those that are free of charge) by visitor numbers in 2017, as obtained from Fáilte Ireland.

A 10.18 The outdoor coverage obligations apply to the information centre at each attraction.

Table 30. Visitor Attraction – Information Centres

Visitor Attraction	Location	Visitor Attraction	Location
Fee Charging			
1. Guinness Storehouse	Dublin	12. Blarney Castle and Gardens	Cork
2. Cliffs of Moher Visitor Experience	Clare	13. Kilmainham Gaol	Dublin
3. Dublin Zoo	Dublin	14. Kilkenny Castle	Kilkenny
4. National Aquatic Centre	Dublin	15. Rock of Cashel	Tipperary
5. Book of Kells	Dublin	16. Dublin Castle	Dublin
6. Tayto Park	Meath	17. Bunratty Castle and Folk Park	Clare
7. St Patrick's Cathedral	Dublin	18. Old Jameson Distillery	Dublin
8. Kylemore Abbey & Gardens	Galway	19. Brú na Bóinne Newgrange	Meath
9. Muckross House Gardens and Traditional Farm	Kerry	20. Christ Church Cathedral	Dublin
10. Powerscourt Gardens and Waterfall	Wicklow	21. Glenveagh Castle and Grounds	Donegal
11. Fota Wildlife Park	Cork		
Free of Charge			
1. National Gallery of Ireland	Dublin	12. National Museum of Ireland - Natural History, Merrion St	Dublin
2. Castletown House Parklands	Kildare	13. Kilkenny Castle Parklands	Kilkenny
3. Glendalough Site	Wicklow	14. Chester Beatty Library	Dublin
4. National Botanic Gardens	Dublin	15. National Museum of Ireland - Decorative Arts and History, Collins Barracks	Dublin
5. DLR Lexicon1	Dublin	16. Connemara National Park	Galway
6. Irish Museum of Modern Art	Dublin	17. The National Library of Ireland	Dublin
7. Doneraile Wildlife Park	Cork	18. Crawford Art Gallery	Cork
8. National Museum of Ireland - Archaeology, Kildare St	Dublin	19. Malin Head Viewing Point	Donegal
9. Science Gallery at Trinity College Dublin	Dublin	20. Dublin City Gallery The Hugh Lane	Dublin
10. Farmleigh	Dublin	21. Sliabh Liag Cliffs	Donegal

Visitor Attraction	Location	Visitor Attraction	Location
11. Newbridge Silverware Museum of Style Icons	Kildare		

Source: Fáilte Ireland, 'TOURISM FACTS 2017', published July 2018, http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/5_International_Tourism_Trends/Tourism-Facts-2017_2.pdf?ext=.pdf

Geographic Coordinates

A 10.19 ComReg provides the geographic coordinates for each specific location across the seven categories on its Proposed Multi Band Spectrum Award webpage¹³⁰¹.

A 10.20 These coordinates were derived using the following methodology:

- Locations for each of the categories were obtained from the authoritative sources referenced at A10.1.
- Satellite images were obtained for each specific location using google maps.
- Areas encompassed by the outdoor coverage obligations were identified using the criteria tabled below:

Table 31. Criteria (Outdoor coverage at/around)

Category	Criteria (outdoor coverage at/around)
Business and Technology Parks	Buildings, the adjacent carparks and thorough fares within, as well as those adjacent to IDA Business and Technology Parks and Strategic Sites.
Hospitals	Hospital's buildings, adjacent car parks and key thoroughfares.
Higher Education Campuses	Institution's buildings (including accommodation), adjacent carparks and key thoroughfares.
Ports	Airports - areas where passengers will be waiting, embarking or disembarking, adjacent short term car parks and key passenger thoroughfares. Passenger seaports - areas where passengers will be waiting, embarking or disembarking, adjacent car parks and key passenger thorough fares.
Principal Bus Stations	Areas where passengers will be waiting, embarking or disembarking, and adjacent carparks.
Train Stations	Areas where passengers will be waiting, embarking or disembarking (platforms), and adjacent carparks
Visitor Attractions – Visitor Centre	Visitor Centre

- Coordinates for the identified areas were mapped using visuals from the satellite images and QGIS. Due to the angle from which the satellite

¹³⁰¹ <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/proposed-multi-band-spectrum-award/>

images may have been projected, the coordinates may vary slightly from the actual coordinates (e.g. mapped boundaries produced by the coordinates may vary from the actual physical boundaries)

A 10.21 The coordinates for the each location included in the coverage obligations can be downloaded in .shp or shape files from <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/proposed-multi-band-spectrum-award/>.

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Annex: 11 Final Rollout RIA – Performance Bands

Introduction

- A 11.1 In Annex 11 of Document 19/124, ComReg set out its draft RIA on the rollout for rights of use in the 2.1 GHz Band, 2.3 GHz Band and 2.6 GHz Band (“the Performance Bands”). ComReg arrived at its preliminary view that a combination of options is required rather than applying one uniform option to each of the Bands.
- A 11.2 This Annex sets out ComReg’s final Base Station ‘Rollout’ RIA for rights of use in the 2.1 GHz Band, 2.3 GHz Band and 2.6 GHz Band having considered the view of respondents (See Section 8.4).

RIA Framework

- A 11.3 The purpose, structure and scope of the RIA framework are discussed at the beginning of the final ‘Spectrum for Award’ RIA which is contained in Annex 4 and are not reproduced here.

Policy issues and identify the objectives (Step 1)

Policy Issues

- A 11.4 In the context of this RIA, the policy issue to be addressed is to determine what rollout obligations (if any) are appropriate for the Performance Bands. For coverage obligations related to the 700 MHz Duplex readers are referred to Annex 9.
- A 11.5 In considering this policy issue, there are a number of objectives which ComReg must balance. On the one hand, if operators granted new rights of use in the Performance Bands do not use those licences to roll out services across a sufficiently large area or sufficiently quickly or in a timely manner, that would not be in the interests of consumers or represent the efficient use of the radio spectrum. This could justify the attachment of rollout obligations to those licences. In contrast, the imposition of overly onerous obligations could have negative consequences such as requiring unnecessary and therefore inefficient investment in infrastructure or even discouraging participation in the Proposed Award by parties who would otherwise efficiently deploy services.
- A 11.6 Accordingly, the policy issue for ComReg is to determine whether a rollout

obligation(s) would be appropriate and, if so, identify an appropriate obligation(s) which would ensure a reasonable level of rollout without significantly discouraging participation in the Proposed Award.

Objectives

A 11.7 In considering the above policy issue, ComReg is guided by what it considers to be the most relevant of its statutory objectives, including:

- assigning rights of use in the 2.1 GHz band in line with the 2.1 GHz EC Decision and other relevant legislation;
- assigning rights of use in the 2.6 GHz band in line with the 2.6 GHz EC Decision and other relevant legislation;
- to ensure that all end users, including disabled users, derive maximum benefit in terms of choice, price and quality;
- to encourage the efficient use and ensure the effective management of spectrum; and
- to ensure there is no distortion or restriction of competition in the electronic communications sector.

A 11.8 ComReg is also mindful of the “connectivity” general objective (and related recitals) in the EECC:

- “Promoting connectivity and access to, and take-up of, **very high capacity networks**, including fixed, mobile and wireless networks, by all citizens and businesses of the Union” (Article 3(2)(a) – **emphasis added**); and
- where “...that connectivity objective translates, on the one hand, into aiming for the highest capacity networks and services economically sustainable in a given area, and, on the other, into pursuing territorial cohesion, in the sense of convergence **in capacity** available in different area” (Recital 23 – **emphasis added**).

A 11.9 ComReg’s overall powers, functions, duties and objectives in relation to the management of the radio frequency spectrum in Ireland are set out in Annex 2.

Identify the regulatory options (step 2)

A 11.10 The background and key questions that are relevant and inform the establishment of the options are set out in Chapter 8 of Document 19/59R

and ComReg does not propose to set them out again here. However, in summary, ComReg is of the view that:

- the main potential uses of the Performance Bands are for mobile services, small cells and fixed wireless services;
- a rollout obligation linked to a base station obligation would be more appropriate for the Performance Bands in this award, and;
- if an obligation is deemed necessary, that an asymmetric obligation (i.e. different obligation depending on use) would likely be required for the Performance Bands¹³⁰² such that:
 - a mobile and non-mobile rollout obligation should be provided for each Performance Band;
 - compared to existing operators¹³⁰³, New Entrants who have no existing network in place should be subject to a less onerous obligation across all bands; and
 - existing 2.1 GHz licensees should be subject to a higher rollout obligation for that band given existing rollout (and consequently already being in a position to meet a coverage condition close to existing rollout).

Regulatory options

A 11.11 In light of the above, ComReg considers that the following regulatory options are potentially available. As elaborated further below, a mixture of options may be appropriate depending on how the spectrum is used (i.e. mobile or non-mobile) and by whom (i.e. incumbent or New Entrant):

a) **Option 1:** Impose no rollout obligation:

- i. This would mean that each licensee would have full flexibility to choose how extensive, or timely, their rollout would be regardless of the amount of spectrum rights of use assigned to it.
- ii. An operator could choose to provide no services, only to provide services in high density areas, or choose to

¹³⁰² Noting that FWA base stations can cover a significantly larger area than mobile base stations in these bands due, amongst other things, to the use of fixed directional antennas.

¹³⁰³ Existing operators refers to the existing licensees in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz bands, noting that these operators already have rolled out existing networks/infrastructure in this bands.

differentiate itself as a provider with an extensive network footprint.

b) **Option 2:** Impose a rollout obligation, with a rollout period of 3¹³⁰⁴-5¹³⁰⁵ years for 80 - 500 network controlled base stations:

- i. The lower end of this range of base stations is informed by the base station rollout obligation used in the 3.6 GHz Award in Ireland¹³⁰⁶;
- ii. The upper end of this range is informed by the proposals in the 3.4 – 3.8 GHz award in Austria (2019)¹³⁰⁷;
- iii. Under this Option, ComReg proposes to set the obligation at a minimum of **290 base stations** (i.e. the mid – point of the range) for Existing Operators and **80 base stations** for New Entrant non-mobile operators, but noted previously in the corresponding draft that it may set the obligation in the lower or higher end of the range depending on any additional information it receives;
- iv. ComReg notes that in response to Document 19/124, it has not received any additional information that would cause it to set the obligation at a higher or lower point of the range (See Chapter 8).

c) **Option 3:** Impose a rollout obligation, with a rollout period of 3 – 5 years for 500 – 1,200 network controlled base stations:

- i. The upper end of this range is informed by Three's existing rollout of the 1800 MHz Band to over 1,200 base stations. However, ComReg notes that part of this rollout may relate to legacy GSM services and may not therefore be reflective of an efficient 4G/5G rollout;

¹³⁰⁴ ComReg notes that the Oxera Report (Document 18/103c) modelled a standard network rollout of 2.5% CAGR which corresponds to a new site every week or an upgrade every two days (Footnote 10 of Document 18/103c). Over a three year period this would result in approximately 547 upgrades (.). This rollout period is sufficient to cover the suggested rollout in Options 1, 2 and 3. Option 4 refers to the 2.1 GHz Band which has already rolled out to these levels.

¹³⁰⁵ This takes into account the longer rollout period that would be required for New Entrants.

¹³⁰⁶ In that award, if a licensee obtained rights of use up to 100 MHz across all of the regions, then the rollout obligation would be 78 base stations.

¹³⁰⁷ ComReg proposes that the upper range of Option 2 be 500 base stations; approximately half of the obligation attached to National licences in the Austrian award. The population of Austria is approximately 8.86 million (2019) and the population density stands at approximately 106 people/km². The population of Ireland is approximately 4.7 million (2016) while the population density is 70 people/km².

- ii. under this Option, ComReg proposes to set the obligation at **525 base stations** (i.e. the median¹³⁰⁸ of the existing 1800 MHz rollout) but noted previously in the corresponding draft that it may set it lower or higher in the range depending on any additional information or advice it receives;
 - iii. ComReg notes that in response to Document 19/124, it has not received any additional information that would cause it to set the obligation at a higher or lower point of the range. (See Chapter 8)
- d) **Option 4:** Impose a rollout obligation, with a rollout period of 3 - 5 years for 1,200 – 1,900 network controlled base stations.
- i. The upper end of this range is informed by Three's rollout in the 2.1 GHz Band.
 - ii. The 2.1 GHz Band was the only band licensed to provide 3G coverage prior to the 2012 MBSA. Site rollout partly reflected the lack of alternative spectrum (particularly spectrum suitable for coverage) with which to rollout 3G services. However, in the intervening period an additional 280 MHz of spectrum has been assigned to MNOs across three different bands (800 MHz, 900 MHz and 1800 MHz).
 - iii. Further, it is proposed to assign an additional 350 MHz in the Proposed Award across three more bands (700 MHz Duplex, 2.3 GHz Band and 2.6 GHz Band). The existing rollout of the 2.1 GHz Band provides useful information on what rollout could be achieved in the future. However, a rollout obligation set at these levels may exceed what could be deemed efficient for the rollout of 4G/5G services given the availability of alternative bands (particularly coverage bands) which were not available when UMTS 2100 was first rolled out.
 - iv. Given the above, under this Option, ComReg proposes to set the obligation under Option 4 at **1,200 base stations** (i.e. the lower end of the range) to provide flexibility in the rollout of 4G/5G services but noted previously in the corresponding draft that it may set it higher in the range depending on any additional information or advice it receives.
 - v. ComReg notes that in response to Document 19/124, it has not received any additional information that would cause it to

¹³⁰⁸ Given the existing rollout, the median is a better measure of the central tendency as it is not skewed by high Three rollout, including existing GSM which is less relevant.

set the obligation at a higher point of the range. (See Chapter 8).

e) **Option 5:** Impose a rollout obligation, with a rollout period of 3 – 5 years for over 1,900 network controlled base stations.

- i. This option would require base station deployment in excess of network deployment for existing 1800 MHz and 2.1 GHz Bands.
- ii. This obligation would be aligned with the likely rollout of sub 1 GHz bands.

A 11.12 The following sections of the final 'Rollout RIA' consider the impact of the aforementioned regulatory options on:

- industry stakeholders (being existing operators and potential New Entrants);
- competition; and
- consumers

Impact on industry stakeholders (step 3)

A 11.13 There are a number of key industry stakeholders in relation to the matters considered in this annex:

- Mobile Network Operators (MNOs);
- Other Service Providers (e.g. FWA providers)¹³⁰⁹; and
- Potential New Entrants.

A 11.14 These are assessed separately under each of the options below. For the purposes of this RIA, ComReg assumes that each operator would likely prefer the rollout obligation that has the least impact on its commercial strategy,¹³¹⁰ particularly if such obligations significantly differ from what it would choose to do independently of any obligation. In that regard, ComReg has considered the responses to its position in Document19/124 in forming its views on likely rollout. For the purposes of the analysis below, ComReg has assumed that all of the MNOs acquiring rights of use of spectrum in the

¹³⁰⁹ ComReg notes that currently Imagine is the only operator offering national fixed wireless services. Other FWA operators are regional, however, ComReg is not discounting the possibility of such operators forming a bidding group in the proposed award and bidding on a national basis.

¹³¹⁰ Which may include imposing a sufficiently high obligation to dissuade its competitors from spectrum hoarding – see Imagine's comments below.

performance bands would want to use that spectrum for the purposes of mobile. This does not rule out such an MNO using the spectrum to only provide FWA services, in which case, FWA obligations would be applicable to it in respect of that band. However, where an operator deploys both mobile services and FWA, in a particular band, the mobile obligation would apply.

Option 1 (no rollout)

MNOs/Other Service Providers

A 11.15 Under Option 1, each new licensee would have full flexibility to choose how extensive their network rollout would be and what areas would be covered. A licensee could choose not to rollout any of the Performance Bands on its network or choose a rollout in line with demand for services. ComReg is of the view that existing MNOs and Other Service Providers may, on the one hand, prefer that no obligation is imposed but, on the other, that the design of the award does not facilitate speculative bidding¹³¹¹ or spectrum hoarding¹³¹², either of which could be more likely under Option 1. For example, in response to Document 19/59R, all MNOs appear to agree that some form of rollout is appropriate to prevent spectrum hoarding. However, a stakeholder's preference for a rollout obligation to prevent such behaviour would need to be balanced against the desire to have flexibility in providing services in line with its commercial strategy.

A 11.16 For the rest of this section, ComReg divides its assessment of likely MNO preferences in two sections because MNOs already enjoy rights of use in the 2.1 GHz Band:

‘Brownfield Spectrum’ where rights of use have already been deployed (i.e. 2.1 GHz Band).

‘Greenfield Spectrum’ where rights of use have not been deployed (i.e. 2.3 GHz Band and 2.6 GHz Band).

New Entrants

A 11.17 Potential New Entrants are likely to prefer an option with as low a rollout obligation as possible, and therefore Option 1 could be their preferred option, although New Entrants would likely be indifferent to obligations that do not go above what they would, in any event, deploy on the basis of their business plans on a commercial basis.

¹³¹¹ Speculative bidding refers to bidders attempting to acquire the spectrum at a low price in the hopes that the value will increase in the future and the spectrum can be sold on at a profit.

¹³¹² This is where a rival is assigned spectrum and does not use it denying its use to alternative users

Option 2 (290 base stations)

MNOs

I. 2.1 GHz rollout

- A 11.18 In relation to the 2.1 GHz Band, a proposed rollout to 290 base stations would be significantly less than MNOs existing deployment of the band. Further, it would provide MNOs flexibility to scale back the footprint of its existing 2.1 GHz network if the deployment of newly assigned bands was preferred from a network planning perspective.¹³¹³ For example, it may be preferable to use the 700 MHz Duplex to provide coverage where it previously used the 2.1 GHz Band¹³¹⁴ and this may require the scaling back of certain 2.1 GHz sites across the country (i.e. 3G services were originally provided by 2.1 GHz alone prior to liberalisation of 900 MHz Band and availability of UMTS 900).
- A 11.19 Therefore, in relation to the 2.1 GHz Band, MNOs are likely to look favourably at Option 2 because such obligations are significantly below the existing 2.1 GHz deployment and are unlikely to go beyond what MNOs would provide independently.

II. 2.3 GHz and 2.6 GHz rollout

- A 11.20 In relation to the 2.3 GHz Band and 2.6 GHz Band, a proposed rollout to 290 base stations under Option 2 would be less than MNOs existing deployment across the 1800 MHz Band (which is used to provide LTE services). Therefore, in relation to the 2.3 GHz Band and 2.6 GHz Band, MNOs are likely to look favourably at Option 2 given the obligations fall below the existing 1800 MHz deployment and are unlikely to go beyond what MNOs would provide independently. Noting also that unlike the 1800 MHz Band, the Performance Bands can be added with a software upgrade rather than an equipment change at some sites, which should reduce the cost of rollout¹³¹⁵.

MNO conclusion on all bands (Option 2)

- A 11.21 Therefore, ComReg is of the view that MNOs are likely to look favourably at

¹³¹³ This could also allow MNOs the opportunity to spread investment decisions across a portfolio of spectrum holdings more efficiently, promoting infrastructure based competition.

¹³¹⁴ Depending on the asset life of the various pieces of equipment, it may be more efficient to add 700 MHz capability to a site rather than installing new 2.1 GHz compatible equipment, noting that equipment is generally not retunable above and below 1 GHz.

¹³¹⁵ As previously noted in the final 'Spectrum for Award' RIA, base station equipment at some sites are multi-band and cover existing bands such as 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz Band but also cover the 700 MHz Duplex, 2.6 GHz band, and to a lesser extent the 2.3 GHz band.

Option 2 for all of the Performance Bands.¹³¹⁶ For example, in response to Document 19/59R, Three and Eir did not raise objections to the rollout being set at these levels. That said, Vodafone has expressed the view that a rollout obligation set at these levels could be excessive.¹³¹⁷ Notwithstanding Vodafone's contention, ComReg is of the view that Vodafone's assessment of likely rollout seems implausible for reasons stated in Chapter 8 and at the conclusion of this section 'Impact on Stakeholders' below.

Other Service Providers

A 11.22 Other Service Providers (e.g. FWA operators) would likely prefer Option 2 because it would prevent speculative FWA entry and such obligations would likely coincide with any commercial FWA rollout. For example, Imagine currently has 235 sites¹³¹⁸ and although it suggests an obligation of 400 sites in its response to Document 20/32, a minimum obligation of 290 sites is less likely to be above what some Other Service Providers may consider to be commercially feasible.

A 11.23 Therefore, ComReg is of the view that Other Service Providers would likely look favourably on Option 2 for all of the Performance Bands.

New Entrants

A 11.24 While potential New Entrants may prefer Option 1, such entrants would need to rollout a network to some degree, regardless of any obligation, and may prefer some rollout obligation that would be in line with its commercial rollout. In this regard, ComReg notes that:

- a) a mobile entrant is likely to look more favourably on Option 2 as rollout to 290 sites is unlikely to be above what it would undertake regardless of any obligation.
- b) a non-mobile entrant would also likely prefer Option 2 but in the lower end of the range and closer to the 3.6 GHz Award obligations (**80 sites**) which resulted in new entry in that award.

A 11.25 Given a likely preference at the lower end of Option 2, a non-mobile New

¹³¹⁶ FWA providers would likely prefer a separate and higher rollout obligation if the Performance Bands are used for mobile services reflecting the different network deployment for those services. For example, some respondents to Document 18/60 expressed concern that certain operators might hoard spectrum damaging the FWA sector. In particular, Imagine expressed concern that mobile operators may seek to hoard spectrum leading to a long-term inability to deliver non-mobile services.

¹³¹⁷ Vodafone suggests that an overall obligation across all bands of 500 would be more appropriate. Since rollout of 290 sites would apply to each Performance Band, Vodafone would only appear to prefer Option 2 if the level of rollout was set at the lower end of the 80 – 500 site range. In its submission to 19/59R, Vodafone notes a nationwide rollout rate of 131 as an alternative.

¹³¹⁸ Data from ComReg Siteviewer as of 2 December 2020.

set at these levels.

MNO conclusion on all bands (Option 3)

A 11.30 ComReg is of the view that MNOs are likely to look favourably at Option 3 for all of the Performance Bands. For example, in response to Document 19/59R, Three and Eir did not raise objections to the rollout set at these levels. Alternatively, Vodafone appears to be of the view that a rollout obligation set at these levels could be excessive for it. Notwithstanding Vodafone's contention, ComReg is of the view that Vodafone's assessment of likely rollout is implausible for the reasons outlined in Chapter 8 and captured at the conclusion of this section under 'Impact on Stakeholders' below.

Other Service Providers

A 11.31 Other Service Providers are unlikely to prefer Option 3 because this option is informed by the rollout of the 1800 MHz band which is used to deliver mobile services, and such a rollout would not be suitable for a FWA network. It is likely that Option 3 would require existing FWA operators to rollout additional base stations in areas where they may not necessarily have appropriate demand. This could also potentially result in such operators having to make inefficient investments in their network. Similarly, Other Service Providers would be unlikely to prefer Options 4 or 5 where higher obligations would apply. Therefore, the views of Other Service Providers are not considered further in the assessment of those options below.

A 11.32 In light of the above, ComReg is of the view that Other Service Providers would likely prefer Option 2 over all other options for all of the Performance Bands.

Mobile entrants

A 11.33 Mobile entrants are unlikely to prefer Option 3 over Option 2. A New Entrant could also have a 700 MHz obligation¹³²¹ to provide a 30 Mbit/s service to 90% of population and would likely use the Performance Bands to achieve that obligation where required. However, a New Entrant would likely have a lightly loaded network until it gained a sufficient market share and therefore may have little justification in rolling out Performance Bands beyond the more densely populated areas of the country over the rollout period.

A 11.34 Similarly, a high rollout obligation could act as a significant barrier to entry for a New Entrant as such an obligation is unlikely to correspond to the

¹³²¹ ComReg notes that any New Entrant would need 700 MHz rights of use rather than rights of use to the Performance Bands in isolation.

market share and business needs of a New Entrant, at least in the short to medium term. Accordingly, the higher rollout obligation could negatively impact on the willingness of mobile New Entrants to participate in an award and ultimately provide services

A 11.35 Therefore, mobile New Entrants are unlikely to prefer Option 3 over Option 2. Similarly, mobile entrants would be unlikely to prefer Options 4 or 5 where higher obligations would apply. Consequently, the views of mobile entrants are not considered further in the assessment of those options below.

A 11.36 In light of the above, ComReg is of the view that mobile entrants would likely prefer Option 2 (290 sites or smaller) over all other options for all the Performance Bands.

Option 4 (1,200 base stations)

MNOs

I. 2.1 GHz rollout

A 11.37 In relation to the 2.1 GHz Band, a proposed rollout to 1,200 base stations under Option 4 would be close to but still below MNOs existing deployment in the band. Further, it would still provide MNOs some flexibility to scale back the footprint of its existing 2.1 GHz network if the deployment of newly assigned bands was preferred from a network planning perspective. The extent to which MNOs would prefer Option 4 would likely depend on how much MNOs preferred to scale back existing 2.1 GHz deployment, if at all. In that regard, ComReg notes that for each operator the number of existing sites is 200 – 750 above the proposed obligation and is therefore likely to be achievable for all operators even accounting for any moderate scaling back of the 2.1 GHz Band.

A 11.38 Therefore, in relation to the 2.1 GHz Band, MNOs would likely be indifferent between Option 3 and Option 4 because such obligations would likely be below the current commercial rollout of the 2.1 GHz Band. For example, in response to Document 19/59R, Three and Eir did not raise objections to 2.1 GHz rollout under Option 4 (1,200 sites). Alternatively, as noted above, Vodafone appears to be of the view that a rollout obligation set at these levels could be excessive for it. Notwithstanding Vodafone's contention, ComReg is of the view that Vodafone's assessment of likely rollout seems implausible for the reasons stated in Chapter 8 and captured at the conclusion of this section 'Impact on Stakeholders'.

II. 2.3 GHz and 2.6 GHz rollout

A 11.39 In relation to the 2.3 GHz Band and 2.6 GHz Band, a proposed rollout to

1,200 sites would be above each MNOs existing rollout in the 1800 MHz Band and significantly so for Vodafone and Eir. Therefore, MNOs are unlikely to prefer Option 4 over Option 3 and Option 2 for these bands. Similarly, MNOs are unlikely to prefer Option 5 where higher obligations would apply. Therefore, the views of MNOs in relation to the 2.3 GHz Band and 2.6 GHz Band are not considered further in the assessment of that option below.

MNO conclusion on all bands (Option 4)

A 11.40 ComReg is of the view that MNOs are likely to look favourably at Option 3 for the Greenfield bands (i.e. 2.3 GHz and 2.6 GHz Bands) and Option 4 for the Brownfield Bands (i.e. 2.1 GHz Band). For example, in response to Document 19/59R and 19/124, Three and Eir did not raise objections to the rollout set at these levels. Alternatively, as noted above, Vodafone appears to be of the view that a rollout obligation set at these levels (i.e. Brownfield (2.1 GHz) and Greenfield (2.3 GHz and 2.6 GHz) could be excessive for it. Notwithstanding Vodafone's contention, ComReg is of the view that Vodafone's assessment of likely rollout in these bands seems implausible for reasons stated in Chapter 8 and at the conclusion of this section 'Impact on Stakeholders'.

Option 5

I. 2.1 GHz rollout

A 11.41 In relation to the 2.1 GHz Band, a proposed rollout to 1900 + base stations would be significantly in excess of Vodafone's and Eir's existing rollout in the band but in line with that of Three's. However, Three's large deployment in the 2.1 GHz Band likely arises from its entry as a 3G only network using the 2.1 GHz Band and its subsequent merger with Telefonica. A rollout of 2.1 GHz at these levels would provide Three little flexibility to rationalise its 2.1 GHz site count or modify certain sites to use other bands (e.g. sub-1 GHz Bands) where it might be efficient to do so. Three would likely prefer to have more control over when and how it rolls out its network across multiple bands.

A 11.42 Option 5 would be aligned with the likely rollout of sub-1 GHz bands and MNOs would be required to rollout and maintain a more extensive network than the other options when it could be more efficient for each to spread their investment across other spectrum bands. This might particularly be the case in non-urban regions where sub-1 GHz bands are more conducive to providing wide area coverage.

A 11.43 Therefore, in relation to the 2.1 GHz Band, MNOs would be unlikely to prefer Option 5 over Options 2, 3 and 4.

Stakeholder summary

A 11.44 In light of the above stakeholder assessment, ComReg summarises the likely views of the various stakeholders as follows:

- a) In relation to all the Performance Bands:
 - i. Non-mobile New Entrants would likely prefer Option 2 (80 sites) over all other options for all the Performance Bands.
 - ii. Mobile entrants would likely prefer Option 2 (290 sites or smaller) over all other options for all the Performance Bands.
 - iii. Other Service Providers would likely prefer Option 2 over all other options for all of the Performance Bands.
- b) In relation to the 2.1 GHz Band, MNOs would likely be indifferent to Option 4 because such obligations would likely be below the current commercial rollout of the 2.1 GHz Band.
- c) In relation to the 2.3 GHz Band and 2.6 GHz Band, MNOs would likely be indifferent to Option 3 because such obligations would likely be below the commercial rollout of both bands.

Commercial rollout

A 11.45 ComReg notes that the responses to its assessments in Documents 19/59R and 19/124 largely support the view that MNOs could competitively achieve the rollout obligations for the Performance Bands¹³²² as outlined above. For example:

- a) Eir expressed no objection to the targets proposed for the Performance Bands but, in its response to Document 20/32 it contends that the same targets should apply to New Entrants.
- b) In its response to 19/59R, Three considers the rollout obligations for the Performance Bands achievable but notes that such obligations are at the upper-end of what network operators could be expected to meet under competitive commercial conditions. It maintains that any further obligations would likely act as a deterrent to bidders in the auction.
- c) Vodafone states that these proposed obligations to be excessive and above the precautionary level in its view.

A 11.46 ComReg notes Three's and Eir's acknowledgement that the rollout

¹³²² ComReg, Document 19/59R.

obligations for the Performance Bands are achievable. In particular, ComReg agrees that such obligations are possibly at the upper end of what could be achievable and obligations above the levels specified in each of the Options above (while possibly achievable by some) could risk distortion to the award process.

A 11.47 Further, ComReg notes Vodafone's contention that the rollout obligation is excessive in its view which it argues is considerably above a precautionary level. However, ComReg considers that such an assessment is implausible for a number of reasons including:

- a) Vodafone's number of 2.1 GHz sites stands at [X [REDACTED] X], over [X [REDACTED] X] above the proposed obligation. As noted earlier, this provides sufficient flexibility for Vodafone to further rationalise as may be required.
- b) Rival operators who both have less market share and in some cases (particularly Eir)¹³²³ a less developed network all acknowledge that the proposed rollout rate is achievable. It seems implausible that the operator with the most subscribers would rollout the Performance Bands (which are used to provide capacity) at lower rates than its rivals.
- c) Even if Vodafone intended to rollout at lower levels, rival operators with less market share are targeting rollout rates significantly in excess of these levels which would likely incentivise Vodafone to increase its rollout rate in order to avoid losing market share.¹³²⁴

A 11.48 In that regard, ComReg is of the view that the likely preferences of each stakeholder group is accurately reflected in the stakeholder assessment above, and the relevant options are not in excess of what operators would likely deliver commercially in a competitive market.

Impact on Competition (step 4)

A 11.49 A coverage/rollout obligation should promote competition such that operators deliver and maintain an acceptable level of coverage/rollout across the country. In that regard, ComReg notes that MNOs would also be subject to the coverage obligation attached to the 700 MHz Duplex (should such rights of use be assigned to all MNOs). The 700 MHz obligation would already

¹³²³ Eir has less sites and spectrum rights of use than both Three and Vodafone.

¹³²⁴ For example, Didier Clavero, Vodafone Ireland CTO, noted that Vodafone "continually work(s) hard to maintain our position as the leading voice and data mobile provider in the country".
<https://n.vodafone.ie/aboutus/press/vodafone-ireland-extends-5g-network-test-bed-as-it-prepares-for-.html>

provide connectivity over a widespread area and MNOs would appear to have clear competitive incentives to add capacity to the coverage layer (using the Performance Bands) in order to attract new subscribers and increase the benefits for all subscribers using the network.

A 11.50 Further, in order to provide the proposed 30 Mbit/s obligation, MNOs would also likely require the use of the Performance Bands in certain areas of the country. In that context, concerns around cherry picking and tacit collusion (as described in the 'Coverage' RIA) of mobile services are unlikely to be relevant with regard to the Performance Bands in this award.¹³²⁵

A 11.51 However, given the variety of bands available in the Proposed Award a number of concerns relevant to competition remain:

- a) the 700 MHz obligation only applies to mobile services and coverage/rollout obligations may be required for other potential uses of the Performance Bands (e.g. fixed wireless).
- b) spectrum hoarding could deny the use of the Performance Bands to other users (MNOs or non-mobile users).
- c) the efficient use of the radio spectrum might not be best provided for if rollout only occurred at low levels but displaced more efficient uses/users.

Option 1

A 11.52 Option 1 could promote competition because it would not run the risk of precluding new entry through setting an obligation that could not reasonably be achieved by a New Entrant. Winning bidders would also have a high degree of flexibility and could choose their own rollout levels allowing customers to make a choice of provider based on the services provided.

A 11.53 However, Option 1 may harm competition to the extent that it could increase the risks of spectrum hoarding as bidders would be under no obligation to rollout any services using the Performance Bands. For example, some respondents to Document 18/60 expressed concern that certain operators might hoard spectrum damaging the FWA sector and or displacing future uses. Similarly, Option 1 could result in strategic bidding, denying rights of use to more efficient users who would provide services to consumers. Setting rollout obligations would better provide for the efficient use of the

¹³²⁵ ComReg notes that cherry picking and tacit collusion are only likely to be relevant to mobile services. In relation to Fixed wireless services the most profitable urban areas are already covered using traditional fixed (fibre) services and tacit collusion is unlikely in rural areas as the cost of extending fixed wireless across a wider area is significantly lower compared to mobile services.

Performance Bands by ensuring that the spectrum is used to deploy services more efficiently than may otherwise be the case.

A 11.54 Given that such entrants should rollout a network to some degree, regardless of any obligation, competition and the efficient use of the radio spectrum would be better promoted by having a rollout obligation that reflected the likely commercial deployment. Therefore, ComReg is of the view that an appropriate rollout obligation is necessary for the Performance Bands and, depending on the use case, Option 2, 3 or 4 would, on balance, have a more positive impact on competition than Option 1.

Option 5

A 11.55 Option 5 could lead to a more comprehensive rollout of services, however, Option 5 would be in excess of existing rollout in similar bands (mobile and non-mobile). By imposing a high rollout obligation, Option 5 is more likely than other options to discourage participation and dampen competition within the Proposed Award.

A 11.56 Further, setting a rollout obligation which is too high could result in the spectrum going unsold which could significantly harm infrastructure based competition given the large amount of spectrum available. It could also negatively impact on competition at the retail level by increasing the likelihood that any winning bidders would make inefficient investment in the network.

A 11.57 Therefore, ComReg is of the view that Option 5 would not be appropriate for any use type in the Proposed Award, it is likely that Options 2, 3 or 4 would have a more positive impact on competition than Option 5.

Options 2, Option 3 and Option 4

A 11.58 Provided any obligation was not out of line with operators 'investment plans' (both incumbents and New Entrants), a coverage obligation is unlikely to have a negative impact on competition. In that regard, and noting the assessment of stakeholders likely deployment earlier, ComReg is of the view that, on balance:

- a) Option 2 would have a more positive impact on competition with respect to **Other Service Providers and New Entrants (mobile and non-mobile)** compared to other options because:

- i. Rollout would not be set at levels¹³²⁶ above that which operators could achieve commercially. Options 3 and 4 would likely act as a significant barrier to entry as rollout set at these levels would likely be above what could be achieved commercially;
 - ii. Options 3 and 4 could also negatively impact on competition at the retail level by increasing the likelihood that winning bidders would make inefficient investment in infrastructure.
- b) Option 3 would have a more positive impact on competition with respect to the **mobile rollout of the 2.3 GHz Band and 2.6 GHz Band** compared to other options because:
- i. It would better encourage efficient use of the radio frequencies compared to Option 2.
 - ii. Options 4 and 5 would likely act as a significant barrier to entry as rollout set at these levels would be significantly above what could achieve commercially in other related bands (e.g. 1800 MHz).
 - iii. Further, these options would likely limit competition during the award and could also negatively impact on competition at the retail level by increasing the likelihood that winning bidders must make inefficient investment in the network.
- c) Option 4 would have a more positive impact on competition with respect to the 2.1 GHz Band compared to other options because it would better encourage the efficient use of the radio frequencies compared to Options 2 and 3 and rollout would not be excessively scaled back below levels necessary to achieve an efficient rollout.

Impact on Consumers

A 11.59 It can be assumed that what is good for competition, and what promotes investment in infrastructure, is, in general, good for consumers. This is because increased competition between operators brings benefits to their customers in terms of price, choice and quality of services. In that regard, options that are good for competition above are likely to be good for consumers. For example, consumers are likely to prefer those options which maintain or improve services and coverage while at the same time not deterring entry or efficient investment.

¹³²⁶ 290 sites mobile and 80 non-mobile (e.g. fixed wireless).

Option 1

A 11.60 From the perspective of all consumers, whilst Option 1 is likely to make entry more attractive compared to other options, it leaves the risk that spectrum would not be used or used inefficiently denying spectrum rights to more efficient users who could provide services that consumers need. Therefore, consumers are unlikely to prefer Option 1.

Option 5

A 11.61 Consumers may, on first impressions, prefer Option 5 as this provides for a high rollout obligation for all services. However, Option 5 could reduce consumer welfare in a number of ways, including:

- a) restricting the extent to which providers including New Entrants would be willing to participate in the Proposed Award and therefore provide services at all;
- b) diverting investment away from providing sites in areas where capacity constraints exist now or in the future; and
- c) increasing the price of mobile services, if the cost of inefficient investment is passed on. As previously noted, consumers have a low willingness to pay for additional coverage meaning the use of other parts of the competitive offering (data, voice text) may have to be reduced.

A 11.62 In light of the above, consumers are unlikely to be in favour of Option 5 as it would not have the greatest positive impact on users.

Option 2, Option 3 and Option 4

A 11.63 Given the different uses likely to arise from the Performance Bands, consumers are likely to prefer different options depending on the services provided by winning bidders and whether new entry is promoted. In that regard, consumers are likely to prefer options that strike the right balance between encouraging rollout to the greatest extent (ensuring that spectrum is used efficiently) and promoting competition.

A 11.64 For **fixed wireless** services, consumers would likely prefer Option 2 over other options for a number of reasons:

- a) it would provide for fixed wireless services to be rolled out across a meaningful area.

- b) it would best encourage potential new FWA entry which could provide more choice for consumers.
- c) it is unlikely to place an onerous obligation on FWA service providers requiring inefficient investment or leading to higher prices.

A 11.65 Consumers would also prefer Option 2 as an obligation for new mobile entrants as this would encourage new entry and ensure any New Entrants would be required to provide services to a minimum level.

A 11.66 For existing **mobile services**, consumers would likely prefer that the 2.3 GHz Band and 2.6 GHz Band were subject to Option 3:

- a) it would increase the potential for these bands to be assigned to users who would provide services that consumer's value over a long period.
- b) it would not discourage MNOs from potentially acquiring additional spectrum where there is a need for it enable considerably higher user data rates and supports a greater number of users, all of which will substantially enhance the consumer experience
- c) the greater connectivity benefits would be achieved across a wider area benefiting more consumers than Option 2.

A 11.67 For existing **mobile services**, consumers would likely prefer that the 2.1 GHz Band is subject to Option 4 because it is best aligned with the existing deployment of the 2.1 GHz Band (compared to other options) and ensures that any scaling back is limited to the efficient rollout of services across its network.

The Final Rollout RIA: Assessment and Preferred Option (step 5)

A 11.68 In light of the above, ComReg is of the view that a combination of the options is required rather than applying one option uniformly to all new rights of use and in all circumstances.

A 11.69 As outlined in Chapter 8, the obligation applies to each of the Performance Bands individually, specifically the 2.1 GHz Band, 2.3 GHz Band, 2.6 GHz FDD Band and the 2.6 GHz TDD Band for the avoidance of doubt, if an operator obtains rights of use in the 2.6 GHz Duplex and the 2.6 GHz Duplex Gap, the base stations obligation must be met in each.

A 11.70 Table 32 below summarises ComReg's final view on the preferred options.

Table 32. Summary of Preferred Options following the Final Rollout RIA

Service	New Entrant Obligation				Existing Operator Obligation			
	2.1 GHz	2.3 GHz	2.6 GHz FDD	2.6 GHz TDD	2.1 GHz	2.3 GHz	2.6 GHz FDD	2.6 GHz TDD
Time	5 Years				4 Years			
Mobile	Option 2 (290)	Option 2 (290)	Option 2 (290)	Option 3 (290)	Option 4 (1,200)	Option 3 (525)	Option 3 (525)	Option 3 (525)
Other	Option 2 (80)	Option 2 (80)	Option 2 (80)	Option 2 (80)	Option 2 (290)	Option 2 (290)	Option 2 (290)	Option 2 (290)

Annex: 12 Voice call Services and Network Availability RIAs

A12.1 Introduction

- A 12.1 In Annex 4 and Chapter 3 of this document, ComReg sets out its view that the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands should be included in the Proposed Award.
- A 12.2 This Annex sets out ComReg's RIAs in respect of whether:
- a voice call service licence condition should be attached to spectrum rights issued in the above bands ('Voice Call Services' RIA); and
 - a network availability licence condition should be attached to spectrum rights issued in the above bands ('Network Availability' RIA).

RIA Framework

- A 12.3 The purpose, structure and scope of the RIA framework is discussed at the beginning of the 'Spectrum for Award' RIA which is set out in Annex 4 and is not repeated here.

A12.2 The 'Voice Call Services' RIA

- A 12.4 The focus of this RIA is to identify the impact of the regulatory options under consideration on stakeholders (including existing operators, potential New Entrants, and consumers) and on competition and, in so doing, to identify the option that would best achieve ComReg's objectives. ComReg notes that the proposed voice call QoS obligation would only apply to operators providing voice call services.
- A 12.5 As set out in Chapter 8 of this document, the voice call QoS licence condition proposed would only apply to 'managed' voice call services, and this RIA therefore only considers 'managed' voice call services. 'Managed' voice call services includes the traditional voice call services carried over circuit-switched connections and the 'managed' packet-switched voice call services (e.g. using VOIP¹³²⁷ or some other similar protocol) which can be provided over different technologies (e.g. VoLTE¹³²⁸, Native Wi-Fi, etc.).

¹³²⁷ Voice over Internet Protocol.

¹³²⁸ VoLTE is a managed voice service that benefits from prioritisation over other traffic.

A 12.6 It is not proposed that a voice call QoS licence condition would apply to 'Unmanaged' voice call services¹³²⁹. Such services including voice call services provided by over the top (OTT) applications that do not use session initiation protocol/IP multimedia subsystem (SIP/IMS) signalling and are delivered in a best effort manner through the Internet access service (i.e. with no prioritisation).¹³³⁰

Policy issues

A 12.7 Voice calls remain an important service for consumers, with 93% using their mobile phone to make traditional voice calls using telephone numbers¹³³¹. Further, use of traditional mobile voice minutes has increased by around 28%)¹³³² since the 2012 MBSA notwithstanding the increased availability of OTT applications such as Skype and WhatsApp.

A 12.8 As illustrated in the 2019 Mobile Consumer Experience Survey¹³³³, the main outdoor service issues across all types of consumers (rural and urban) relate to voice calls. For example, of respondents who experienced services issues:

- 44% noted that the quality of reception deteriorated when on a call¹³³⁴;
- 47% could not make a call¹³³⁵;
- 36% could not receive a call¹³³⁶; and
- 35% experienced a dropped call¹³³⁷.

A 12.9 The outdoor population coverage obligations proposed in Chapter 8 may provide for voice coverage. However, because voice services are currently provided over GSM and UMTS (i.e. 2G and 3G networks) it is not clear whether a population coverage obligation at a rate of 30 Mbit/s would necessarily improve the quality

ITU, 'Quality of Service Regulation Manual' (2017), Section 5.4.4.

https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-BB.QOS_REG01-2017-PDF-E.pdf

¹³²⁹ 'Unmanaged' voice call services are provided over the applications and/or networks of third parties over which the licensee would have very limited control in terms of the quality of the service experienced by the end user.

¹³³⁰ ITU, 'Quality of Service Regulation Manual' (2017), Section 5.4.4.

¹³³¹ Mobile Consumer Experience Survey 2019, document 19/101, Slide 50.

¹³³² ComReg Quarterly Key Data Portal. <https://www.comreg.ie/industry/electronic-communications/data-portal/>

¹³³³ Mobile Consumer Experience Survey 2019, Document 19/101.

¹³³⁴ Ibid, Slides 87, 88, 89 & 90.

¹³³⁵ Ibid.

¹³³⁶ Ibid.

¹³³⁷ Ibid.

of service for voice calls to any material degree.

A 12.10 The policy issue to be addressed is therefore whether it is appropriate to impose specific QoS obligations in respect of voice call services to ensure that users are offered a minimum service level by operators who secure rights of use in the Proposed Award.

Objectives

A 12.11 The focus of this RIA is to assess the impact of the proposed measure(s) (i.e. various regulatory options) on stakeholders, competition and consumers. In that way, it allows ComReg to identify and implement the most appropriate and effective obligations, while still allowing ComReg to achieve its objectives. In considering the above policy issue, ComReg is guided by what it considers to be the most relevant statutory objectives, including:

- assigning rights of use in line with the various EC Decisions¹³³⁸ relating to the Award Bands and other relevant legislation;
- to ensure that all end users, including disabled users, derive maximum benefit in terms of choice, price and quality;
- to encourage the efficient use and ensure the effective management of spectrum; and
- to ensure there is no distortion or restriction of competition in the electronic communications sector.

A 12.12 Of further relevance to the issue of voice obligations for 700 MHz rights of use is:

- EP&C Decision 2017 (EU)2017/899 which, among other things, obliges Member States to:
 - assess the need to attach conditions to the rights of use for frequencies within the 700 MHz frequency band and, where appropriate, shall consult relevant stakeholders in that regard.
- MPBT - [Focus Group Report on Mobile Coverage](#)¹³³⁹ and in particular the 2017 Action Point 39 which notes that “*All operators will introduce*

¹³³⁸ For example:

- EC Decision 2008/477/EC of 13 June 2008 (“2.6 GHz EC Decision”);
- (EU) 2016/687 of 28 April 2016 (“700 MHz EC Decision”); and
- Decision 2012/688/EU of 5 November 2012 (“2.1 GHz Decision”).

¹³³⁹ MPBT - [Focus Group Report on Mobile Coverage](#)

*WiFi calling, VoLTE and other network feature and functionality enhancements at the earliest juncture and report on progress to the Taskforce Implementation Group.*¹³⁴⁰ While this is a 2017 Action Point it remains important particularly since these network features and functionality enhancements remain unavailable for certain consumers.

A 12.13 ComReg's overall powers, functions, duties and objectives in relation to the management of the radio frequency spectrum in Ireland are set out in Annex 2. The most relevant objectives in terms of QoS (Voice Call Services) is to ensure that all users derive maximum benefit in terms of price, choice and quality from the spectrum to be made available in the Proposed Award.

Identifying the regulatory options

A 12.14 In light of the above, ComReg has identified the following options:

- **Option 1:** Do not attach a voice QoS licence condition to rights of use granted in the Proposed Award used to provide 'managed' voice call services.
- **Option 2:** Attach a voice QoS licence condition (in respect of 'managed' voice call services) to all rights of use granted in the Proposed Award:
 - *Option 2A:* Impose such QoS conditions in line with licence condition in the 3.6 GHz Band Liberalised Use Licences¹³⁴¹.
 - *Option 2B:* Impose such QoS conditions in line with the licence condition in the 3.6 GHz Band Liberalised Use Licences¹³⁴² and additionally include an obligation that where LTE is deployed in the Award Bands, and where consumers using services provided using the Award Bands are also offered a mobile voice service by the licensee, VoLTE technology must be enabled on the licensee's network and the base stations in the Award Bands and made available to consumers (including MVNO consumers) that have a VoLTE enabled handset within an appropriate period.

¹³⁴⁰ Action 14 of the 2018 Implementation Review Report – “Operators are progressing the introduction of WiFi calling. Eir introduced WiFi calling in Q1 2017 and has seen very strong usage by its customer to enhance their mobile experience. Vodafone has indicated that it intends to introduce WiFi calling prior to the end of Q1 2019. Three is continuing to evaluate the potential introduction of WiFi calling”.

Action 14 of the Q1 2018 Report – “Mobile operators, through TIF, have indicated that the Commercial Implementation of VoLTE is planned by all operators for 2018”.

¹³⁴¹ See [S.I. No. 532/2016](#) - Wireless Telegraphy (3.6 GHz Band Licences) Regulations 2016.

¹³⁴² See [S.I. No. 532/2016](#) - Wireless Telegraphy (3.6 GHz Band Licences) Regulations 2016.

Impact on stakeholders

A 12.15 There are a number of key industry stakeholders in relation to the matters considered in this chapter:

- Mobile Network Operators (MNOs)¹³⁴³;
- MVNOs; and
- Potential New Entrants.

A 12.16 These are assessed separately under each of the options below.

Option 1 v Option 2

MNOs

A 12.17 A number of factors can affect consumers' QoS in voice services including network congestion in a particular area or the performance of a particular handset. While some of these factors may be outside the control of the mobile operators (e.g. handset performance)¹³⁴⁴ the technical performance of each operator's network does represent a key differentiator in the QoS delivered by different networks.

A 12.18 While an operator can guarantee a certain minimum QoS for voice calls made between subscribers on its own network, it cannot guarantee a certain minimum QoS for voice calls when its subscribers make/receive calls to/from a different network, as such voice calls originate/terminate on a different network (either fixed or mobile). In Q3 2020, 46.4% of all mobile-to-mobile call minutes was to networks other than the dialling party (i.e. off-network).¹³⁴⁵ In effect nearly half of all mobile to mobile calls made would have required both MNOs to have a sufficient QoS voice call standard in order to provide good quality services between callers on different networks.

A 12.19 However, if consumers experience a poor-quality voice call service, it is often unclear which network is primarily responsible for the deterioration in voice call quality. Unless consumers can take the QoS offered by different operators into account when making purchasing decisions, there is less incentive for operators

¹³⁴³ FWA operators are not considered in this RIA as such operators do not provide mobile voice calls and would therefore not be subject to VoLTE obligations.

¹³⁴⁴ Document 18/05 'Mobile Handset Performance (Voice)' was published in February 2018 and identified a variation in performance of up to 14 dB between handsets, meaning that some handsets have significantly poorer reception than others. In effect, consumers living in areas where signal strength is more marginal could potentially significantly improve their connectivity experience by changing their handset. Further updated reports from ComReg include Documents 18/109, 19/110

¹³⁴⁵ ComReg Quarterly Key Data Portal.

to invest in improving it.

- A 12.20 Under Option 1, the non-imposition of a minimum standard for a voice call could create an incentive for a licensee (or other third party providers) to engage in behaviour which resulted in the quality of its voice calls falling below the current standards (e.g. through lack of investment or poor network planning). In addition, other operators with higher quality standards would not be able to insulate the higher quality standards applied to voice calls on their own network from the lower quality standards applied on other networks. This, in turn, arguably reduces the incentive for those operators to maintain higher standards.
- A 12.21 Under Option 1, MNOs might not reap the benefit of investments in its network to the extent that those investments should improve the voice experience for its consumers. Such higher quality operators might then have less incentive to maintain this higher QoS and may allow the quality of their voice calls to fall. Such an overall reduction in quality for voice calls could result in lower consumer demand for voice calls or switching to OTT providers, which in turn would negatively impact all providers of voice call services, though no individual provider would have an incentive to unilaterally increase quality back to previous levels.
- A 12.22 Under Option 2, the imposition of minimum QoS conditions for voice calls would prevent such a situation from arising, and ensure that all operators would be subject to the same minimum standard and, as such, each would be assured that no other operator could avoid meeting these minimum standards. Under Option 2, the obligation to provide a minimum QoS standard on voice call services would apply equally to all MNOs. It would provide some assurance that any investment in voice services would be based on minimum standards being implemented by other MNOs. This would reduce the extent to which the negative consequences referred to above under Option 1 could arise.
- A 12.23 ComReg acknowledges that Option 2 may involve some compliance costs for MNOs which would not arise under Option 1. However, incumbent MNOs are already subject to minimum voice call QoS obligations under current Liberalised Use Licences (800 MHz, 900 MHz, 1800 MHz and 3.6 GHz Frequency bands) so the extension of the voice call QoS obligations to the bands covered by the Proposed Award is unlikely to impose a significant additional cost to incumbent MNOs, particularly in relation to Option 2A.
- A 12.24 Considering the above, and in light of the responses received in relation to Document 19/124 MNOs would be unlikely to prefer Option 1 over Option 2

New Entrants

- A 12.25 It is not clear whether New Entrants would favour a voice call QoS obligation.

However, ComReg observes that in the 3.6 GHz Award, six of the seven respondents (including those respondents that became new entrants as a consequence of the award) to Document 15/70 agreed that a QoS obligation was necessary¹³⁴⁶. Therefore, New Entrants may be of the view that Option 2 provides good incentives for all operators to maintain a good voice call standard. New Entrants may also be of the view that such conditions improve the perception of the network and such benefits are likely to exceed any compliance costs.

A 12.26 Therefore, ComReg is of the view that New Entrants would be unlikely to prefer Option 1 over Option 2.

MVNOs

A 12.27 An MVNO would likely prefer the option that maximises the QoS that would be available to its consumers. Under Option 1, MVNOs would be exposed to the risk that consumers may consider its service to be inferior because either its host or receiving network has low QoS standards. Further, MVNOs would be unlikely to choose a host operator that did not have certain minimum QoS, in the first instance, reducing competition in the wholesale market for access.

A 12.28 Therefore, ComReg is of the view that MVNOs would prefer Option 2 over Option 1.

Option 2A v Option 2B

A 12.29 Option 2B is the same as Option 2A except for the inclusion of an obligation where if LTE is deployed in the Proposed Bands, and where consumers using the Award Bands are also offered a mobile voice service, VoLTE technology must be enabled on the licensee's network and the base stations in the Award Bands and made available to consumers (including MVNO consumers) that have a VoLTE enabled handset to provide for additional QoS. Therefore, the extent to which stakeholders would prefer Option 2A or 2B may to some extent depend on whether it would additionally prefer the rollout of VoLTE on its network within an appropriate period. The time period for VoLTE rollout is discussed in Chapter 8.

MNOs

A 12.30 Under Option 2A, each new licensee would have full flexibility to choose whether to provide VoLTE to its consumers. A licensee could choose not to rollout VoLTE on its network or choose a rollout in line with demand for services. However, MNOs are likely to favour the rollout of VoLTE as it is likely to provide a number

¹³⁴⁶ The only respondent who disagreed at that time was Three, who was not in favour of that type of obligation which it considered to be more appropriate to a "core" mobile band.

Source: Document 15/140 – paragraph A9.90 and A9.91.

of benefits to MNOs. For example:

- a) the deployment of VoLTE would release additional spectrum for LTE services after the transition from 2G/3G services which are currently necessary in the provision of voice services;
- b) VoLTE provides greater spectral efficiency and capacity gains compared with conventional circuit-switched calls over legacy 2G and 3G networks. VoLTE has up to three times more voice and data capacity than 3G UMTS and up to six times more than 2G GSM¹³⁴⁷;
- c) VoLTE can provide operational savings for operators as it can run all services (voice and data) across the same infrastructure compared to having one for data and one for voice^{1348 1349};
- d) VoLTE should slow down revenue erosion towards OTT providers by leveraging the seamless use experience between all access networks without disruption even in the case of network congestion¹³⁵⁰;
- e) 5G requires MNOs to have VoLTE implemented in the network to enable 5G voice, so it would seem important to deploy VoLTE before the widespread introduction of 5G smartphones, which will also require voice service capabilities^{1351 1352} (i.e. 5G voice calls will not work via circuit-switched connections). All MNOs have begun rolling out its 5G network¹³⁵³;
- f) VoLTE offers improved voice call quality¹³⁵⁴ and would reduce consumer service issues relating to voice. Consumer switching

¹³⁴⁷Document 17/70r, 'Market Review Fixed Voice Call Termination and Mobile Voice Call Termination', published 2 November 2017, p75.

¹³⁴⁸<https://www2.deloitte.com/ie/en/pages/technology-media-and-telecommunications/articles/tmt-pred16-telecomm-volte-vowifi-capacity-reach-capability.html>

¹³⁴⁹ Network standards like UMTS open a dedicated channel between nodes to handle voice, text and data, in a technique called "circuit switching. VoLTE works over IP-based networks and supports packet switching which allows users to equally share bandwidth resources rather than dedicated channels.

¹³⁵⁰ Krussel, P (2016), 'Future Telco: Successful Positioning of Network Operators in the Digital Age' Springer, p144.

¹³⁵¹ <https://www.ericsson.com/en/digital-services/offerings/voice-services/voice-over-lte/why-deploy-volte-now>

¹³⁵² <https://www.nokia.com/blog/nokias-100th-volte-contract-and-why-it-matters-you/>

¹³⁵³ <https://n.vodafone.ie/network/5g.html>

<https://www.eir.ie/5G/>

<https://www.three.ie/5g.html>

¹³⁵⁴ Einashar, A & A. El-Saidny, M (2018), 'Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G: 1st Edition' Wiley.

related to voice call issues would therefore arguably be reduced. (See paragraphs A 12.55 – A 12.59 below); and

- g) VoLTE compatible handsets are becoming more widespread. For example, VoLTE is compatible with all iPhones from the iPhone 6 (released in 2015) onwards.¹³⁵⁵ In 2012, Samsung announced VoLTE will become available starting with the Galaxy S III LTE device.¹³⁵⁶ Samsung and Apple account for 72% of all smartphones.

A 12.31 For these reasons, operators in Ireland and other jurisdictions have already begun to roll out VoLTE. For example:

- a) a total of 272 operators are investing in VoLTE in 119 countries, including 211 operators with commercially launched VoLTE-HD voice service in 100 countries, up from 262 operators in 120 countries in August 2019.¹³⁵⁷
- b) in March 2019, Vodafone launched VoLTE across the entire country¹³⁵⁸ following trials in 2017¹³⁵⁹ and is the only operator providing VoLTE services in Ireland on the iPhone, Samsung and Huawei phones.¹³⁶⁰
- c) Eir and Three also announced that they intend to rollout VoLTE services.^{1361, 1362}
- d) mobile operators, through TIF, have indicated that the commercial implementation of VoLTE was planned by all operators for 2018.¹³⁶³

A 12.32 MNOs are likely to be concerned that the time period allowed for rollout would need to be sufficient to provide for a successful rollout. In that regard, Document

¹³⁵⁵ <https://support.apple.com/en-ie/HT203078>

¹³⁵⁶ <https://news.samsung.com/global/samsung-ready-to-launch-worlds-first-voice-over-lte-smartphone>

¹³⁵⁷ HD-Voice - VoLTE - VoWi-Fi - VoLTE Status March 2020-Executive Summary, <https://gsacom.com/paper/volte-status-march-2020/> (August 2019 update available at: <https://gsacom.com/paper/volte-vilte-global-market-update/>)

¹³⁵⁸ <https://www.siliconrepublic.com/comms/volte-vodafone-voice-over-4g-wi-fi-5g>
<https://n.vodafone.ie/network/wi-fi-calling.html>

¹³⁵⁹ <https://www.independent.ie/business/technology/vodafone-switches-on-volte-service-on-its-network-35973395.html>

¹³⁶⁰ <https://support.apple.com/en-ie/HT204040>

¹³⁶¹ <https://www.siliconrepublic.com/comms/huawei-eir>
<https://www.siliconrepublic.com/comms/eir-mobile-network-investment-ireland-4g-5g>

¹³⁶² <https://www.irishtimes.com/business/retail-and-services/revenue-slips-10-at-mobile-operator-three-1.3176901>

¹³⁶³ Mobile Phone & Broadband Taskforce Quarterly Progress Report Q1 2018. Since renamed Telecoms Industry Ireland (TII), see <https://www.ibec.ie/connect-and-learn/industries/technology-telecoms-and-audiovisual/telecommunications-industry-ireland>

19/59R noted that the transition will take time (depending on the operator), as the nature of the technology is complex and there are a variety of network and operational support system challenges^{1364,1365} to successfully launch and operate. If VoLTE was deployed over too short a period, the quality of voice calls could deteriorate particularly where voice calls must fall back on 2G/3G networks when 4G networks are unavailable (e.g. rural areas where 4G coverage is lower).^{1366 1367}

- A 12.33 However, all MNOs committed to rollout VoLTE by end 2018. Therefore, while Eir and Three have not yet rolled out VoLTE¹³⁶⁸, the transition process is likely to be sufficiently developed such that the launch of VoLTE should not take longer than the 2 years after licence commencement proposed by ComReg in Chapter 8. For example, Eir has already rolled out Native Wi-Fi so they will have already deployed an IP Multimedia Subsystem¹³⁶⁹ (IMS) and introducing VoLTE should be an obvious next step in order to maximise service provision from the IMS.
- A 12.34 In light of the above, Vodafone would likely be indifferent as to whether Option 2A or 2B is chosen as it has already rolled out VoLTE across the entire country. In its response to Document 19/124, Vodafone confirms that a VoLTE requirement is appropriate for the Proposed Award.
- A 12.35 Alternatively, while Eir submits in its response to Document 19/59R¹³⁷⁰ that a VoLTE obligation seems reasonable, it claims that it has not had the time to validate the network for VoLTE in order to measure performance against the proposed targets. Therefore, notwithstanding Eir's view that ComReg's proposal is reasonable, Eir would likely prefer Option 2A to manage its own rollout of

¹³⁶⁴ For example:

- **Call handover** - Where a user has initiated a call in an LTE cell but moved out of LTE coverage mid-call, the call must be seamlessly handed over from LTE to the 2G/3G voice network.
- **End-to-end quality of service** – Voice being real time in nature, any degradation in network performance can have a noticeable impact on call quality. The network has to be optimally tuned to ensure voice packets get the highest priority for duration of call.
- **QoS** - as customers move to the edge of the cell, low reliability of the connection and interference from neighbouring cells can result in dropped calls.

¹³⁶⁵ The recommended ITU-T G.1028 "End-to-end QoS for voice over 4G mobile networks" was developed by ITU's standardization expert group for 'performance, QoS and QoE', ITU-T Study Group 12. ITU-T G.1028 offers guidance on the factors impacting the end-to-end performance of "managed" voice applications over LTE networks and how the impacts of these factors should be assessed.

¹³⁶⁶ Three in its response to Document 19/124 agrees and suggests a minimum rollout period of 3 years.

¹³⁶⁷ For example, transferring voice calls between LTE 'packet switched' to legacy 2G/3G 'circuit switched' can compromise quality of service and dropped calls. The use of 2G/3G technologies will likely be required until LTE coverage matches that of 2G/3G.

¹³⁶⁸ ComReg notes that [].

¹³⁶⁹ The IP Multimedia Subsystem (IMS) provides the technical means for operators to transfer core services (voice, video and messaging) to an all-IP LTE environment.

¹³⁷⁰ Eir has not provided updated views in response to Document 19/124.

VoLTE.

- A 12.36 Similarly, Three observed that such services would be introduced when the customer experience over a mobile network is as good as circuit-switched voice. Three submits ComReg is seriously mistaken about the QoS offered through VoLTE services. It states in response to Document 19/124 that if VoLTE was a suitable replacement for circuit switched voice, then MNOs would have generalised its implementation already on the vast majority of their customer base as this would have allowed for the re-farming of spectrum to LTE. Three claims that in the short term (3-5 years), it will not be possible to maintain and guarantee the minimum dropped call and call blocking rates currently experienced by MNOs providing the service with circuit switched calls.
- A 12.37 First, ComReg notes that the benefits of VoLTE for QoS are well established as summarised at paragraph 12.30 above. Furthermore, ComReg notes that Three UK has been using VoLTE (“4G Super-Voice”) in the United Kingdom since 2016 and has previously set out the benefits of same, including better coverage and removal of dropped calls.¹³⁷¹
- A 12.38 Second, in relation to Three’s claim that it would not be possible to maintain and guarantee the minimum dropped and blocking call rates, ComReg notes that if implemented correctly over the time period provided (see Chapter 8) there is no reason why dropped call rates would be higher than existing circuit switched calls given that VoLTE is a more efficient technology for delivering voice services. Furthermore, ComReg notes that this does not require an operator to fully replace existing voice services with VoLTE as there will be an ongoing need for 4G circuit-switched fallback to 2G or 3G networks to account for devices that are not compatible or where 4G coverage has yet to be provided (but 2G/3G is available).
- A 12.39 Therefore, on balance, even though all three MNO’s have publicly stated their intention to rollout VoLTE, each would appear to prefer different options. Eir and Three appear to prefer Option 2A while Vodafone would prefer 2B (noting that Eir and Three may prefer Option2B if a longer period was provided to implement same.)

New Entrants

- A 12.40 Any potential New Entrant is likely to prefer an option which gives it maximum flexibility in its choice of business model in line with its commercial strategy and therefore Option 2A could be preferred over Option 2B. However, given that such an entrant would be unlikely to rollout a 2G/3G network to provide voice services, it would likely rollout VoLTE in tandem with the rollout of its network more

¹³⁷¹ <http://www.three.co.uk/hub/4g-super-voice/>

generally in order to provide voice services. In effect, a New Entrant may be indifferent as to whether Option 2A or 2B is chosen since the rollout of VoLTE would coincide with the rollout of its coverage network which is subject to a separate rollout obligation. (i.e. VoLTE would always be active across all its sites).

MVNOs

- A 12.41 An MVNO would likely prefer the option that maximises the amount of services that can be provided to consumers. In that regard, it would be unlikely to prefer Option 2A over Option 2B as this could unduly lead to a delay in the provision of VoLTE to its customers. MVNOs would likely prefer Option 2B but only to the extent to that it would not compromise the provision of voice services more generally.

Impact on competition

Option 1 v Option 2

- A 12.42 QoS is an important aspect of competition and represents a key non-price consideration that determines how consumers choose their mobile phone provider and/or switch away from existing providers. While 21% of consumers cite price as a reason for selecting their preferred mobile operator, 20% of respondents cite quality of service issues such as coverage and network reliability.¹³⁷² In effect, both quality and price are important aspects of competition in mobile markets and a decrease in QoS (where price is unchanged) could be as harmful to consumer welfare as an increase in price (where QoS is unchanged).
- A 12.43 Competition in relation to prices is normally straightforward (i.e. prices fall as competition increases). Typically, competition also has a positive impact on QoS as operators begin to compete more vigorously in relation to quality attributes. Moreover, quality considerations can also drive innovation within the market, thereby improving dynamic efficiency. For example, to improve efficiencies as well as the QoS provided to consumers, operators are looking to other solutions and technologies such as VoLTE¹³⁷³ and Native Wi-Fi¹³⁷⁴ to improve their voice call service. Further the rollout of Native Wi-Fi and/or VoLTE by certain operators should encourage others to do the same, increasing competition further.
- A 12.44 However, under certain circumstances, increased competition could cause a stagnation or a reduction in QoS, if price competition becomes too intense and

¹³⁷² Mobile Consumer Experience Survey 2019, Document 19/101, Slide 37.

¹³⁷³ <https://n.vodafone.ie/network.html>

¹³⁷⁴ <https://www.eir.ie/wificalling/>

the need to reduce prices for less efficient operators causes it to sacrifice investment or reduce costs to the detriment of quality. While such a scenario would appear unlikely to arise, given the preference consumers place on quality in relation to mobile services, it cannot be ruled out in the future, particularly for any New Entrants who would be aiming to establish market share.

A 12.45 Furthermore, as noted previously, it is difficult for MNOs to differentiate their services and compete based on voice call QoS because of the difficulty in identifying the source of poor voice call standards. For example:

- i. Individual MNOs may find it difficult to isolate the higher quality standards applied to voice calls on their own network from the lower quality standards applied on other networks; and
- ii. Consumers who experience poor voice call quality cannot determine whether the problem relates to their own network or to the network of the person on the other end of the line.

A 12.46 An MNO with a high level of QoS may not reap the rewards from efficient investments or be aware that voice calls are not being delivered in line with its network expectations. This could result in consumers forming views on voice call QoS that may not be related to the underlying performance of the network but rather based on misperceptions arising from the poor QoS from a different MNO. Switching activity resulting from such misconceptions would not necessarily enhance consumer welfare since poor voice call QoS can affect all operators to a similar extent, albeit unknown to individual consumers.

A 12.47 This could be particularly damaging to competition because a consumer's decision to switch would be based on a substantial information asymmetry (namely that the consumer would not be aware that poor voice QoS relates to the other caller's network). Further, there is no switching activity that would improve the situation for consumers since poor voice QoS would affect all operators to a similar extent, albeit unknown to individual consumers.

A 12.48 Moreover, reputational impacts, in and of themselves, are an important aspect of competition. For example, 27% of consumers cite 'Good Reputation' as a reason for choosing their current mobile provider.¹³⁷⁵ However, competition requires that such reputations are based on actual performance or perceptions of same rather than consumers being uninformed about a particular aspect of their service provision and the substantial information asymmetry has the effect of undermining competition on the basis of voice call QoS.

A 12.49 Finally, given that the mix of spectrum available in this award may be attractive to a New Entrant, any such New Entrant under Option 1 would not be obliged to

¹³⁷⁵ Mobile Consumer Experience Survey 2019, Document 19/101, Slide 37.

have any minimum voice call QoS standards. Such a New Entrant may decide to compete strongly on price to the detriment of QoS in order to gain market share. This would create a situation where incumbent MNOs are obliged to provide a minimum voice call QoS under existing licences¹³⁷⁶ and compete with a New Entrant that has no such obligation.

A 12.50 Alternatively, the provision of a minimum voice call standard would ensure that any competition on price would not come at the cost of unacceptably low QoS levels. Under Option 2A and 2B, all MNOs (incumbents and New Entrants) would be subject to a minimum QoS obligation. This would provide several benefits that would likely promote competition better than Option 1. For example:

- a) It would allow price competition to take place without voice call QoS falling below certain minimum standards.
- b) Consumers would make better selection and switching decisions by reducing the extent to which such decisions would be based on unreliable or incorrect information.
- c) New Entrants would have the same voice call QoS obligation as incumbent MNOs using other bands and would have to compete on the same basis.
- d) It would promote efficient investment and innovation in new and enhanced infrastructures by facilitating MNOs to make investments in the knowledge other MNOs would be subject to a minimum obligation in relation to voice call QoS.

A 12.51 Therefore, ComReg is of the view that, on balance, Option 2 (2A or 2B) would have a more positive impact on competition than Option 1.

Option 2A V Option 2B

A 12.52 ComReg assesses the impact of Option 2A and Option 2B on competition under the following headings:

- Distortions to competition;
- Maximising benefits to consumers; and
- Efficient use of the radio spectrum.

¹³⁷⁶ As noted above, MNOs are already subject to minimum QoS standards under current Liberalised Use Licences.

Distortions to competition

- A 12.53 Option 2B would only apply to operators that rolled out an LTE network. In that regard, if one or more operators failed to rollout VoLTE having already rolled out an LTE network, it could represent a distortion or restriction of competition which would not promote the interests of users in terms of price, choice and quality of service. Such distortions could arise depending on how competition across bundles and the components of those bundles evolves.
- A 12.54 For example, consumers are much more likely to choose/switch to an operator based on monthly access charges, the prices of calls and the volume of minutes and data in bundles. Under Option 2A, if competition for a specific aspect of a consumer's bundle (i.e. voice call QoS) is weak relative to the provision of other aspects of the bundle (e.g. data), QoS improvements such as VoLTE may be unreasonably delayed or not passed through to the customer. While such a situation is unlikely to arise (all MNOs have committed to the rollout of VoLTE), Option 2B would provide greater protections against distortions of competition compared to Option 2A.

Consumer benefits

- A 12.55 ComReg notes that the full benefits of VoLTE would not be provided unless both ends of the call are delivered through LTE. For example, to make a VoLTE call using an iPhone (which accounts for a third of all phones)¹³⁷⁷ both ends of the call need to have VoLTE enabled.¹³⁷⁸ Under Option 2A, operators could delay or avoid the rollout of VoLTE meaning that significant portions of calls would have a lower standard of voice calls regardless of whether other operators rolled out VoLTE or not.
- A 12.56 While a VoLTE to 3G call (as may occur under Option 2A) improves call quality compared to a 3G to 3G call¹³⁷⁹ a VoLTE to VoLTE call (as would arise under Option 2B) maximises the voice quality for all callers.¹³⁸⁰ In particular:
- the call set up latency for VoLTE to 3G call is higher than in VoLTE to VoLTE call (even in near cell conditions).¹³⁸¹
 - a higher call latency can lead to broken voice or echo on the call.

¹³⁷⁷ Mobile Consumer Experience Survey 2019, Document 19/101, Slide 43.

¹³⁷⁸ <https://support.apple.com/en-ie/HT203078>

¹³⁷⁹ Einashar, A & A. El-Saidny, M (2018), 'Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G: 1st Edition' Wiley, p177.

¹³⁸⁰ Ibid.

¹³⁸¹ Ibid.

- a VoLTE to 3G call can experience higher delays (e.g. call setup) due to the circuit switched part of the call. ¹³⁸²

A 12.57 These benefits from VoLTE arise because the call setup is conducted within the same radio access network and there is no need to fall back to UMTS at the call set up stage, reducing the possibility for dropped calls. Additionally, the signalling speed in LTE on the radio interface is faster than in 3G and fewer signalling messages are needed to establish the call. ^{1383, 1384}

A 12.58 Option 2B would provide protection that VoLTE would be provided by all operators and encourage the timely rollout of VoLTE. This would promote competition and maximise the benefits for consumers in terms of price, choice and quality by ensuring that the benefits of introducing new services would not be limited through lack of innovation on the part of other operators or New Entrants.

A 12.59 Further, Option 2B would reassure network operators that they will not face the risk of one or more operators compromising the ability of the market to deliver consumer benefits across the entire market. This would encourage efficient investment in enhanced infrastructure, promoting innovation and ensuring the efficient use and effective management of the radio frequency spectrum.

Efficient use of the radio spectrum

A 12.60 A key objective in designing and carrying out this award process is to encourage the efficient use and ensure the effective management of the radio spectrum in order to promote competition and maximise the benefits for consumers in terms of price, choice and quality. ComReg has a statutory objective of promoting competition by means of ensuring the efficient use of spectrum.

A 12.61 In that regard, VoLTE optimises the spectral efficiency of mobile voice using LTE and delivers voice calls more efficiently. VoLTE provides significant spectral efficiency improvements compared to 2G/3G networks by using 3 times less spectrum for the same quality voice call¹³⁸⁵. Accordingly, Option 2B and the introduction of VoLTE across all networks would promote competition by encouraging more efficient use of spectrum resulting in more spectrum resources for the provision of high growth services (i.e. data) as only a limited amount of spectrum is required for voice service provisioning.

A 12.62 This can provide important benefits by allowing spectrum refarming to occur

¹³⁸² Ibid.

¹³⁸³ Ibid, p175.

¹³⁸⁴ See also Recommendation ITU-T G.1028 provides guidelines concerning the key ... performance of managed voice applications over LTE network.

¹³⁸⁵ Ibid.

earlier than might be otherwise the case, this may bring about significant benefit for consumers and potential cost savings for operators by facilitating transition to more spectral efficient technologies and ensuring scarce spectrum resources can be allocated for data, IoT and other services which are growing at a faster rate than voice.¹³⁸⁶ This has clear advantages in terms of promoting spectrum use and related services, and in turn intensifying competition in downstream markets.

A 12.63 Considering the above, ComReg is of the view that Option 2B would, on balance, better promote competition than Option 2A.

Impact on consumers

A 12.64 The ability to make or receive voice calls remains a highly utilised service and a key priority for consumers. Voice remains the most popular service used by consumers when using their mobile phones with 93% of consumers using their mobile phone to make voice calls (higher than text 90% and data 78%).¹³⁸⁷ For example, in Q2 2020, mobile minutes reached peak levels at nearly 3.7 billion minutes for that quarter.¹³⁸⁸ Further the main outdoor service issues across all types of consumers (rural and urban) relate to voice calls. For example, of respondents who experienced service issues outside the home 46% believed that the quality of reception deteriorated when on a call.¹³⁸⁹

Option 1 v Option 2

A 12.65 Consumers would likely prefer any option which ensures that they receive a minimum voice call QoS (Option 2A and 2B) over an option which relies solely on market forces or the goodwill of individual operators (Option 1), as long as the preferred option does not otherwise result in reduced benefits in terms of price, choice and quality.

A 12.66 Further, as voice calls can originate and terminate on different networks, under Option 1 a consumer who experiences poor voice call quality cannot determine whether the problem relates to his/her own network or to the network of the person on the other end of the line. Consequently, consumers would not be in a position to make informed choices based on the quality of voice calls.

A 12.67 Under Options 2A and 2B, setting minimum QoS standards for voice calls will promote the interests of consumers:

¹³⁸⁶ For example, data usage volumes increased by 49.5% in the last year. ComReg Quarterly Key Data Portal.

¹³⁸⁷ Mobile Consumer Experience Survey 2019, Document 19/101, Slide 50.

¹³⁸⁸ ComReg Quarterly Key Data Portal. Mobile minutes remained high in Q3 2020 at 3.4 billion minutes.

¹³⁸⁹ Mobile Consumer Experience Survey 2019, document 19/101, Slide 89.

- a) it provides a minimum QoS voice call obligation to all MNOs which should ensure that the standard of voice calls does not fall below a certain level;
- b) this allows consumers to make more informed decisions about choosing a service provider and/or switching to an alternative provider;
- c) the standards under current Liberalised Use Licences¹³⁹⁰ would be applied to future technologies maintaining voice call standards at current levels, at a minimum; and
- d) it would ensure that services provided by New Entrants would be subject to a minimum voice call QoS standard.

A 12.68 Further, the voice call QoS obligation would apply to any technology used by operators to deliver the managed voice service (e.g. VoLTE, Native-Wi-Fi, etc.). This would encourage operators to appropriately validate and test new technologies prior to rollout.

A 12.69 Therefore, consumers are unlikely to prefer Option 1 over Option 2A or Option 2B.

Option 2A v Option 2B

A 12.70 Option 2B provides the same benefits as Option 2A with the additional protection that all operators would provide VoLTE within an appropriate time period. VoLTE also offers several benefits to consumers that may not arise for all consumers under Option 2A. These include:

- a) the best voice quality compared to OTT and circuit-switched voice calls. LTE with a speech rate of 12.65 kbps falls within the range of 'good quality' specified in ITU-T P.863. On the other hand, 3G and OTT falls within the range of 'Acceptable Quality' while 2G falls into 'poor quality'¹³⁹¹;
- b) quicker call set-up times (0.9 – 2.2 seconds) compared to 3G circuit-switched networks (4 – 6 seconds)¹³⁹²;
- c) seamless use of different applications as VoLTE enables customers to make high quality voice calls while simultaneously using 4G data,

¹³⁹⁰ The Liberalised Use Licences in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz frequency bands.

¹³⁹¹ Einashar, A & A. El-Saidny, M (2018), 'Practical Guide to LTE-A, VoLTE and IoT: Paving the way towards 5G: 1st Edition' Wiley, p212 – 213.

¹³⁹² Holma, H, Toskalka, A & Reunanen (2016) 'LTE Small Cell Optimization: 3GPP Evolution to Release 13' John Wiley and Sons, p 404.

(e.g. to access information (maps, banking, documents) while talking to someone over the phone)¹³⁹³;

- d) compared to using OTT Voice apps, VoLTE calls use less battery resources. Many factors affect battery life, but VoLTE uses network resources more efficiently such that, all else being equal, a battery will last longer.¹³⁹⁴

A 12.71 While operators are likely to aim to prevent any disruption to voice services in order to retain and attract consumers there are situations where setting more specified QoS standards may be necessary in order to protect consumers. For example, ComReg notes that consumer experience regarding voice connectivity has deteriorated since 2017. In 2019, 35% of consumers have experienced voice issues compared to 31% in 2017¹³⁹⁵. In that regard, consumers would likely prefer Option 2B as it gives additional protections above Option 2A.

A 12.72 Further and as noted in the 'Impact of competition' above the benefits referred to in the preceding paragraph would not be fully realised unless all MNOs transition to VoLTE.

A 12.73 Therefore, ComReg is of the view that consumers are likely to prefer Option 2B over Option 2A.

Preferred Option

A 12.74 In light of the preceding discussion, ComReg is of the view that, on balance, Option 2B should be preferred over the other options, in terms of its overall impact on stakeholders, competition and consumers.

A12.3 The 'Network Availability' RIA

A 12.75 This section sets out the 'Network Availability' RIA. The focus of this RIA is to identify the impact of the regulatory options under consideration on stakeholders (including existing operators, potential New Entrants, and consumers) and on competition and, in so doing, to identify the option that would best achieve ComReg's objectives.

Policy Issue and Objectives

A 12.76 The policy issue to be addressed in this RIA is whether a network availability

¹³⁹³ <https://www.ericsson.com/en/digital-services/offerings/voice-services/voice-over-lte/why-deploy-volte-now>

¹³⁹⁴ <https://www.nokia.com/blog/why-operator-volte-beats-ott-voip/>

¹³⁹⁵ Mobile Consumer Experience Survey 2017, Document 17/100a, Slide and Mobile Consumer Experience Survey 2019, Document 19/101, Slide 73.

condition should be imposed on holders of liberalised licences in the 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands, in order to ensure that any periods during which a licensee's network is unavailable do not exceed a specified level.

A 12.77 ComReg's overall powers, functions, duties and objectives in relation to the management of the radio frequency spectrum in Ireland are set out in Annex 2. The most relevant objectives in terms of QoS (Network Availability) is to ensure that all users derive maximum benefit in terms of price, choice and quality from the spectrum to be made available in the Proposed Award.

Identifying the regulatory options

A 12.78 ComReg has identified the following options:

- **Option 1:** Do not impose minimum QoS conditions in respect of the availability of the network.
- **Option 2:** Set minimum QoS conditions in respect of the availability of the network, based on current liberalised use licence conditions, such that each licensee shall ensure that service unavailability shall be less than 35 minutes¹³⁹⁶ (based on weighting factors) per six month period.

Impact on stakeholders

A 12.79 Option 1 would allow operators full discretion over how often and how long their networks may be unavailable (e.g. for the purposes of systems upgrades etc.).

A 12.80 Option 2 may require network operators to incur additional expenditure in their networks to ensure compliance with obligations (e.g. back-up systems) over and above the level which they would choose to incur, absent the licence condition. However, operators may be of the view that such conditions improve the perception of the network and such benefits are likely to exceed any compliance costs. Furthermore, as noted above, respondents to the 3.6 GHz Award¹³⁹⁷ consultation were generally in favour of such obligations. Also, MVNOs are likely to prefer Option 2 over Option 1 (for the same reasons as set out in paragraph A 12.27 above). In response to Document 19/124, Three proposes that the network availability should exclude those periods that have arisen as a result of weather conditions for which Met Eireann have issued a weather warning.

A 12.81 Therefore, operators appear, on balance, to be indifferent as to whether Option

¹³⁹⁶ This is based on the network availability licence condition in the Liberalised Licences for spectrum rights in the 800 MHz, 900 MHz, 1800 MHz and 3.6 GHz bands.

¹³⁹⁷ See Document 15/140.

1 or 2 is chosen.

Impact on competition

A 12.82 Neither option is likely to impact materially on competition as any conditions imposed would apply equally to all licensees. Option 1 could, however, result in less competitive intensity in terms of network availability than would occur under Option 2, for the reasons described in the above 'Voice Call Services' RIA.

Impact on consumers

A 12.83 Network availability is of fundamental importance to consumers. If any network is unavailable, subscribers on that network cannot use services. Consumers face serious disruption if the network to which they are subscribed is unavailable. The longer the period of unavailability, the greater the level of disruption. Setting a licence condition relating to network performance would safeguard the interests of consumers against operators who might otherwise have an unacceptably high level of network unavailability. Option 2 would ensure that consumers would be protected against an unreasonable level of disruption to services. Further, ComReg notes that any adjustment to QoS conditions would provide poor incentives for operators to deliver a minimum QoS standard when such a standard is likely to be most required. Consumers would be unlikely to prefer the inclusion of such a provision.

A 12.84 Under Option 1, operators may, amongst other things, have an incentive to undertake lower levels of investment in their networks in terms of operability than would otherwise be the case, or to impose unreasonable levels of disruption on their customers when undertaking systems upgrades, etc.

A 12.85 The QoS obligation imposed under Option 2 would apply to licensees which means, in turn, that licensees would need to ensure that third parties using their network assist it in achieving compliance as appropriate. As a result, all consumers regardless of the provider would benefit from the obligation.

A 12.86 For these reasons, consumers would most likely prefer Option 2 whereby all licensees are required to ensure that the overall duration of network unavailability does not exceed a specified level, assuming that this requirement does not otherwise result in reduced benefits in terms of price, choice and quality.

Preferred Option

A 12.87 In light of the preceding discussion, ComReg is of the view that, on balance, Option 2 should be preferred over Option 1, in terms of its overall impact on stakeholders, competition and consumers.

Annex: 13 Technical Conditions

A13.1 Introduction

- A 13.1 In line with its consideration of the technical conditions in Chapter 8 of this document, ComReg sets out in this Annex the technical conditions for the 700 MHz Duplex, the 2.1 GHz Band, the 2.3 GHz Band and the 2.6 GHz Band in accordance with the relevant EC Decisions¹³⁹⁸, and in the case of 2.3 GHz, the relevant ECC Decision.

A13.2 MFCN Cross Border Compatibility

- A 13.2 ComReg has engaged with neighbouring administrations, particularly with Ofcom in the UK, to coordinate and agree cross border arrangements to address the deployment of MFCN/ECS in the Award Bands. These cross-border agreements take the form of a Memorandum of Understanding (MoU)¹³⁹⁹ and aim to cater for the deployment of both 4G and 5G services, taking into account the latest CEPT reports regarding cross border coordination of these systems. ComReg provides details of all such MoU on its website¹⁴⁰⁰.
- A 13.3 Any bidder that successfully acquires spectrum rights of use in the Award is obliged to comply with the planning arrangements agreed in all relevant cross border Memoranda of Understanding (MoU).

A13.3 Guard band emission limits

- A 13.4 Guard bands shall not be implemented between assignments, be that on a FDD, TDD or other mode basis. Licensees are required to ensure compatibility with neighbouring licensees within their own spectrum assignments which ensures spectrum efficiency and maximises the quantum of spectrum available for use.

A13.3 The 700 MHz Duplex

- A 13.5 In accordance with the 700 MHz EC Decision, the technical conditions applicable to any new rights of use in the 700 MHz Duplex are set out below.

¹³⁹⁸ ComReg will update the Draft Regulations (as set out in Annex 2 of Document 20/32) as appropriate to reflect the technical conditions set out in this annex.

¹³⁹⁹ [Cross border Memorandum of Understanding \(MoU\)](#)

¹⁴⁰⁰ International Spectrum MoUs available at www.comreg.ie.

In-block Power limits

Base station power limits

- A 13.6 The maximum mean EIRP in-block power limit of 64 dBm/5 MHz per antenna applies, given that this limit is considered sufficient for the provision of likely services within the band. This in-block power limit is applicable to all base stations within the operators' assigned blocks.

Out-of-Block Power Limits

Baseline Power Limits

- A 13.7 The 700 MHz Duplex will be awarded in 2 × 5 MHz blocks in line with a measurement bandwidth of 5 MHz¹⁴⁰¹ outlined in the 700 MHz EC Decision. This measurement bandwidth applies to out-of-block emissions in both the uplink blocks in the range of 703 – 733 MHz and the downlink blocks in the range of 758 – 788 MHz. The base station baseline power limit applies as follows:

- a) for uplink frequencies in range 698 – 736 MHz, a maximum mean EIRP limit of -50 dBm per cell¹⁴⁰² across a 5 MHz measurement bandwidth shall apply;
- b) for uplink frequencies as defined in the 700 MHz EC Decision (i.e. 832 – 862 MHz), a maximum mean EIRP limit of -49 dBm per cell across a 5 MHz measurement bandwidth shall apply;
- c) for downlink frequencies in the range 738 – 791 MHz, a maximum mean EIRP of 16 dBm per antenna across a 5MHz measurement bandwidth shall apply;
- d) for downlink frequencies as defined in the 700 MHz EC Decision (i.e. 791 – 821 MHz), a maximum mean EIRP limit of 16 dBm per antenna across a 5 MHz measurement bandwidth shall apply; and
- e) for frequencies below 694 MHz where DTT broadcasting is protected, a maximum mean EIRP limit of -23 dBm per cell across an 8 MHz measurement bandwidth is required.

Transitional Power Limits

- A 13.8 The transitional power limits for downlink only blocks in the frequency range 733

¹⁴⁰¹ The 700 MHz EC Decision also provides for a measurement bandwidth of 3 MHz or 200 kHz for the protection of block size of 3 MHz depending on the national implementation options.

¹⁴⁰² In a multi-sector site, the value per "cell" corresponds to the value for one of the sectors.

– 788 MHz are as follows:

- a) for -10 to -5 MHz offset from lower block edge or 5 to 10 MHz offset from the upper block edge, a limit of 18 dBm maximum mean EIRP per antenna shall apply across a 5 MHz measurement bandwidth; and
- b) for -5 to 0 MHz offset from lower block edge or 0 to 5 MHz offset from the upper block edge, a limit of 22 dBm maximum mean EIRP per antenna shall apply across a 5 MHz measurement bandwidth.

A 13.9 For a block in frequency range 788 – 791 MHz, with an upper edge at:

- a) 788 MHz, a 21 dBm maximum mean EIRP limit per antenna shall apply across a 3 MHz measurement bandwidth;
- b) 783 MHz, a 16 dBm maximum mean EIRP limit per antenna shall apply across a 3 MHz measurement bandwidth;
- c) 788 MHz for protection of systems with bandwidth < 3 MHz, a 11 dBm maximum mean EIRP limit per antenna shall apply across a 200 kHz measurement bandwidth; and
- d) 783 MHz for protection of systems with bandwidth < 3 MHz, a 4 dBm maximum mean EIRP limit per antenna shall apply, across a 200 kHz measurement bandwidth.

A 13.10 For a block in the frequency range 791 – 796, with upper edge at:

- a) 788 MHz, a 19 dBm maximum mean EIRP limit per antenna shall apply across a 5 MHz measurement bandwidth; and
- b) 791 – 796 MHz for a block with upper edge at 783 MHz, a 17 dBm maximum mean EIRP limit per antenna shall apply across a 5 MHz measurement bandwidth.

A 13.11 For a block in the frequency range 796 – 801 MHz, with upper edge at 788 MHz, a 17 dBm maximum mean EIRP limit per antenna shall apply across a 5 MHz measurement bandwidth.

Guard Band Base Station Power Limits

A 13.12 Base station limits for part of the guard bands not used for PPDR or M2M radio communications, i.e. 694 – 703 MHz and 788 – 791 MHz shall be implemented in accordance with the 700 MHz EC Decision, as follows:

- a) a maximum mean EIRP limit of -32 dBm per cell across 1 MHz shall apply to spectrum between the lower band edge of the 700 MHz

frequency band and FDD uplink lower band edge (i.e. 694 – 703 MHz); and

- b) a maximum mean EIRP limit of 14 dBm per antenna across 3 MHz shall apply to spectrum between FDD downlink upper band edge and the FDD downlink lower band edge as defined in the 700 MHz EC Decision (i.e. 788 – 791 MHz).

Duplex Gap Power limit

A 13.13 A base station power limit is defined in the 700 MHz EC Decision for part of the duplex gap not used for PPDR or M2M. Although provision for these services in the paired frequency range 733 – 736 / 788 – 791 MHz has not been made as part of this process, the following power limits of the duplex gap (733 – 738 MHz), in line with the 700 MHz EC Decision shall apply as follows:

- a) for -10 to 0 MHz offset from FDD downlink lower band edge or lower edge of the lowest downlink-only block, but above FDD uplink upper band edge, a 16 dBm maximum mean EIRP limit per antenna shall apply across 5 MHz; and
- b) for more than 10 MHz offset from FDD downlink lower band edge or lower edge of the lowest downlink-only block, but above FDD uplink upper band edge, a -4 dBm maximum mean EIRP limit per antenna shall apply across 5 MHz.

Terminal station

Terminal station in-block power limit

A 13.14 The 700 MHz EC Decision defines a maximum mean in-block power limit of 23 dBm¹⁴⁰³ for terminal stations. The in-block power limit may be relaxed in certain situations including for fixed terminal stations in rural areas, provided that protection of other services, networks and applications is not compromised, and cross-border obligations are fulfilled.

Terminal station out-of-block (lower edge) power limit

A 13.15 A Total Radiated Power¹⁴⁰⁴ (TRP) limit for terminal stations operating in the uplink band (i.e. 703 – 733 MHz) applicable to the guard band between the upper limit of spectrum used for television broadcasting (694 MHz) and FDD uplink

¹⁴⁰³ This value is subject to a tolerance of up to +2 dB, to take account of the operation under extreme environmental conditions and production spread.

¹⁴⁰⁴ TRP is a measure of how much power the antenna actually radiates. The TRP is defined as the integral of the power transmitted in different directions over the entire radiation sphere.

(694 –703 MHz) and used for television broadcasting (below 694 MHz) is implemented as follows:

- a) for 694 – 698 MHz, a -7 dBm maximum mean out-of-block EIRP across 4 MHz;
- b) for 698 – 703 MHz, a 2 dBm maximum mean out-of-block EIRP across 5 MHz; and
- c) for 470 – 694MHz, a -42 dBm maximum mean out-of-block power across 8 MHz.¹⁴⁰⁵

Terminal station out-of-block (upper edge/duplex gap) power limit

A 13.16 The terminal station power limits for the duplex gap between FDD uplink and FDD downlink:

- a) for 733 – 738 MHz, a 2 dBm maximum mean out-of-block EIRP across 5 MHz;
- b) for 738 – 753 MHz, a -6 dBm maximum mean out-of-block EIRP across 5 MHz; and
- c) for 753 – 758 MHz, a -18 dBm maximum mean out-of-block EIRP across 5 MHz.

A 13.17 ComReg notes that the derived spectrum mask described above is specified in clause 4.2.3 of ETSI EN 301 908-13 v6.2.1¹⁴⁰⁶ which ensures that LTE based equipment would inherently comply with these limits.

Terminal station – protection to the frequency range 470 – 694 MHz

A 13.18 A licensee with spectrum rights of use starting at 703 MHz and having been assigned more than 2 × 10 MHz of spectrum rights in the 700 MHz Duplex, shall ensure that the terminal station bandwidth is no greater than 10 MHz in order to meet the conditions as set out in Table 12 of the Annex to the 700 MHz EC Decision to provide protection to the frequency range 470 - 694 MHz;

¹⁴⁰⁵ If an applicant were to win more than 10 MHz of spectrum in the 700 MHz Duplex band, refer to Chapter 5, paragraph (footnoted in Section 5.2) of this document which outlines the applicable licence obligations.

¹⁴⁰⁶ ETSI Standard [EN 301 908-13 v6.2.1](http://www.etsi.org), available at www.etsi.org

A13.5 The 2.1GHz Band

A 13.19 In accordance with 2.1 GHz EC Decision, as amended¹⁴⁰⁷ the technical conditions applicable to any new spectrum rights of use in the 2.1 GHz band. are set out below.

In-block Power Limits

Base station power limits

A 13.20 An in-block non-AAS power limit of 64 dBm/5MHz per antenna is applicable to all base stations within the operator's assigned blocks¹⁴⁰⁸.

A 13.21 An in-block AAS TRP limit of 57 dBm/5MHz per cell¹⁴⁰⁹ in the FDD downlink band is applicable to all base stations within the operator's assigned blocks.

A 13.22 ComReg considers these limits to be sufficient for the provision of likely services in the band taking into account current base station deployment in 2.1 GHz Band.

Out-of-Block Power Limits

Baseline Power Limits

A 13.23 For frequencies spaced more than 10 MHz from the lower or upper block edge, a 9 dBm/5MHz Non-AAS mean EIRP limit per antenna shall apply.

A 13.24 For frequencies spaced more than 10 MHz from the lower or upper block edge, a 1 dBm/5MHz AAS mean TRP limit per cell shall apply.

Transitional Requirements

A 13.25 The following transitional power limits for non-AAS base stations shall apply:

- a) for -10 to -5 MHz offset from lower block edge or +5 MHz to +10 MHz offset from the upper block edge, a 11 dBm per antenna limit shall apply; and
- b) for -5 to 0 MHz offset from lower block edge or 0 to +5 MHz offset from the upper block edge, a 16.3 dBm per antenna limit shall apply.

¹⁴⁰⁷ The 2.1 GHz EC Decision was amended by Commission Implementing Decision (EU) 2020/667, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020D0667&from=EN>

¹⁴⁰⁸ The 2.1 GHz EC Decision sets out a non-obligatory in-block non-Active Antenna System (AAS) EIRP limit of 65 dBm/5MHz in the FDD downlink band.

¹⁴⁰⁹ In a multi-sector base station, the AAS radiated power limit applies to each one of the individual sectors.

A 13.26 The following transitional power limits for AAS base stations shall apply:

- a) for -10 to -5 MHz offset from lower block edge or +5 MHz to +10 MHz offset from the upper block edge, a 3 dBm mean TRP per cell limit shall apply; and
- b) for -5 to 0 MHz offset from lower block edge or 0 to +5 MHz offset from the upper block edge, a 8 dBm mean TRP per cell limit shall apply.

Terminal Station BEM in-block power limit

A 13.27 The maximum mean-in-block power as for terminal stations emission limit over frequencies of FDD uplink shall be 24 dBm/5MHz.¹⁴¹⁰

A13.6 The 2.3 GHz Band

A 13.28 In accordance with the 2.3 GHz ECC Decision¹⁴¹¹, the technical conditions applicable to any new spectrum rights of use in the 2.3 GHz band is set out below.

In-block Power Limits

Base Station Power limits

A 13.29 Within the 2300 – 2390 MHz frequency range, an in-block limit at 68 dBm/5MHz EIRP per antenna shall apply, given that this limit is considered to be sufficient for the provision of likely services in the band¹⁴¹². Additionally, all base stations are subject to baseline power limits, and transitional region power limits where applicable.

A 13.30 Within the 2390 – 2400 MHz frequency range (see blocks 19 and 20 in Figure 16 below) an in-block¹⁴¹³ EIRP limit of not more than 45 dBm/5 MHz shall apply in order to ensure coexistence with systems above 2.4 GHz.

¹⁴¹⁰ For the determination of out of band emissions of terminals in CEPT Report 39 the maximum conducted transmit power of 23 dBm has been used as a reference.

¹⁴¹¹ [2.3 GHz ECC Decision](https://eur-lex.europa.eu/), available at <https://eur-lex.europa.eu/>

¹⁴¹² The 2.3 GHz ECC Decision sets out a non-obligatory in-block power limit.

¹⁴¹³ Block for which the BEM is derived.

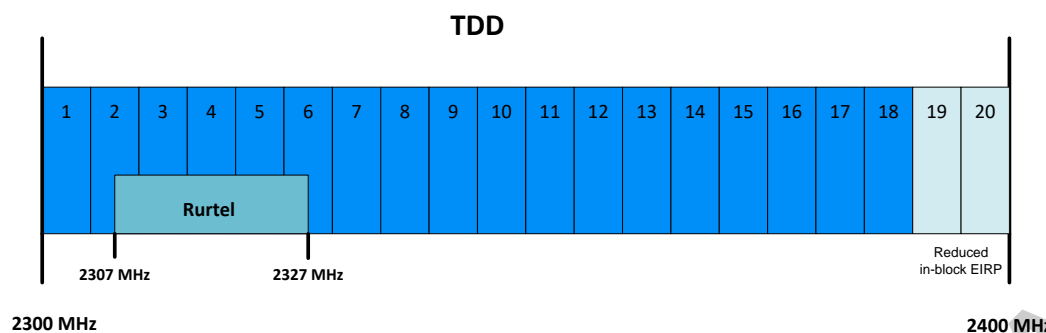


Figure 18. The 2.3 GHz Band (RurTel and Restricted Blocks)

Out-of-block Power Limits

Baseline requirements for TDD base station

A 13.31 Baseline power limits apply to synchronised and unsynchronised TDD blocks outside of in-block and transitional frequencies.

A 13.32 The following TDD baseline power limits, in accordance with the 2.3 GHz ECC Decision, shall apply:

- a) for synchronised TDD blocks a limit of $\text{Min}(\text{PMax}^{1414} - 43, 13)$ dBm/5 MHz EIRP per antenna shall apply; and
- b) for unsynchronised TDD blocks -36 dBm/5 MHz EIRP per cell shall apply.

A 13.33 Additional baseline requirements are necessary above 2403 MHz for unsynchronised and synchronised MFCN base stations, these are:

- a) for $\text{Pmax} > 42$ dBm, power limit of 1dBm/5 MHz applies;
- b) for $24 \text{ dBm} < \text{Pmax} \leq 42$ dBm, power limit $(\text{Pmax} - 41)$ dBm / 5 MHz applies; and
- c) for $\text{Pmax} \leq 24$ dBm, a power limit of -17 dBm / 5 MHz applies.

Transitional region requirements for MFCN base stations

A 13.34 The following transitional limits, in accordance with the 2.3 GHz ECC Decision shall apply¹⁴¹⁵ as follows:.

¹⁴¹⁴ Where PMax is the maximum mean power of the base station in question, measured as EIRP per carrier.

¹⁴¹⁵ These transition limits do not apply below 2300 MHz or above 2400 MHz.

- a) for -5 to 0 MHz offset from lower block edge or 0 to 5 MHz offset from upper block edge a limit of $\text{Min}(\text{PMax} - 40, 21)$ dBm/5 MHz EIRP per antenna shall apply; and
- b) for -10 to -5 MHz offset from lower block edge or 5 to 10 MHz offset from upper block edge a limit of $\text{Min}(\text{PMax} - 43, 15)$ dBm/5 MHz EIRP per antenna shall apply.

Terminal station BEM in-block power limit

A 13.35 A maximum in-block power limit for terminal stations of 25 dBm¹⁴¹⁶ shall apply.

Coordination with Eir's RurTel network

A 13.36 Within the 2305 – 2330 MHz frequency range (see blocks 2 to 6 in Figure 16 above), licensees deploying MFCN within the coordination area defined in Figure 1.7^{1417,1418} (as may be updated from time to time by ComReg showing the reduction in the coordination area as the Eir RurTel customer migration program progresses) are required to coordinate with Eir, the operator of the RurTel Network in the 2307 – 2327 frequency range, until otherwise notified by ComReg.

¹⁴¹⁶ This power limit is specified as EIRP for terminal stations designed to be fixed or installed and as total radiated power (TRP) for terminal stations designed to be mobile or nomadic. A tolerance of up to + 2 dB has been included in this limit, to reflect operation under extreme environmental conditions and production spread. Administrations may relax this limit in certain situations, for example fixed UE in rural areas, providing that protection of other services, networks and applications is not compromised and cross-border obligations are fulfilled.

¹⁴¹⁷ Sourced from Plum Report (ComReg 20/122b), Figure 1.7 available at www.comreg.ie.

¹⁴¹⁸ Shape Files (.SHP) representing Eir's Donegal's RurTel Co-channel coordination area is available at www.comreg.ie.

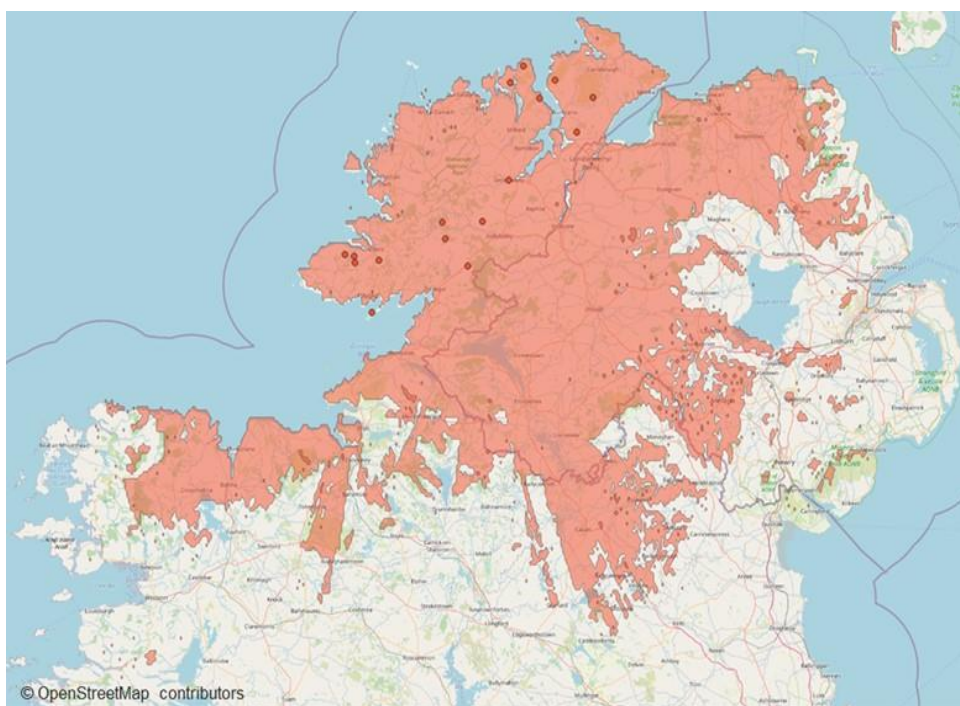


Figure 19. Co-ordination contour (co-channel, -94.5dBm) contour for Donegal RurTel Network

A13.6 The 2.6 GHz Band

- A 13.37 In accordance with the 2.6 GHz EC Decision as amended¹⁴¹⁹, the technical conditions applicable to any new spectrum rights of use in the 2.6 GHz band. are set out below.
- A 13.38 In the case of two adjacent unsynchronised TDD networks or a TDD network adjacent to an FDD network, more restrictive BEM parameters apply. The spectrum blocks 2570 – 2575 MHz¹⁴²⁰ and 2615 – 2620 MHz are restricted blocks and the amended 2.6 GHz EC Decision sets out the in-block levels and BEM for these restricted blocks.

Unrestricted BEM for Base Stations

- A 13.39 Unrestricted BEM's apply to all TDD blocks that are not adjacent unsynchronised TDD networks or the frequency blocks 2570 – 2575 MHz and 2615 – 2620 MHz.
- A 13.40 The BEM for an unrestricted spectrum block is found by combining Baseline power limits, in-block power limits and transitional power limits and implemented

¹⁴¹⁹ The 2.6 GHz EC Decision was amended by Commission Implementing Decision 2020/636/EU, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020D0636&from=en>.

¹⁴²⁰ Except when this block is operating in uplink-only mode of operation.

in such a way that the limit for each frequency is given by the higher value.

In-block Power Limits

Non-AAS Base Station Power Limits

A 13.41 A non-AAS in-block EIRP limit of up to 68¹⁴²¹ dBm/5MHz per antenna¹⁴²² shall apply. This in-block power limit is applicable to all base stations assigned to an operator within the unrestricted blocks.

AAS Base Station Power Limits

A 13.42 An AAS in-block TRP limit of up to 60 dBm/5MHz per each individual sector in a multi sector base station.

Out-of-Block Power limits

Non- AAS Baseline Power Limits

A 13.43 The 2.6 GHz EC Decision, as amended defines baseline power limit values for frequencies allocated to FDD blocks and for those operating in TDD allocated blocks, these limits shall be implemented as follows:

- a) for frequencies allocated to FDD downlink, TDD blocks synchronised with the TDD block under consideration (including TDD SDL blocks), and the range 2615 – 2620 MHz, a limit of +4 dBm/ MHz applies; and
- b) for frequencies in the 2.6 GHz band, not covered by above, a -45 dBm/MHz limit applies.

AAS Baseline Power Limits

A 13.44 The 2.6 GHz EC Decision, as amended defines baseline power limit values for frequencies allocated to FDD blocks and for those operating in TDD allocated blocks, these limits shall be implemented as follows:

- a) for frequencies allocated to FDD downlink, TDD blocks synchronised with the TDD block under consideration (including TDD SDL blocks), and the range 2615 – 2620 MHz, a limit of +5 dBm/ MHz applies; and
- b) for frequencies in the 2.6 GHz band, not covered by above, a -52 dBm/MHz limit applies.

¹⁴²¹ This limit set out in the 2.6 GHz EC Decision replaces the limit of 61 dBm set out in the 2008 2.6 GHz EC Decision.

¹⁴²² A licensee assigned any 2.6 GHz Band Blocks must ensure protection of all Aeronautical Primary Radars by meeting in-band and out-of-band pfd limits, as appropriate, set out below.

Transitional Power Limits

Transitional Power limit for non-AAS base stations

A 13.45 The transitional power limits, as set out in the 2.6 GHz EC Decision, shall apply as follows:

- a) for -5 to 0 MHz offset from lower block edge or 0 to +5 MHz offset from upper block edge a maximum mean EIRP limit per antenna of +16 dBm/5 MHz applies.

A 13.46 In a multi-sector base station, the radiated power limit applies to each one of the individual sectors¹⁴²³.

Transitional Power limit for AAS base stations

A 13.47 The transitional power limits as set out in the 2.6 GHz EC Decision shall apply as follows:

- a) for -5 to 0 MHz offset from lower block edge or 0 to +5 MHz offset from upper block edge a maximum mean TRP limit per cell of +16 dBm/5 MHz applies;

A 13.48 In a multi-sector base station, the radiated power limit applies to each one of the individual sectors¹⁴²⁴.

Restricted BEM for Base Stations

A 13.49 The BEM for a restricted spectrum block is built up by combining the value from Baseline power (above) and in-block power limit (below) in such a way that the higher value gives the limit for each frequency.

In-block Power Limits

Non-AAS Base Station Power Limits

A 13.50 A base station non-AAS in-block EIRP limit for restricted blocks not exceeding 25 dBm/5 MHz per antenna shall apply.

AAS Base Station Power Limits

A 13.51 A base station non-AAS in-block TRP power limit for restricted blocks not exceeding 22 dBm/5 MHz shall apply.

¹⁴²³ This limit assumes that the emissions come from a macro base station.

¹⁴²⁴ This limit assumes that the emissions come from a macro base station.

Out-of-Block Power limits

BEM for Base Stations with restrictions on antenna placement

A 13.52 Where antennas are placed indoors or where the antenna height is below a certain height, ComReg sets out alternative parameters in line with the Transitional Power Requirements described below. This is provided that at geographical borders to other member states the Baseline Requirements described above applies and that the above in-block power limits for restricted blocks remains valid nationwide. For AAS with restrictions on antenna placement, alternative measures in line with AAS Baseline power levels and the above in-block power limits may be agreed on a case by case basis.

Baseline Power Requirements for non-AAS base stations

A 13.53 The power limits set out in the 2.6 GHz EC Decision, as amended for restricted blocks for non-AAS base stations with additional restrictions on antenna placement shall apply as follows:

- a) From the lower band edge of the 2500 MHz to -5 MHz offset from the lower block edge, or +5 MHz offset from the upper block edge to the band edge of 2690 MHz a maximum mean EIRP limit of -22 dBm/MHz applies.

Transitional Power Requirements

A 13.54 The base station out-of-block EIRP BEM for non-AAS restricted block with additional restrictions on antenna placement shall apply:

- a) from -5 to 0 MHz offset from the lower block edge, or 0 to +5 MHz offset from the upper block edge a maximum mean EIRP limit of -6 dBm/MHz applies.

Protection of Aeronautical Primary Radars

A 13.55 In light of the approaches taken in the benchmark countries and the analysis and recommendations of its technical advisors Plum, mitigation measures recommended by Plum in its 2.6 GHz report (Document 19/59c and 19/124c) to ensure coexistence between aeronautical primary radars operating in the 2.7 GHz band and new MFCN base stations in the 2.6 GHz band shall apply

A 13.56 A licensee assigned any 2.6 GHz Band Blocks must ensure protection of all Aeronautical Primary Radars as follows:

- i. Observe a coordination zone of one-kilometre radius around the Aeronautical Primary Radar to provide additional protection from

MFCN base station emissions at the Aeronautical Primary Radar receiver;

- ii. in relation to Star 2000 Aeronautical Primary Radars, the licensee shall:
 - A. comply with an out-of-band Power Flux Density limit (pfd) limit given¹⁴²⁵ by $-140 \text{ dBW/m}^2/\text{MHz} + (10 \times \text{Log}_{10} (B_{\text{op}}/120))$, where B_{op} is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the licensee in the 2.6 GHz Band, to address the impact of MFCN spurious emissions at the radar antenna receiver location; and
 - B. until notified by the Commission in writing that filters are installed at the Aeronautical Primary Radar, comply with an in-band pfd limit, given¹⁴²⁶ by $-78 \text{ dBW/m}^2 + (10 \times \text{Log}_{10} (B_{\text{op}}/120))$, where B_{op} is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the licensee in the 2.6 GHz Band, to address the impact of blocking and intermodulation effects at the Aeronautical Primary Radar receiver.
- iii. in relation to the TA10 Aeronautical Primary Radar, the licensee shall, until otherwise notified by the Commission in writing:
 - A. comply with an out-of-band pfd limit given¹⁴²⁷ by $-151 \text{ dBW/m}^2/\text{MHz} + (10 \times \text{Log}_{10} (B_{\text{op}}/120))$, where B_{op} is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the licensee in the 2.6 GHz Band, to address the impact of MFCN spurious emissions at the Aeronautical Primary Radar antenna receiver location; and
 - B. comply with an in-band pfd limit given¹⁴²⁸ by $-88 \text{ dBW/m}^2 + (10 \times \text{Log}_{10} (B_{\text{op}}/120))$, where B_{op} is the quantum of downlink (i.e. FDD downlink and TDD) spectrum in MHz assigned to the licensee in the 2.6 GHz Band, to address the impact of

¹⁴²⁵ Where $-140 \text{ dBW/m}^2/\text{MHz}$ is the absolute limit required to protect the Star2000 Aeronautical Primary Radar installations from emissions by all operators for out-of-band (i.e. $>2700 \text{ MHz}$) power.

¹⁴²⁶ Where -78 dBW/m^2 is the absolute limit required to protect the Star2000 Aeronautical Primary Radar installation from emissions by all operators for in-band (i.e. $2570 - 2690 \text{ MHz}$) power.

¹⁴²⁷ Where $-151 \text{ dBW/m}^2/\text{MHz}$ is the absolute limit required to protect the TA10 Aeronautical Primary Radar installation from emissions by all operators for out-of-band (i.e. $>2700 \text{ MHz}$) power.

¹⁴²⁸ Where -88 dBW/m^2 is the absolute limit required to protect the TA10 Aeronautical Primary Radar installation from emissions by all operators for in-band (i.e. $2570 - 2690 \text{ MHz}$) power.

blocking and intermodulation effects at the Aeronautical Primary Radar antenna receiver.

- iv. In relation to other models of Aeronautical Primary Radars other than the Star2000 and TA10, the licensee shall comply with conditions as may be determined by ComReg from time to time.

Protection of the Radio Astronomy Service

A 13.57 To protect Radio Astronomy Service stations an additional baseline TRP power limit per cell in the frequency range 2690 – 2700 MHz of +3 dBm / 10 MHz shall apply¹⁴²⁹.

Terminal station BEM in-block power limit

A 13.58 The maximum mean in-block power is defined as 31 dBm/5 MHz TRP, and 35 dBm/5 MHz EIRP, for terminal stations¹⁴³⁰.

A13.7 TDD inter-network synchronisation

A 13.59 For TDD inter-network synchronisation, the following shall apply:

- a) Not setting guard bands between assignments. Unsynchronised networks require guard bands which shall be internalised within the block of spectrum assigned. By default, synchronised networks do not require guard bands;
- b) Setting a TD-LTE frame configuration 2 (i.e. a downlink / uplink ratio of 3:1) or compatible frame structure as the default one for TDD networks; and
- c) As set out in the 2.6 GHz EC Decision, setting an unrestricted BEM for synchronised TDD networks and a restrictive BEM for unsynchronised networks.

Special Sub-Frame

A 13.60 The special sub-frame 6 configuration shall be set as the default for TD-LTE networks in the 2.3 GHz and 2.6 GHz bands.

Unrestricted and Restrictive BEMs

A 13.61 In respect of BEMs in the 2.3 GHz band:

¹⁴²⁹ This limit yields a reduced coordination zone with respect to RAS stations.

¹⁴³⁰ This limit includes Automatic Transmitter Power Control (ATPC) range.

- a) Operators utilising frame structure configuration 2 on their network (and having a common reference phase clock with adjacent channel operators¹⁴³¹) shall be subject to an unrestricted BEM with the parameters set out in Table 33 below.

Table 33. Unrestricted BEM for 2.3 GHz Band

BEM Element	Frequency Range	Power Limit
In-block	Block assigned to the operator	68 dBm/5 MHz
Transitional Region	-5 to 0 MHz offset from lower block edge 0 to 5 MHz offset from upper block edge	Min(PMax - 40,21) dBm/5 MHz EIRP per antenna
Transitional Region	-10 to -5 MHz offset from lower block edge 5 to 10 MHz offset from upper block edge	Min(PMax - 43,15) dBm/5 MHz EIRP per antenna
Baseline	2,300 – 2,390 MHz (except for in-block and transitional)	Min(PMax - 43,13) dBm/5 MHz

- b) Operators utilising alternative frame structures (or failing to synchronise with adjacent channel networks for any other reason) shall be subject to the restrictive BEM with the parameters set out in Table 34 below. It is important to note that in order to meet the restrictive mask operators would likely have to adopt guard bands within its assignment.

Table 34. Restrictive BEM 2.3 GHz Band

BEM Element	Frequency Range	Power Limit
In-block	Block assigned to the operator in the range 2300 – 2390 MHz; and	68 dBm/5 MHz EIRP per antenna
	Block assigned to the operator in the range 2390 – 2400 MHz	shall not exceed 45 dBm/5 MHz to ensure coexistence with systems above 2,400 MHz
Baseline	2300 – 2400 MHz (except for in-block frequencies)	-36 dBm/5 MHz EIRP per cell ¹⁴³²

A 13.62 In relation to BEMs in the 2.6 GHz band:

¹⁴³¹ Operators need to ensure the start of frame is aligned with adjacent channel operators above and below its assignment

¹⁴³² This value is based on a scenario including all base station classes (Macro, Micro, Pico and Femto). A more restrictive scenario may allow a more relaxed value for some BS classes.

- a) Operators utilising frame structure configuration 2, SSF 6 on their network (and having a common reference phase clock with adjacent channel operators¹⁴³³) are subject to an unrestricted BEM with the parameters set out in Table 2, 3 and 4 of Section C. “Technical Conditions for Base Stations – Block Edge Masks” of EC Decision 2020/636/EU.
- b) Operators utilising alternative frame structures (or failing to synchronise with adjacent channel networks for any other reason) would be subject to the restrictive BEM built up by combining Tables 3 and 5, of Section C. “Technical Conditions for Base Stations – Block Edge Masks” EC Decision 2020/636/EU, where the limit for each frequency is given by the higher value out of the baseline and the in-block power limits.

A 13.63 Non-AAS small cells (with an EIRP not exceeding 24 dBm) are exempt from synchronisation restrictions for indoor domestic and other indoor locations, on a non-interference basis, for deployments in the 2.3 GHz TDD and 2.6 GHz TDD bands.¹⁴³⁴

A 13.64 AAS small cells (with an TRP not exceeding 16 dBm) are exempt from synchronisation restrictions for indoor domestic and other indoor locations, on a non-interference basis, for deployments in the 2.3 GHz TDD and 2.6 GHz TDD bands.

¹⁴³³ Operators need to ensure the start of frame is aligned with adjacent channel operators above and below its assignment.

¹⁴³⁴ This approach was also implemented for the award of the 3.6 GHz band.

Annex: 14 Three's option to return sub-1 GHz spectrum

Summary of Document 20/56

A 14.1 In Section 2.5 of Document 20/56, and in the context of Three's pricing asymmetry concerns in relation to the use of ComReg's proposed sub-1 GHz competition spectrum in combination with the CCA format, ComReg observed that the return of a 2 × 5 MHz sub-1 GHz block of spectrum to ComReg might alleviate these concerns for Three. In this regard, ComReg noted that:

"2.92 The range of bids that Three could make under the proposed spectrum competition caps would be different to those for the other MNOs, particularly in relation to the 700 MHz Duplex, because Three currently holds more sub-1 GHz spectrum than the other two MNOs (i.e. an additional 900 MHz lot)¹⁴³⁵.

2.93 However, if Three was to return one of its 2 × 5 MHz sub-1 GHz blocks (in the 800 MHz or 900 MHz bands), it would equalise current sub-1 GHz MNO spectrum holdings and thus all three MNOs would be permitted to bid for the same number of 700 MHz Duplex lots (or other sub-1 GHz lots if returned and included) in the Proposed Award"

2.94 This is analogous to Three's own recent suggestion that Eir should be given the opportunity to "surrender its 2.1GHz spectrum back to ComReg to be re-awarded as liberalised spectrum". By adopting such an approach, Three could:

- ensure that all MNOs would have the opportunity to place bids for the same number of 700 MHz lots;*
- address its concerns that asymmetric spectrum competition caps could lead to exposing operators to paying highly asymmetric prices for the same 700 MHz rights of use; and*

¹⁴³⁵ Footnote 63: of Document 20/56: "In that regard, ComReg notes NERA's observation that "in the absence of a 5th bidder, it [Three] was de facto guaranteed to win one 900 MHz lot at reserve price [in ComReg's 2012 MBSA]."

See, Nera Economic Consulting, 'Price Distortions in the Combinatorial Clock Auction – a Bidder perspective', published April 2015.

https://www.ofcom.org.uk/data/assets/pdf_file/0020/82226/telefonica_-_annex_3.pdf

- *facilitate its ability to bid for an additional 700 MHz lot to the extent that it considered a 700 MHz lot more important than a 800 MHz or 900 MHz block¹⁴³⁶.*

A 14.2 In relation to this option, ComReg observed that, if Three returned a sub-1GHz spectrum block then:

- *“in accordance with Regulation 8(10) and 8(11) of the Liberalised Licence Regulations¹⁴³⁷, Three would no longer be liable for SUF payments for this Block and there would be no return of any portion of any Upfront Fee / SAF paid in respect of any Lot returned to ComReg; and*
- *the returned 2 × 5 MHz sub – 1 GHz block could be included in the Proposed Award.”*

A 14.3 Noting its intention to issue a response to consultation and substantive decision on the Proposed Award during Q4 2020, ComReg observed in paragraph 2.96 of Document 20/56 that, if Three wished to avail of this possibility, then it:

- *“should indicate this possibility in its response to this Information Notice”; and*
- *“would then need to provide ComReg with a binding commitment by 31 August 2020 to return a 2 × 5 MHz sub–1 GHz block in order to provide sufficient time for due consultation on the inclusion of an additional 2 × 5 MHz of sub-1 GHz spectrum in the Proposed Award.”*

A 14.4 Finally, in paragraph 2.97 of Document 20/56, ComReg noted that, while the return of a 2 × 5 MHz sub-1 GHz block would largely remove the pricing asymmetry concerns claimed by Three, it remains solely a matter for Three.

A 14.5 Document 20/56 was published on 6 July 2020 and interested parties were given until 17 August to respond.

Responses to Documents 20/56

A 14.6 Two respondents (Three and Vodafone) commented on this option in their submissions to Document 20/56.

¹⁴³⁶ For example, in response to Document 19/124, Three claims that the impact of the competition caps is most severe for spectrum in the 700MHz band, which is a pilot band for 5G services.

¹⁴³⁷ S.I. No. 251 of 2012, “Wireless Telegraphy (Liberalised Use and Preparatory Licences in the 800 MHz, 900 MHz and 1800 MHz bands) Regulations 2012”

Vodafone's submission

- A 14.7 Vodafone submits that it supports the proposal that ComReg have made to Three to return a block of sub-1GHz spectrum pre-auction. In other words, its position was predicated on the point that Three could *“return a block of 900 MHz spectrum in advance of the completion of the auction design for the forthcoming award.”*
- A 14.8 In addition, Vodafone submitted that *“even without this option Three have no justified case for seeking changes to the current auction design”*. In this regard, Vodafone notes that:
- Three's concerns only arise because it has an additional sub-1 GHz block, which, as Three's expert economic advisers, NERA, observe, it was *“de facto guaranteed to win ... at reserve price [in ComReg's 2012 MBSA]”*; and
 - if Three was to return a 2 × 5 MHz block of 900 MHz spectrum, then *“all three MNOs would be permitted to bid for the same number of 700 MHz Duplex lots (or other sub-1 GHz lots if returned and included) in the Proposed Award.”*

Three's submission

- A 14.9 In its response to Document 20/56 of 17 August 2020, Three acknowledges that, earlier in the consultation process, it had suggested the return of spectrum in the 2.1 GHz Band as one possible option open to Eir to simplify the Proposed Award, but submits that, while there may be similarities between that and its own case with regard to sub 1 GHz bands, there are also “significant differences” in its view (without elaborating further). Three subsequently states that:
- *“[i]t is surprising that ComReg is suggesting that a licensee should be required to surrender a licence early in order to remedy a defective process proposed by the regulator itself”*; and
 - *“ComReg has not evidenced any competition issues or any other potential harm which needs to be addressed by Three returning spectrum and ComReg itself has stated that “the existing spectrum asymmetry does not appear to be harming competition” (most recently in paragraph 6.184 of [Document] 19/124).”*
- A 14.10 In relation to the potential return of spectrum in this matter, Three also contends that ComReg has not made a proposal on how to compensate the licensee for loss of its upfront investment in the licence, and it submits that this *“undermines the regulatory certainty that is required by a bidder at an auction or an investor in networks – that their licence will remain available and in place under*

predictable conditions for the duration of the licence.”

A 14.11 Three further notes that it is open to any licensee to return spectrum at any time, and in relation to paragraph 2.96 of Document 20/56¹⁴³⁸ Three states that *“it is impossible to respond to this statement as it is unclear what possibility is being offered to Three over and above that which it is already entitled in any event.”*

Three’s proposal to contingently return a block of 900 MHz spectrum

A 14.12 Shortly before publication of the present document, Three made additional submissions (see Annex 15 of this document) in which it: (i) reiterated views it had already outlined in previous consultation submissions (e.g. in relation to perceived discrimination) but (ii) formally set out a proposal to contingently return a 2 × 5 MHz block of 900 MHz spectrum, as detailed below.

“Three’s Proposal is that Three gives, in advance of the award commencing, a binding commitment to ComReg as follows:

- *Three will identify and agree with ComReg 1 lot (2x5MHz) of its existing sub-1GHz spectrum that Three is willing to divest itself of, subject to the conditions below. The lot to be divested will be specifically identified and agreed with ComReg and will be in the 900MHz band (“the Divestment Lot”);*
- *The divestiture of the Divestment Lot would be triggered if Three wins more than 2 lots of 700MHz in the upcoming spectrum auction;*
- *The two 900MHz FDD lots left will need to remain contiguous in the band*
- *Three will divest the Divestment Lot within a reasonable time following the spectrum award (the Transition Time), such period to be agreed with ComReg but which could be 3 months;*
- *The Transition Time would allow Three to migrate its use out of the Divestment Lot (to ensure continued service to consumers), and would also include a specified period for Three to offer to transfer the spectrum through a sale of rights, such period to be agreed with ComReg, following which if no agreement for sale can be reached, then the Divestment Lot would be surrendered to ComReg and available for re-*

¹⁴³⁸ Where ComReg states that *“If Three was to avail of this possibility, ComReg observes that Three should indicate this possibility in its response to this Information Notice”.*

licensing in a new award lot where Three would not be entitled to participate;

- *The Divestment Lot would not count against Three's bidding cap in the upcoming spectrum award such that Three would be permitted to bid for up to 3 lots of 700MHz spectrum in the upcoming spectrum auction."*

A 14.13 Regarding Three's option to return a 2 × 5 MHz block of sub-1GHz spectrum as suggested in Document 20/56, Three notes that "ComReg has not clarified how Three might be compensated for the loss on any early licence surrender", and states that "[i]t is critical that Three and all operators have regulatory certainty and that there is a predictable environment against which operators can invest in their networks."

ComReg's reply of 4 December 2020

A 14.14 On 4 December 2020, ComReg' replied to Three (see Annex 15 of this document). In that letter, ComReg:

- a) confirmed that it is fully considering and will address Three's views in its response to consultation;
- b) thanked Three for providing additional detail and clarifications on its proposal and for the offer to further clarify any aspects of the proposal, noting that ComReg would avail of the offer should it require further information to aid its consideration of the proposal; and
- c) confirmed that it had never suggested that Three would be "compensated" for any early return of a 900 MHz block, and in that regard, directed Three to paragraph 2.95 of Document 20/56 which clearly sets out the position in this regard and simply articulates what is already set down in legislation.

DotEcon's assessment on Three's proposal – Contingent release of a block of 900 MHz spectrum

A 14.15 In Annex B of its report, DotEcon assesses the contingent release of spectrum as proposed by Three in its letter of 3 December.

A 14.16 DotEcon notes that it has "grave concerns about this proposal" for the reasons set out in its report, which in summary are that:

- a) *Three's proposal allows it to win a third block of 700 MHz spectrum, but to deny the released 900 MHz [block] to the MNO with the smallest*

overall holdings of sub-1 GHz spectrum. This risks worse outcomes for downstream competition than the current proposals;

- b) *Contingent availability of a 900 MHz lot for a subsequent award creates severe problems for bidders other than Three in valuing 700 MHz lots and may result in inefficient outcomes. Trying to integrate the release and re-award into a single unified process along with award of the current MBSA2 spectrum is extremely complex and highly impractical; and*
- c) *Fair treatment of the three MNOs would seem to require also giving Vodafone and Eir the opportunity to give up 800 MHz or 900 MHz contingently on being awarded additional 700 MHz blocks and potentially then also allowing Three to give up more than one block.*

A 14.17 In addition, DotEcon notes that:

- a) *Although these are cumulating reasons, in our view the issue of creating uncertainty in the valuation of 700 MHz lots for bidders other than Three is severe enough by itself to rule out Three's proposal. This problem is quite fundamental and arises due to the contingent availability of [a] 900 MHz lot that is a substitute for 700 MHz spectrum; it is not dependent on any particular details of Three's proposal.*

ComReg's assessment and final position

Return of 2 × 5 MHz of sub-1 GHz spectrum

A 14.18 In relation to the observations made by Three in its submission of 17 August 2020 in response to Document 20/56, ComReg responds as follows:

- a) at no point did ComReg suggest that it was 'requiring' Three to surrender a block of sub-1GHz spectrum early. Rather, ComReg was simply observing that Three had the option to do so¹⁴³⁹;
- b) in relation to Three's suggestion that it should be compensated for the grant back of spectrum (in particular "over and above that which is already entitled to"), ComReg had already made it clear in paragraph 2.95 of Document 20/56 its position on fees (which simply articulated the position set down in legislation) and, as noted in its letter of 4 December,

¹⁴³⁹ See, for example, paragraph 2.91 where ComReg noted that "*it is open to Three to return a 2 × 5 MHz sub-1 GHz block*" (emphasis added) and paragraph 2.97. In relation to Three's reference to the Proposed Award being a "defective process", presumably in the context of its perceived concerns around the use of the Proposed Sub-1 GHz Competition Cap with a CCA, ComReg is satisfied that it has sufficiently addressed these concerns elsewhere in this document and does not propose to comment on them further here.

confirms that it has never suggested that Three would be compensated for any early return of a 900 MHz block. ComReg also notes that Three suggestion that it should be compensated “*over and above that which is already entitled to*” is at odds with the strenuous arguments it raised around discrimination and State aid at the time ComReg was developing the 2012 MBSA.¹⁴⁴⁰; and

- c) in light of the above, ComReg does not propose to comment on these points further.

Three’s proposal - Contingent return of a block of 900 MHz spectrum

- A 14.19 In relation to Three’s proposal to contingently return one 2 × 5 MHz block of 900 MHz spectrum, ComReg **firstly** observes that this is not the same option that ComReg identified in Section 2.5 of Document 20/56¹⁴⁴¹, and on which Three and Vodafone responded.
- A 14.20 The option identified in Section 2.5 of Document 20/56, clearly envisaged that Three would agree to unconditionally give up, well in advance of the Proposed Award, a sub-1GHz block (900 MHz or possibly 800 MHz) of spectrum and, as per paragraph 2.95 of Document 20/56, that the additional surrendered block could then “be included in the Proposed Award”. By contrast, Three’s proposal now (mooted for the first time in Q4 2020, fully 4 months after publication of Document 20/56, and a period during which ComReg had clearly indicated it would be issuing its response to consultation and substantive decision) is that it would commit to giving up a block of 900 MHz spectrum at some point after the Proposed Award, to be engaged only if it exceeded the spectrum competition cap for sub-1 GHz.
- A 14.21 ComReg **secondly**, notes and agrees with the significant concerns raised by DotEcon in relation to Three’s proposal including, amongst other things, that it would create severe problems for bidders other than Three in valuing 700 MHz lots.
- A 14.22 ComReg **thirdly** observes that, if Three was permitted to exceed the spectrum competition cap for sub-1 GHz spectrum on the basis that, if it did, it would later surrender some other sub-1 GHz spectrum block of a similar size, then it is difficult to see any good reason of principle why the same should not apply to all

¹⁴⁴⁰ See www.comreg.ie/industry/radio-spectrum/spectrum-awards/multi-band-spectrum-award-2012/

¹⁴⁴¹ For example, ComReg noted that “*If Three was to avail of this possibility, ComReg observes that Three should indicate this possibility in its response to this Information Notice, and it would then need to provide ComReg with a binding commitment by 31 August 2020 to return a 2 × 5 MHz sub-1 GHz block in order to provide sufficient time for due consultation on the inclusion of an additional 2 × 5 MHz of sub-1 GHz spectrum in the Proposed Award.*” (paragraph 2.96 of Document 20/56)

other bidders. This significantly compounds the effect on other bidders identified that such “contingency bidding” would have. It also risks the auction becoming practically unmanageable, since the number of potential permutations would become highly complex, iterative, and interlocking. As DotEcon summarises:

“Fair treatment of the three MNOs would seem to require also giving Vodafone and Eir the opportunity to give up 800 MHz or 900 MHz contingently on being awarded additional 700 MHz blocks and potentially then also allowing Three to give up more than one block.”

“Clearly providing a general facility for existing spectrum to be released conditional on acquiring other spectrum would raise further concerns about complexity of the process and uncertainty for bidders about what spectrum may be available due to such contingent release be triggered.”

ComReg’s final position

A 14.23 In light of the above, in particular the significant concerns, potential discrimination to other bidders and complications for the Proposed Award raised by Three’s proposal, ComReg’s final position is that it is not appropriate to adopt Three’s proposal for a contingent return of a block of 900 MHz spectrum. ComReg also notes that the significant concerns identified above would be present in any kind of contingent grant back of sub-1 GHz spectrum by Three and so does not consider it necessary to seek further information or clarifications around Three’s proposal, or potential amendments to same, in order to reach a decision on this matter. Three’s most recent letter of 3 December was in any event adequate in terms of providing the requisite details on the proposal.

Annex: 15 Correspondence with Three regarding a potential return of spectrum

NON-CONFIDENTIAL



1 December 2020

Ms Niamh Hodnett
Three Ireland
28/29 Sir Rogerson's Quay,
Dublin 2

BY EMAIL ONLY

Ref: Proposed Multi Band Spectrum award – possibility of Three conditionally returning a block of 2 x 5 MHz of 900 MHz based on the outcome of the proposed award

Dear Niamh,

I refer to our telephone conversation on 23 November 2020 on which you sought to explore whether ComReg could agree, in some legally binding way, to a conditional grant back of spectrum whereby Three would, prior to the proposed award, commit to returning a 2 x 5 MHz block of 900 MHz spectrum within a short period after the proposed award if it were to win rights of use in respect of three blocks of 700 MHz spectrum in the proposed award (the “**Proposal**”).

I note that you stated on the call that the Proposal was “*without prejudice*”.¹ However, ComReg is willing to treat the Proposal as a Three submission in response to consultation, if you confirm, by close of business on Wednesday 2 December, that you wish it to be treated as a submission. ComReg will, in any event, deal with the substance of the Proposal in the response to consultation, since it has consulted on the underlying points for some time now, and, unless we hear otherwise, will do so without referring to its origin.

I look forward to hearing from you.

Yours sincerely,

George Merrigan
Director
Market Framework

¹ Although ComReg reserves its position as to whether without prejudice privilege applied to the call.



3 December 2020

George Merrigan
Commission for Communications Regulation
One Dockland Central
Guild Street
Dublin 1

Dear George,

Upcoming Spectrum Auction and Equal Treatment of all Bidders - Three's Proposal

I refer to your letter of 1 December and all previous engagement regarding the planned multiband spectrum auction and the proposal made to you orally on 23 November.

The purpose of this letter is to record in writing the proposal made to you orally and ensure that it is considered as a formal on the record proposal ("**Proposal**").

Three's Proposal as outlined further below is made in good faith to ComReg to resolve what it considers to be an unlawful disadvantage in-built to ComReg's planned auction. We believe that it is imperative that there is follow up engagement from ComReg regarding Three's Proposal, including our suggestions as to how it could be implemented. We would be very concerned were ComReg not to give the Proposal the proper consideration it merits. We assure you that we would be happy to deal with any follow up queries or issues with our Proposal, noting that to date no detail has been sought in respect of it.

As you are aware, it is important to Three that ComReg's upcoming spectrum auction gives fair and equal treatment to all bidders. I wish to further express my concerns that if the award process remains unchanged from that which was proposed in ComReg's Document No. 19/124 then an unlawful disadvantage towards Three would be in-built within the auction mechanism and rules. The effect of this disadvantage would be significant and disproportionate so as to place Three at a material disadvantage as a potential bidder in the auction. This I believe is contrary to the strict legal requirement that such awards do not contain unlawful discrimination.

Three has submitted extensive documents throughout the consultation process to explain the problem that we see with the specific proposal and we have also described



how ComReg can eliminate the problem while continuing to meet all of ComReg's statutory objectives for the award. I will not repeat those details here, however, in summary there is a specific combination of factors within the ComReg proposal that together leads to an unlawful disadvantage for Three – (i) a Combinatorial Clock Auction (CCA) using second price rule; and (ii) the sub-1GHz cap that would restrict Three's ability to bid relative to its competitors. The problem is neither remote nor theoretical but rather is a genuine and rational concern noting the relevant bidding conditions and as ComReg will be aware from previous submissions, the impact is significant.

ComReg has suggested in Document No. 20/56 that Three could eliminate the disadvantage in the proposed auction by the early surrender of some of its currently licensed spectrum, in particular, one lot of sub-1 GHz spectrum at 900 MHz. It should be noted that Three currently uses all of its currently licensed spectrum and it could not easily be simply surrendered or released. Three places significant value on its ability to continue to use its licences for their full duration (as would all operators) noting that the full market price was paid for this spectrum, on the basis of it being used for the full duration of the licence. We note that ComReg has not clarified how Three might be compensated for the loss on any early licence surrender. It is critical that Three and all operators have regulatory certainty and that there is a predictable environment against which operators can invest in their networks.

Notwithstanding Three's position as outlined above and following ComReg's own suggestion regarding early surrender, in our view, Three's Proposal meets ComReg's objectives for the spectrum auction while reducing what we consider to be the discrimination against Three inherent in ComReg's Document No. 19/124. As explained above, it is a consequence of ComReg's choice of a CCA and the sub 1-GHz cap that creates the material and unlawful disadvantage for Three in the auction process – in effect, Three is limited to bidding on only 2 lots of 700MHz while its competitors can bid for up to 3 lots.

Three's Proposal is that Three gives, in advance of the award commencing, a binding commitment to ComReg as follows:

- Three will identify and agree with ComReg 1 lot (2x5MHz) of its existing sub-1GHz spectrum that Three is willing to divest itself of, subject to the conditions below. The lot to be divested will be specifically identified and agreed with ComReg and will be in the 900MHz band ("the Divestment Lot");
- The divestiture of the Divestment Lot would be triggered if Three wins more than 2 lots of 700MHz in the upcoming spectrum auction;
- The two 900MHz FDD lots left will need to remain contiguous in the band
- Three will divest the Divestment Lot within a reasonable time following the spectrum award (the Transition Time), such period to be agreed with ComReg but which could be 3 months;



- The Transition Time would allow Three to migrate its use out of the Divestment Lot (to ensure continued service to consumers), and would also include a specified period for Three to offer to transfer the spectrum through a sale of rights, such period to be agreed with ComReg, following which if no agreement for sale can be reached, then the Divestment Lot would be surrendered to ComReg and available for re-licensing in a new award lot where Three would not be entitled to participate;
- The Divestment Lot would not count against Three's bidding cap in the upcoming spectrum award such that Three would be permitted to bid for up to 3 lots of 700MHz spectrum in the upcoming spectrum auction.

This issue remains of serious concern to Three and we do not seek any advantage in the proposed spectrum auction, just a level playing field. I regard this as being of fundamental importance and believe a change from ComReg's original proposal is necessary, if the auction is to be lawful and comply with requirements under the regulatory framework. There are options available to ComReg which would facilitate a lawful spectrum auction consistent with its functions and objectives.

We remain available to clarify any aspects of the Proposal further and to engage on the detail as to how we can make this spectrum available in a short period of time where the above conditions are met. We believe that it is important that ComReg fully considers the Proposal and engages with Three in respect of it rather than rushing to issue a flawed decision along the lines previously proposed which does not take full account of the Proposal.

Yours Sincerely,

Niamh Hodnett
Head of Regulatory Affairs

CC Jeremy Godfrey Commissioner



4 December 2020

Ms Niamh Hodnett
Three Ireland
28/29 Sir Rogerson's Quay,
Dublin 2

BY EMAIL ONLY

Ref: MBSA2 – Three proposal to conditionally return a block of 2 x 5 MHz of 900 MHz

Dear Niamh,

I refer to our telephone conversation on 23 November 2020, my letter of 1 December and your letter of response of 3 December 2020.

I note that your letter of 3 December, amongst other things, reiterates views already set out in previous submissions by Three, e.g. in relation to discrimination. I can confirm that ComReg is fully considering and will address these views in its response to consultation.

Many thanks for providing the additional detail and clarifications on the Three proposal and for the offer to further clarify any aspects of the proposal. We will certainly be in touch should ComReg require further information to aid its consideration of the proposal.

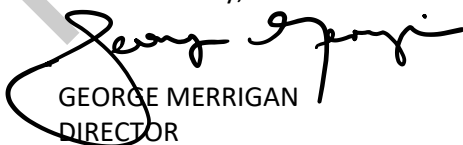
For the avoidance of doubt and as it does with all stakeholder submissions, I can confirm that ComReg is treating Three's proposal seriously and will certainly give it the proper consideration it merits. As you can appreciate, ComReg cannot comment on the merits or otherwise of the proposal outside the normal consultation process, but I can confirm that ComReg will assess the proposal by reference to, and in accordance with, its statutory functions, objectives and duties.

In relation to your suggestion that "*ComReg has not clarified how Three might be compensated for the loss on any early licence surrender*", I can confirm that neither I nor ComReg has ever suggested that Three would be "*compensated*" for any early return of a 900 MHz block. I would point you to paragraph 2.95 of Document 20/56 which clearly sets out the position in this regard and simply articulates what is already set down in legislation.

Finally, can you please confirm, by return, that your letter of 3 December 2020 does not contain any confidential information and so can be published in due course as a consultation submission alongside my letter of 1 December?

I look forward to hearing from you.

Yours sincerely,



GEORGE MERRIGAN
DIRECTOR

MARKET FRAMEWORK

Commission for Communications Regulation

An Coimisiún um Rialáil Cumarsáide

1 Dockland Central, Guild St., Dublin 1, D01 E4X0.

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Annex: 16 Correspondence (Tesco Mobile)

NON-CONFIDENTIAL



Mr Garrett Blaney, Chair and Mr Robert Mourik, Commissioner
The Commission for Communications Regulation ("ComReg")
1 Dockland Central
Guild Street
Dublin 1

BY EMAIL: garrett.blaney@comreg.ie; robert.mourik@comreg.ie

19 November 2020

CONTAINS COMMERCIALY SENSITIVE INFORMATION¹

Dear Garrett, Robert

COMREG – MVNO STUDY

I refer to our meeting on 15 October 2020 (attended by Mr Geoff Byrne, Chairman, Mr Ciaran Melia, General Manager and Mr Colm O'Connell, Head of Legal and Regulatory Affairs, Tesco Mobile and myself) and our resulting action to provide ComReg with updated margin data which reflects the true costs of our business, including marketing, rent, etc.

We found the meeting very constructive. As discussed, Tesco Mobile is very concerned about the ability of MVNOs to match the unlimited data offers in the Irish retail mobile communications market (including the arguably below cost selling by Three and eir by means of their GoMo €12.99 and 48 Months €7.99 offers) on the basis of currently available wholesale 'pay as you go'/volumetric wholesale arrangements and as a result: (i) the medium term viability of MVNOs in the Irish market, including Tesco Mobile; and (ii) in the absence of MVNOs, significantly increased prices for consumers. In particular (and without prejudice to other options, including market analysis), we identified 4 potential options that ComReg could exercise to enable MVNOs secure better wholesale access and as a result, compete effectively with the MNOs, namely:

¹ **Confidential:** The contents of this document are commercially sensitive and are provided to ComReg on the basis that they will be treated in confidence. This document and its contents are not to be disclosed without Tesco Mobile's prior written consent. If the recipient of this document has any questions in this regard or would like to discuss, they are asked to contact Mr Colm O'Connell, Head of Legal and Regulatory Affairs, Tesco Mobile: colm.oconnell@tesco.com.

Geoff Byrne, Sarah Gallagher, Surojit Majumder (India)

Tesco Mobile Ireland Ltd. Registered in Ireland | Reg.No: 421281 | Registered Office: Gresham House, Marine Road, Dun Laoghaire, Co.Dublin

1. Option 1:

In light of the developments in the Irish retail mobile communications market since ComReg's decision to proceed with the 700 MHz spectrum award (the "Spectrum Award")² without attaching MVNO access obligations (including the increased presence of unlimited data offers and the launch of Three's 48 Months €7.99 offer), to delay the Spectrum Award and consult in respect of a detailed MVNO access obligation prescribing the nature/price of such an access obligation;

2. Option 2:

In light of the market developments referred to above, to delay the Spectrum Award and consult in respect of a general MVNO access obligation to provide reasonable wholesale access;

3. Option 3:

In light of the market developments referred to above, to delay the Spectrum Award and consult in respect of the reservation by ComReg to itself of a right to impose either of the above MVNO access obligations in the event that the market deteriorated any further; and

4. Option 4:

To signal to the MNOs, via the MVNO study, ComReg's willingness to intervene in the event that the market deteriorated any further.

We highlighted:

1. The value MVNOs bring to the Irish retail mobile communications market, namely diversity of operator/incentive (ie MNO versus non-MNO) and in the case of Tesco Mobile, a long term commitment by our shareholder, Tesco, to deliver value, convenience and customer service to its customers.
2. The dangers of a tight oligopolistic market for consumers, namely that whilst consumers might benefit from short term price competition (such as the GoMo and 48 Months offers referred to above) they have no protection against price/service exploitation in the medium/long term.

[REDACTED]

4. Whilst delaying the Spectrum Award under Options 1 – 3 would result in a short term delay to the use of key 5G spectrum, failure by ComReg to intervene at this stage would carry with it a high, real and immediate risk that one or more MVNOs would exit the Irish retail mobile communications market to the detriment of consumers in the medium term. For the avoidance of doubt, we are asking ComReg to exercise Options 1, 2 or 3 above in order to mitigate this risk.

Finally, we undertook to speak again in a number of weeks.

² ComReg Doc. No. 19/124, "Proposed Multi Band Spectrum Award – Response to Consultation and Draft Decision The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands".

See below the updated margin data referred to above.

[REDACTED]

[REDACTED]

[REDACTED]

This demonstrates how the Irish retail mobile communications market is failing when Tesco Mobile which has been in the Irish market for 13 years and has a market share by subscriber of 6.2%: [REDACTED]

[REDACTED]. The above is a conservative estimate and does not take into account increased data usage by consumers availing of these plans. It is difficult to imagine how the other MVNOs, with much smaller market shares, can effectively compete with the MNOs in such circumstances.

We look forward to discussing this matter with you again shortly. If you have any questions or would like to discuss, please do not hesitate to contact me.

Yours sincerely

**Bears no signature as sent by email*

MARK HUGHES

Legal and Regulatory Affairs Consultant, Tesco Mobile

Copy: Mr Geoff Byrne, Chairman, Tesco Mobile (geoff.byrne@tesco.com)

Mr Ciaran Melia, General Manager, Tesco Mobile (ciaran.melia@tesco.com)

Mr Colm O'Connell, Tesco Mobile (colm.oconnell@tesco.com)

Annex: 17 Correspondence with Eir

NON-CONFIDENTIAL

Conor Berkeley

From: Conor Berkeley
Sent: 28 February 2020 11:35
To: XX WILLIAM MCCOUBREY
Subject: RE: [Confidential] Information request regarding Eir's licences in the 2.3 GHz Band (RurTel Network)

Hi William,

Following the request below relating to an update to RurTel migration activities and our recent phone call, could you provide a response to below by Wednesday 4th March please?

Kind regards,
Conor

From: Conor Berkeley
Sent: 06 February 2020 16:23
To: 'William Mccoubrey' <[REDACTED]>
Subject: RE: [Confidential] Information request regarding Eir's licences in the 2.3 GHz Band (RurTel Network)

Hi William,

As you are aware ComReg published its latest document (Response to Consultation and Draft Decision) in relation to its proposed multiband spectrum auction (MBSA) on 20th December 2019 ([Document 19/124](#)). ComReg has requested submissions to this publication by 10 February 2020.

In relation to Eir's RurTel network thank you for providing the information to date with regards to the migration activity of RurTel in Galway, Donegal and Kerry. In this regard, from Eir's last update on 5 December 2019, ComReg note 80 active customers (4 in Galway and 76 in Donegal) remain on the RurTel network. ComReg would now appreciate an update from Eir in relation to its RurTel migration activity, particularly in relation to the 4 remaining customers in Galway and the migration plan for the 76 customers in Donegal.

Please note that ComReg may publish the information provided as part of this request and as such, any information deemed confidential by Eir should be identified as such.

Kind regards,
Conor



29 July 2020

Mr William McCoubrey
Head of Regulatory Strategy
Eircom PLC t/a Eir
2022 Bianconi Avenue
Citywest Business Campus
Dublin 24

By email

Eir's licences in the 2.3 GHz Band used for its RurTel network

Dear William,

I refer to our e-mail correspondence regarding Eir's Wireless Telegraphy Act licences in the frequency ranges 2308 – 2326 MHz and 2402 – 2420 MHz (i.e. Eir's RurTel licences), including your e-mails of 31 October 2019, 8 November 2019 and 5 December 2019.

As you will be aware, ComReg has subsequently published a number of documents to progress its award proposals for the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz bands ("MBSA"). Among other things, these documents set out ComReg's draft proposals and draft transition framework for the 2.3 GHz band and, in particular:

- section 8.1.3 of Document 19/124 sets out the proposed Transition Arrangements for the 2.3 GHz Band;
- Document 19/124c provides an updated compatibility analysis for the 2.3 GHz Band based on updated information of the RurTel network provided by Eir on 31 October 2019 and 5 December 2019;
- section 2.5 of Document 20/32 sets out the draft terms and conditions that would be associated with a MBSA2 2.3 GHz Band Transition Licence and Section 3.8.1 of Document 20/32 sets out the draft transition rules for the 2.3 GHz band.

ComReg observes that, in its submissions to Documents 19/124 and 20/32, Eir did not comment on the 2.3 GHz Band co-existence analysis or the proposed transition arrangements for this band.

Commission for Communications Regulation

An Coimisiún um Rialáil Cumarsáide

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To progress ComReg's considerations of these issues, and in light of the matters set out below, ComReg requests that Eir provide an update on its RurTel network for Galway and Donegal.

A. Galway

i. Background - Eir's information

In its correspondence of 31 October 2019, 8 November 2019 and 5 December 2019, Eir relevantly:

- identified that there were 4 active customers on its Galway RurTel network (which entailed 6 point to multi-point licences); and
- provided its field survey results regarding the feasibility of providing an alternative service for these 4 RurTel customers (see Table 1 of the annex to this letter).

ii. ComReg desktop and field surveys

Since then, ComReg conducted a desktop survey of the 4 customer locations using its outdoor coverage mapping tool and a field survey at the locations of Customer 3 (██████████) and Customer 4 (██████████). The results of these surveys are set out in Tables 2 and 3 of the annex to this letter.

iii. ComReg observations

Given the results of Eir's field survey and ComReg's desktop and field surveys as summarised in the Annex to this letter, ComReg observes that:

- Customer 1 (██████████), Customer 2 (██████████) and Customer 4 (██████████) are likely to have a sufficient signal to allow Eir to provide an alternative fixed cellular service ("FCS"); and
- Customer 3 (██████████) is not being served by the Galway RurTel network or using spectrum rights in the 2.3 GHz Band.

iv. Requested actions and information

Accordingly, ComReg requests that Eir:

1. by 28 August 2020, provide:
 - i. any views it may have on the above matters (and further detailed in the annex);



- ii. its plans for migrating Customers 1, 2 and 4 to a FCS or alternative service (including timelines); and
 - iii. an end-date for the decommissioning of RurTel in Galway network; and
2. promptly engage with ComReg regarding the appropriate licensing of the apparatus for wireless telegraphy currently deployed by Eir to provide service to Customer 3 . As Eir will be aware, it is an offence under the Wireless Telegraphy Act of 1926 (as amended) to operate wireless telegraphy apparatus without a licence. Please contact myself or Brendan O'Brien, Manager, Projects and Licensing as soon as possible and in advance of 28 August 2020.

B. Donegal

i. Eir's information

In its correspondence of 31 October 2019, 8 November 2019 and 5 December 2019, Eir relevantly:

- identified that there were 76 active customers on its Donegal RurTel network (which entails 22 point to multi-point licences); and
- noted while each customer in Donegal had been surveyed and this survey indicates that FCS is available for the majority, further analysis and consideration would be required as this survey also indicated that there are 8 customers on the extremity of the network with no FCS availability.

ii. Information Request

In relation to the Donegal RurTel network, which ComReg has not surveyed, ComReg requests that Eir provide by 28 August 2020 an update regarding the (76) remaining customers, including:

- i. the results of **Eir's further studies**¹ to provide FCS to the remaining customers active on the Donegal RurTel network and the outcome of same;

¹ In its response of 5 December 2019, in relation to Donegal Eir noted that, "each customer location has been surveyed and eir continue to assess opportunities to provide alternate voice solutions for these customers particularly as mobile voice service is enhanced in these areas".



- ii. any further **migration activities** carried out or sites decommissioned², since Eir's December 2019 response; and
- iii. a **migration plan**, providing timelines and end dates for the decommissioning of RurTel in Donegal as soon as possible and sufficiently in advance of the MBSA award process.

ComReg may rely on and/or publish some or all of the information received, if required, and, in this regard, Eir should clearly identify in its response what material it considers to be genuinely confidential and the reasons for same.

Please note that ComReg reserves its rights to seek the above information under section 13D of the Communications Regulation Act 2002 (as amended).

If you wish to discuss any of the above, please feel free to contact me.

Yours sincerely,

Conor Berkeley
Manager, Spectrum Compatibility & Development
Commission for Communications Regulation

² ComReg notes that Eir last cancelled RurTel licences on 02 September 2019



Annex 1 –Eir’s Galway RurTel network: survey results and ComReg’s observations

This annex provides a summary of the surveys completed by Eir and ComReg in relation to the four active customers on the Eir Galway RurTel Network and then sets out ComReg’s observations on same.

In total three surveys were completed:

1. Eir’s field survey (submitted 5 December 2019);
2. ComReg’s desktop survey – ComReg’s mobile coverage map (completed February/March 2020); and
3. ComReg’s field survey (completed 10 March 2020).

1) Eir’s field survey

Table 1 sets out information provided by Eir on 5 December 2019 on the feasibility of fixed cellular service (“FCS”) as an alternative service for the 4 active customers on the Galway RurTel network.

From this survey Eir concludes that:

- Customer 1 ([REDACTED]) and Customer 2 ([REDACTED]) should be suitable for FCS migration; and
- Customer 3 ([REDACTED]) and Customer 4 ([REDACTED]) would not appear be suitable for FCS migration due to no signal or weak signal respectively, although in relation to Customer 4, the FCS signal is categorised as Y/N.

Table 1: Eir's survey results

Customer #	cust_name	cust_add	FCS signal Y/N	XY coordinates	Notes
1	[REDACTED]	[REDACTED]	Y	[REDACTED]	signal is weak but should be possible to migrate
2	[REDACTED]	[REDACTED]	Y	[REDACTED]	Good Signal
3	[REDACTED]	[REDACTED]	N	[REDACTED]	No Signal, and could not get eircode
4	[REDACTED]	[REDACTED]	Y/N	[REDACTED]	Signal very weak, and could not get eircode

[Source: Eir correspondence of 5 December 2019]

2) ComReg's desktop study - ComReg's mobile coverage map

In February 2020, a desktop analysis of the location of all four customers on the Galway RurTel network was conducted using ComReg's Outdoor Coverage Map³. The results of this analysis are outlined in Table 2 below.

Table 2: ComReg's desktop survey results – ComReg's mobile coverage map

ComReg Desktop Survey Results					
Customer #	Customer Name	Grid Co-ordinates	UMTS	GSM	4G
			EIR	EIR	EIR
1	[REDACTED]	[REDACTED]	FAIR	FAIR	NONE
2	[REDACTED]	[REDACTED]	VERY GOOD	VERY GOOD	GOOD
3	[REDACTED]	[REDACTED]	FRINGE	FRINGE	NONE
4	[REDACTED]	[REDACTED]	VERY GOOD	GOOD	VERY GOOD

From this survey, ComReg observes that:

³ [ComReg Coverage Map Frequently Asked Questions](#)

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- Customer 1 has a FAIR UMTS signal. This aligns with the results of Eir’s field survey in Table 1 above, where Eir notes that the “signal is weak but should be possible to migrate”.
- Customer 2 has a VERY GOOD UMTS signal and a GOOD 4G signal. This aligns with the results of Eir’s field survey in Table 1 above, where Eir notes a “good signal”
- Customer 3 has a FRINGE UMTS signal and no 4G signal. This aligns with the results of Eir’s field survey in Table 1 above, where “no signal” is noted; and
- Customer 4 has a VERY GOOD UMTS and a VERY GOOD 4G signal. This is different to the results of Eir’s field survey in Table 1 above, where a “very weak” signal is noted.

3) ComReg’s field survey results

On 10 March 2020, ComReg conducted a field survey to assess Eir’s survey results at the location of Customer 3 and Customer 4.⁴

The results of ComReg’s field survey are set out in Table 3 below.

Table 3: ComReg’s field survey Results

ComReg Field Survey Results							
Customer #	cct_no	Pair_No	cust_name	cust_add	Eir GSM	Eir 3G	Eir 4G/LTE
3	[REDACTED]	65	[REDACTED]	[REDACTED]	No Signal	No Signal	No Signal
4	[REDACTED]	50	[REDACTED]	[REDACTED]	-95dBm	-80 dBm	-94dBm

From this field survey, ComReg observes that:

- At Customer 4’s location there were strong Eir 3G and Eir 4G signals (-80 dBm and -94 dBm, respectively). This aligns with the results of ComReg’s desktop study (as set out in Table 2 above) and strongly suggests that it would be possible for Eir to provide a FCS service to this customer;

⁴ ComReg staff did not carry out a field survey for Customers 1 and 2 as the results of ComReg’s desktop study aligned with Eir’s field survey (where Eir had already indicated that these customers were suitable for a FCS).



- Customer 3's location - while there was no signal from any Eir mobile network (GSM, 3G and 4G/LTE), it was discovered that this customer was not being served by a 2.3 GHz band RurTel system but rather by an Exicom Condor system operating in the VHF band (159 - 174 MHz). On inspection, ComReg staff observed that this system is likely to have been installed many years previously.

4) ComReg observations

From the survey results above, ComReg staff observe that:

- Customers 1, 2 and 4 are likely to have a sufficient signal to allow Eir to provide a FCS service to same; and
- Customer 3 is not being served by the Galway RurTel network or using spectrum rights in the 2.3 GHz band.



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eir.ie

Conor Berkeley
Manager, Spectrum Compatibility & Development
Commission for Communications Regulation
1 Dockland Central
Guild Street
Dublin 1
D01 E4X0

By email only: [REDACTED]

28 August 2020

Confidential

Re: eir's licences in the 2.3 GHz Band used for its RurTel network

Dear Conor,

Further to ComReg's request for information dated 29 July 2020, Please see below for our responses in respect of the queries regarding the Galway RurTel system. We are currently undertaking a further study of the Donegal system. The field work completes this week and the results will then be analysed by our mobile team to seek to determine appropriate migration strategies for the customers. eir is aiming to complete this analysis in the coming weeks during September.

A. Galway

ComReg requests that eir provide:

1. by 28 August 2020, provide:

- i. any views it may have on the above matters (and further detailed in the annex);***
- ii. its plans for migrating Customers 1, 2 and 4 to a FCS or alternative service (including timelines); and***
- iii. an end-date for the decommissioning of RurTel in Galway network; and***

eir response: Based on our records there are two customers remaining on the Galway RurTel network. Of the four customers reviewed by ComReg one has been migrated to FCS and one has ceased. The two remaining customers are not within our existing mobile network coverage footprint. A new site is planned as part of our ongoing mobile network enhancement programme which should provide mobile coverage at both of the remaining customer locations. When the site is deployed both customers will be candidates for FCS.



Unfortunately eir is not in a position to provide a forecast decommissioning date. The deployment of the new mobile network infrastructure is subject to planning permission which has not yet been granted.

2. promptly engage with ComReg regarding the appropriate licensing of the apparatus for wireless telegraphy currently deployed by Eir to provide service to Customer 3 . As Eir will be aware, it is an offence under the Wireless Telegraphy Act of 1926 (as amended) to operate wireless telegraphy apparatus without a licence. Please contact myself or Brendan O'Brien, Manager, Projects and Licensing as soon as possible and in advance of 28 August 2020.

eir response: Customer 3 is served by the RurTel system and there is no Exicom Condor system equipment at this premises. We are investigating the matter further.

We will be in contact as soon as possible with the results of the Donegal RurTel survey.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'W. McCoubrey'.

William McCoubrey
Head of Regulatory Strategy

NON-CONFIDENTIAL

Conor Berkeley

From: William Mccoubrey <[REDACTED]>
Sent: 31 August 2020 16:36
To: Conor Berkeley
Cc: Brendan O'Brien; James Eivers
Subject: Re: [Confidential] Information request regarding Eir's licences in the 2.3 GHz Band (RurTel Network)

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Conor,

Customer 1: ceased
Customer 2 & 3: RurTel
Customer 4: FCS

Regards,
William

On Fri, 28 Aug 2020 at 16:44, Conor Berkeley [REDACTED] wrote:

Hi William,

Thanks for the information provided in your email below. In relation to Galway I note that you state two customers have been decommissioned and 2 customers remain. In relation to these 4 customers, can you identify the 2 customers remaining and their locations and also identify the 2 customers that have been decommissioned and their locations please?

Kind regards,

Conor

From: William Mccoubrey [REDACTED]
Sent: 28 August 2020 15:16
To: James Eivers [REDACTED]
Cc: Conor Berkeley [REDACTED]; Brendan O'Brien [REDACTED]
Subject: Re: [Confidential] Information request regarding Eir's licences in the 2.3 GHz Band (RurTel Network)

Hi Conor,

Please see attached.

Regards,

William

On Wed, 29 Jul 2020 at 17:51, James Eivers [REDACTED] wrote:

Hi William,

Please see attached a letter on behalf of Conor Berkeley regarding Eir's licences in the 2.3 GHz Band used for its RurTel network.

If you have any questions regarding the information requested don't hesitate to contact either myself or Conor.

Kind regards,

James.

James Eivers

Anailísí Speictrim Raidió , Comhoiriúnacht & Forbairt Speictrim

Radio Spectrum Analyst, Spectrum Compatibility & Development

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Rphost | Email [REDACTED]

Suíomh | Website www.comreg.ie

Conor Berkeley

Subject: FW: [Confidential] Information request regarding Eir's licences in the 2.3 GHz Band (RurTel Network)

From: William Mccoubrey [redacted]
Sent: 03 September 2020 17:22
To: Conor Berkeley [redacted]
Cc: Brendan O'Brien [redacted]; James Eivers [redacted]
Subject: Re: [Confidential] Information request regarding Eir's licences in the 2.3 GHz Band (RurTel Network)

Hi Conor,

Yes and to correct my earlier submission, customer 2 is in coverage. What I meant to say is that migration would take place in similar timescales to the provision of coverage to customer 3, as we need all customers off the Galway system before it can be decommissioned.

Regards,
William

On Thu, 3 Sep 2020 at 16:54, Conor Berkeley [redacted] wrote:

Hi William,

Could you please clarify that Customer 2 relates to [redacted] located at [redacted] and that Customer 3 relates to [redacted] located at [redacted], as detailed in Eir's response of 5th December 2019 provided below:

cct_no	Pair_No	cust_name	cust_add	dp_no	dp_address	FCS signal Y/N	eircode	XY coordinates	stations served directly / repeaters	notes
[redacted]	101	[redacted]	[redacted]			Y	[redacted]	[redacted]	Repeaters	signal is weak but should be possible to migrate
[redacted]	128	[redacted]	[redacted]			Y	[redacted]	[redacted]	Repeaters	Good Signal

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	65	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	N	[REDACTED]	[REDACTED]	Repeaters	No Signal, and could not get eircode
[REDACTED]	50	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	Y/N	[REDACTED]	[REDACTED]	Repeaters	Signal very weak, and could not get eircode

In your recent response of 28 August, you note that “The two remaining customers [Customer 2 and Customer 3] are not within our existing mobile network coverage footprint” and that an additional base station is required to serve these customers. In the table above (response of 5th December) Eir notes that Customer 2 ([REDACTED]) has “Good Signal” and indicates FCS is viable. Can you please clarify the requirement for the additional base station for Customer 2?

Kind regards,

Conor

From: William Mccoubrey [REDACTED]
Sent: 31 August 2020 16:36
To: Conor Berkeley [REDACTED]
Cc: Brendan O'Brien [REDACTED]; James Eivers [REDACTED]
Subject: Re: [Confidential] Information request regarding Eir's licences in the 2.3 GHz Band (RurTel Network)

Hi Conor,

Customer 1: ceased

Customer 2 & 3: RurTel

Customer 4: FCS

Regards,

William

On Fri, 28 Aug 2020 at 16:44, Conor Berkeley [REDACTED] wrote:

Hi William,

Thanks for the information provided in your email below. In relation to Galway I note that you state two customers have been decommissioned and 2 customers remain. In relation to these 4 customers, can you identify the 2 customers remaining and their locations and also identify the 2 customers that have been decommissioned and their locations please?

Kind regards,

Conor

From: William Mccoubrey [REDACTED]
Sent: 28 August 2020 15:16
To: James Eivers [REDACTED]
Cc: Conor Berkeley [REDACTED]; Brendan O'Brien [REDACTED]
Subject: Re: [Confidential] Information request regarding Eir's licences in the 2.3 GHz Band (RurTel Network)

Hi Conor,

Please see attached.

Regards,

William

On Wed, 29 Jul 2020 at 17:51, James Eivers [REDACTED] wrote:

Hi William,

Please see attached a letter on behalf of Conor Berkeley regarding Eir's licences in the 2.3 GHz Band used for its RurTel network.

If you have any questions regarding the information requested don't hesitate to contact either myself or Conor.

Kind regards,

James.

James Eivers

Anailísí Speictrim Raidió , Comhoiriúnacht & Forbairt Speictrim

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GDPR information: we have updated our Privacy Notice, which explains what personal information we collect and use about individuals, what we do with it and why. Here is a link to our updated Privacy Notice:

<https://www.comreg.ie/privacy/>



2 November 2020

Mr William McCoubrey
Head of Regulatory Strategy
Eircom PLC t/a Eir
2022 Bianconi Avenue
Citywest Business Campus
Dublin 24

By email: [REDACTED]

Eir's licences in the 2.3 GHz Band used for its RurTel network in Galway

Dear William,

I refer to Wireless Telegraphy Act licences in the 2.3 GHz Band held by Eircom PLC t/a Eir ("Eir") used for its RurTel network in Galway¹ and to previous correspondence (copies of which are set out in Annex 2 for ease of reference).

Background

On 20 November 2017, staff of the Commission for Communications Regulation ("ComReg") met with Eir. Following that meeting, ComReg wrote to Eir on 28 November 2017 noting that:

- it was in the process of considering the future use and the potential award of the 2.3 GHz Band;
- it was gathering information on the existing use of the band and in this regard Eir currently held licences in the frequency ranges 2308 - 2326 MHz and 2402 - 2420 MHz;
- it intended to, among other things, consider the compatibility and coexistence between the RurTel network and potential future services in the 2.3 GHz Band; and
- as RurTel is a legacy system, ComReg requested that Eir provide its plans for delivering alternative service to the customers and the envisaged timeframes for same.

¹ This letter focuses upon the Galway RurTel network. A letter regarding the Donegal RurTel network will issue separately.



Since then, ComReg has published a number of documents to progress its award proposals for the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz bands (“Proposed Award”), including its compatibility analysis for the 2.3 GHz Band based on, among other things, information from Eir regarding the RurTel network².

In addition, on 27 September 2019, ComReg wrote to Eir requesting updated and further information on its RurTel network particularly in relation to:

- the number of active customers on the RurTel network;
- Eir’s migration activities and the locations of remaining RurTel customers; and
- the technical parameters of the network.

In its response dated 31 October 2019, Eir confirmed, among other things, that the Galway RurTel network had 4 active customers, each of which had been surveyed by Eir with respect to eligibility and feasibility of migration to alternative voice solutions.

In its subsequent response dated 8 November 2019, Eir provided ComReg with customer details and locations (including coordinates) for the 4 remaining customers on the Galway RurTel network.

Following further correspondence from ComReg (on 21 November 2019), Eir responded by letter dated 5 December 2019 and provided results of its RurTel survey in Galway relating to its 4 remaining Galway customers.³ An extract from that survey is set out in Table 1 below.

² For information on ComReg’s awards see the [Spectrum Awards](http://www.comreg.ie) webpage at www.comreg.ie

³ This is available in Annex 2 of this letter, “ST1 RURTEL 2018 Donegal – Galway Rurtel survey 05Dec19”.

Table 1: Eir Survey - Customer location and Survey Results

Cust. No.	CustomerName	Cust Address	FCS signal Y/N	XY coordinates	Eir notes
1	[REDACTED]	[REDACTED]	Y	[REDACTED]	<i>Signal is weak but should be possible to migrate</i>
2	[REDACTED]	[REDACTED]	Y	[REDACTED]	<i>Good Signal</i>
3	[REDACTED]	[REDACTED]	N	[REDACTED]	<i>No Signal, and could not get eircode</i>
4	[REDACTED]	[REDACTED]	Y/N	[REDACTED]	<i>Signal very weak, and could not get eircode</i>

ComReg requested a further update from Eir by email on 6 February 2020 and again on 28 February 2020 but received no response.

In February and March 2020, ComReg completed a survey of Eir's RurTel network in Galway for the 4 customers, using information provided by Eir. ComReg's survey was completed in two parts:

- I. ComReg's desktop survey – based on ComReg's mobile coverage map (completed February/March 2020); and
- II. ComReg's field survey in relation to customer 3 and 4 (completed 10 March 2020).

On 29 July 2020, ComReg wrote to Eir setting out the high-level results of its surveys⁴ and ComReg's staff observations in relation to the four customers, being that:

- Customers 1, 2 and 4 “are likely to have a sufficient signal to allow Eir to provide a FCS service to same”; and
- Customer 3 “is not being served by the Galway RurTel network or using spectrum rights in the 2.3 GHz band”. In particular, ComReg staff observed an Exicom Condor System operating at 159.0875 MHz (Tx) and 163.5875 MHz (Rx) on the customer premises which appeared to be providing service to Customer 3.

⁴ As out in the annex to that letter.

ComReg requested Eir's views on the above, and that it *"promptly engage with ComReg regarding the appropriate licensing of the apparatus for wireless telegraphy currently deployed by Eir to provide service to Customer 3"*.

In its response dated 28 August 2020, Eir relevantly identified that:

- *"there are two customers remaining on the Galway RurTel network" (which entail 6 point to multi-point licences), down from the 4 active customers identified in its correspondence of 31 October 2019;*
- *"the two remaining customers [Customer 2 and 3]⁵ are not within our existing mobile network coverage footprint. A new site is planned as part of our ongoing mobile network enhancement programme which should provide mobile coverage at both of the remaining customer locations. When the site is deployed both customers will be candidates for [Fixed Cellular Service] FCS"; and*
- *"Customer 3 is served by the RurTel system and there is no Exicom Condor system equipment at this premises. We are investigating the matter further".*
- In its correspondence dated 3 September 2020, Eir corrected its earlier correspondence to clarify that:
 - *"Customer 2 is in coverage"; and*
 - *"that the migration would take place in similar timescales to the provision of FCS coverage to Customer 3, as we need all customers off the Galway system before it can be decommissioned".*

ComReg staff observations on Customers 2 and 3 in the Galway network

As of 2 November 2020, ComReg understands that Eir's RurTel network in Galway is supporting one customer (Customer 2).

While Eir asserts that Customer 3 is being supplied with a service using the RurTel network, ComReg considers that service is instead being provided using unlicensed equipment operating in the Very High Frequency (VHF) range of 159 – 174 MHz.

⁵ In its correspondence dated 31 August 2020, Eir further clarified that the two remaining customers referred to are "Customer 2" and "Customer 3".

Customer 3

Considering:

- On 10 March 2020, ComReg staff conducted a field survey of Customer 3's premises.⁶ The key finding from that survey was that, "*Customer 3 is not being served by the Galway RurTel network or using spectrum rights in the 2.3 GHz band*";
- On 29 July 2020, ComReg wrote to Eir setting out its high-level results of its survey and ComReg staff's observation that:

Customer 3 "*is not being served by the Galway RurTel network or using spectrum rights in the 2.3 GHz band*". ComReg staff observed an Exicom Condor System operating at 159.0875 MHz (Tx) and 163.5875 MHz (Rx) on the customer premises which appeared to be providing Customer 3 service.

- Eir had not provided any evidence to contest ComReg's view, as set out in its letter dated 29 July 2020, other than stating in its response dated 28 August 2020 that "*Customer 3 is served by the RurTel system and there is no Exicom Condor system equipment at this premises. We are investigating the matter further*"; and
- the detailed results of ComReg's field survey from 10 March 2020 for Customer 3, an extract⁷ from which is set out in Annex 1 to this letter, where ComReg staff identify that:

"ComReg staff did not observe any RurTel infrastructure at the site of Customer 3 following completion of a field survey of the premises. Instead it appears to ComReg staff that an unlicensed Exicom System operating in the VHF frequency range is being used by Eir to provide an extension of the existing copper network through the valley at locations identified in Figure A.5 [of Annex 1]"

ComReg staff maintain the view that Customer 3:

- is not being served by the Galway RurTel network or using spectrum rights in the 2.3 GHz band; and

⁶ The results of this survey are set out in the annex to this letter

⁷ This extract focuses on details of ComReg's Report on Eir's RurTel Network for Customer 3. Although Customer 4 was also investigated, Eir have since confirmed (in its response of 28 August 2020) that Customer 4 has been successfully migrated to an alternative service and is therefore no longer relevant.

- is instead being served by an unlicensed Exicom System operating in the VHF frequency range.

Requested action regarding Customer 3

In light of the above, ComReg staff requests Eir to promptly engage with ComReg regarding the appropriate licensing of the apparatus for wireless telegraphy⁸ currently deployed by Eir to provide service to Customer 3. As Eir will be aware, it is an offence under the Wireless Telegraphy Act 1926 (as amended) to operate wireless telegraphy apparatus without a licence. Please contact myself or Brendan O'Brien, Manager, Projects and Licensing as a matter of urgency and, in any event, in advance of 12 November 2020.

For the avoidance of doubt, Eir should not install new RurTel equipment to provide service to Customer 3.

Customer 2

Considering:

- Eir's survey results dated 5 December 2019 (Table 1), which confirms that "*Customer 2 is in [FCS] coverage*"; and
- ComReg's desktop survey conducted in February 2020 (included in Annex 1 to the letter of 29 July 2020 and again in the annex to this letter) which indicates that Customer 2 has "*VERY GOOD*" UMTS and GSM coverage, and "*GOOD*" 4G coverage, and concurs with Eir's survey on same;
- Eir's response dated 28 August 2020 and its subsequent clarification of 3 September 2020 which states that Customer 2 is, in fact, in [FCS] coverage:
 - Eir's response, dated 28 August 2020, states that:
"The two remaining customers are not within our existing mobile network coverage footprint" ; and

"a new site is planned as part of our ongoing mobile network enhancement programme which should provide mobile coverage at both of the

⁸ See [ComReg's Business Radio Licensing process](#) available at www.comreg.ie



remaining customer locations. When the site is deployed both customers will be candidates for FCS.”; and

- Eir clarification in its response dated 3 September 2020 that “*Customer 2 is in [FCS] coverage*”; and
- the migration of Customer 2, although being in FCS coverage, “*would take place in similar timescales to the provision of FCS coverage to Customer 3, as we need all customers off the Galway system before it can be decommissioned*”,

ComReg staff consider that:

- the field surveys conducted by Eir and the desktop survey conducted by ComReg conclude that Customer 2 should have a sufficient signal by which to allow Eir to provide a fixed cellular service using its existing network infrastructure; and
- there appears to be no legitimate reason to delay this migration, particularly by reference to:
 - Eir’s planned mobile enhancement programme referred to in its correspondence dated 28 August 2020, as this customer should already have a sufficient signal to allow Eir to provide a FCS service; or
 - Eir’s wish to align this migration with the provision of coverage to Customer 3 in relation to Eir’s mobile network enhancement programme referred to in its correspondence dated 3 September 2020, because Customer 3, in ComReg staff’s view, is not receiving its service from the RurTel network.

Requested action regarding Customer 2

Noting the above, ComReg staff requests Eir to promptly migrate Customer 2 from RurTel to an alternative service, again noting that this customer is in existing FCS coverage. Given that the installation of FCS for a single customer is not a complex task⁹, ComReg requests that this action be completed no later than 31 January 2021.

⁹ Eir Document “Single Billing through Wholesale Line Rental (SB-WLR)” notes that Customer Premises Equipment (CPE) requires that “A fixed line phone is connected to a terminal box that contains a SIM card. The terminal box is radio linked to a cellular network. The terminal box in this case will be deemed the NTU for this service. The handset utilised is a normal corded or cordless phone.”

Expiry of RurTel licensing in Galway

Noting that there would be no active customers on the Galway RurTel network following the migration of Customer 2 to an alternative service, ComReg is of the current view that it will cease issuing renewal licences to Eir in respect of the Galway network from 31 January 2021.

Next Steps

As set out above, please contact ComReg as a matter of urgency regarding what appears to be an unlicensed Exicom system.

Should Eir wish to respond to any of the other points made in this letter, it is requested to do so by 12 November 2020.

Please note that ComReg may rely on and/or publish some or all of the information received, if required, and, in this regard, Eir should clearly identify in its response any material that it considers to be genuinely confidential and the reasons for same. For the avoidance of doubt, ComReg will not publish customer names, addresses or geographic locations.

Please note that ComReg reserves all of its rights, including, in particular, its right to require the provision of information in relation to the matters raised in this letter under section 13D of the Communications Regulation Act 2002 (as amended) and its rights to take action in relation to the operation of unlicensed wireless telegraphy equipment.

If you wish to discuss any of the above, please feel free to contact me.

Yours sincerely,

By email

Conor Berkeley

Manager, Spectrum Compatibility & Development

Commission for Communications Regulation



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Annex 1 – Technical Report

Extract of ComReg staff Studies of Eir's Galway RurTel Network

ComReg staff:

- Garrett Stack – Manager, Spectrum Intelligence and Investigations; and
- James Eivers – Radio Spectrum Analyst, Spectrum Policy and Development

Location of Field Study:

- [REDACTED], Co Galway - at the premises of Customer 3 ([REDACTED]) and Customer 4 ([REDACTED])

Date: 10 March 2020

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A 1.1 This extract contains details relating to ComReg’s surveys of Eir’s RurTel network in Galway. For simplicity, this extract excludes information available in the full report such as:

- background information provided in the original report;
- details of ComReg’s coverage analysis using Atoll;
- information relating to ComReg’s field survey results of Customer 4; and
- annexes of the original report.

A 1.2 In this regard this Annex relates specifically to Customer 3 and should be read and understood in the context intended in ComReg’s letter to Eir dated 2 November 2020.

Purpose of Report

A 1.3 In its correspondence of 31 October 2019, 8 November 2019 and 5 December 2019, Eir relevantly:

- identified that there were 4 active customers on its Galway RurTel network (which entailed 6 point to multi-point licences); and
- provided its field survey results regarding the feasibility of providing an alternative service for these 4 RurTel customers.

A 1.4 An extract of Eir’s survey results is contained in Table A.1 below.

Customer	cct_no	cust_name	cust_add	FCS signal Y/N	eircode	XY coordinates	notes
1	[REDACTED]	[REDACTED]	[REDACTED]	Y	[REDACTED]	[REDACTED]	signal is weak but should be possible to migrate
2	[REDACTED]	[REDACTED]	[REDACTED]	Y	[REDACTED]	[REDACTED]	Good Signal
3	[REDACTED]	[REDACTED]	[REDACTED]	N	[REDACTED]	[REDACTED]	No Signal, and could not get eircode
4	[REDACTED]	[REDACTED]	[REDACTED]	Y/N	[REDACTED]	[REDACTED]	Signal very weak, and could not get eircode

Table A.1: Extract of Eir Survey Results (5 December 2019)

A 1.5 In February and March 2020, ComReg conducted its own surveys of the Galway RurTel network consisting of:

- (1) a desktop survey of the 4 customer locations using its outdoor coverage mapping tool¹; and
- (2) in light of the outcome of the desktop survey, a field survey at the locations of Customer 3 (██████████) and Customer 4 (██████████).

A 1.6 The purpose of these surveys is to assess and verify information provided by Eir at each of the customer locations. In particular, to assess the migration eligibility and feasibility of each customer from RurTel to an alternative voice service.

ComReg staff desktop study of Eir’s RurTel customers in Galway

A 1.7 ComReg staff’s initial review of the information provided by Eir concluded that Customer 1 and Customer 2 had a Fixed Cellular Service (“FCS”) signal available and, therefore, an alternative to RurTel was available and it should be possible for Eir to migrate these customers.

A 1.8 Eir provided no alternate solution to allow for the migration of Customer 3 and Eir was unsure whether Customer 4 could be served by FCS.

A 1.9 In February 2020, a desktop analysis of the location of all four customers on the Galway RurTel network was conducted using the Atoll planning tool and ComReg’s outdoor coverage map. The results of this analysis are outlined in Table A.2.

ComReg Desktop Survey Results					
Customer #	Customer Name	Grid Co-ordinates	UMTS	GSM	4G
			EIR	EIR	EIR
1	██████████	██████████	FAIR	FAIR	NONE
2	██████████	██████████	VERY GOOD	VERY GOOD	GOOD
3	██████████	██████████	FRINGE	FRINGE	NONE
4	██████████	██████████	VERY GOOD	GOOD	VERY GOOD

Table A.2: ComReg staff’s desktop survey results

A 1.10 From this survey ComReg staff observed that:

¹ ComReg periodically receives accurate datasets of network architecture from each network operator. A radio network planning tool is then used to process data and generate coverage predictions in tandem with a Digital Terrain Model (“DTM”) provided by Ordnance Survey Ireland (“OSI”) along with land type data from various service providers.

- Customer 1 has a FAIR UMTS signal. This aligns with the results of Eir’s field survey in Table A.1 above, where Eir notes that the *“signal is weak but should be possible to migrate”*;
- Customer 2 has a VERY GOOD UMTS signal and a GOOD 4G signal. This aligns with the results of Eir’s field survey in Table A.1 above, where Eir notes a *“good signal”*;
- Customer 3 has a FRINGE UMTS signal and no 4G signal. This aligns with the results of Eir’s field survey in Table A.1 above, where *“no signal”* is noted; and
- Customer 4 has a VERY GOOD UMTS and a VERY GOOD 4G signal. This is different to the results of Eir’s field survey in Table A.1 above, where a *“very weak”* signal is noted.

A 1.11 The desktop survey highlighted the Customer 3 location as the most problematic for providing an alternate service to allow the migration of the RurTel system. The coordinates provided for Customer 3 were not clearly associated with a single house, and from using satellite images, it was clear that the [REDACTED] was a challenging environment for radio propagation.

A 1.12 ComReg staff considered that a field survey was required to verify the information provided by Eir and investigate the feasibility of providing an alternate service. As Eir had reported that Customer 3 and Customer 4 had weak or no signal, ComReg staff’s field survey focussed on these customers.

ComReg staff field study of Eir’s RurTel customers in Galway

A 1.13 On 10 March 2020, ComReg conducted a field survey to assess Eir’s survey results at the location of Customer 3 and Customer 4².

A 1.14 For the purpose of this Annex, this report focuses on Customer 3 (Customer 4 has since been migrated).

² ComReg staff did not carry out a field survey for Customers 1 and 2 as the results of ComReg staff’s desktop study aligned with Eir’s field survey (where Eir had already indicated that these customers were suitable for a FCS).

Customer 3

Location - [REDACTED] ore, Co Galway ([REDACTED])

A 1.15 The [REDACTED] is approximately 10 km long surrounded by high mountain walls (approximately 400 m above sea level) on all sides where the only entrance to the [REDACTED] [REDACTED]. The [REDACTED] entrance is curved which adds to its seclusion and presents a very challenging environment from a radio propagation perspective, as shown in Figure A.1.

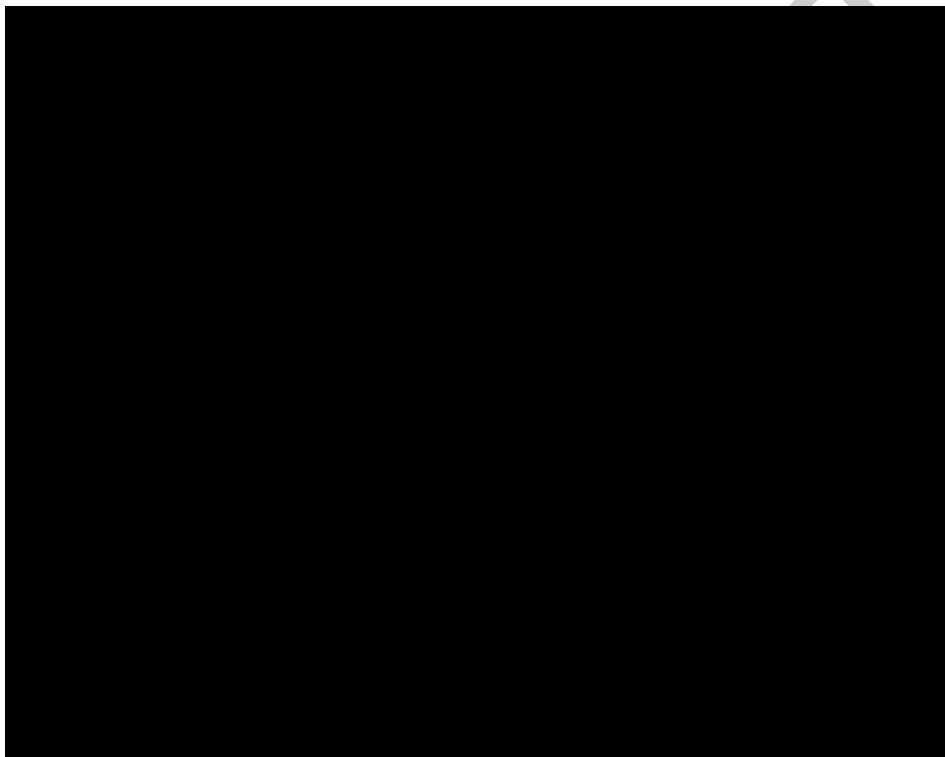


Figure A.1: Customer 3 Location and Physical Terrain

A 1.16 Using Customer 3 co-ordinates provided by Eir (5 December 2019, Table A.1 below) and an analysis of satellite images of the valley using Google Earth, ComReg identified a number of possible premises at the given coordinates. ComReg assumed the premises in question was at the end of the valley, as shown in Figure A.1.

Site Survey

- A 1.17 The location of cottages and pole mounted VHF installations were noted along the roadside in the valley. Signal strength was recorded from the Three network, as it was the only mobile network available in this location and was broadly in line with coverage expected from ComReg's Outdoor Coverage map. The extent of the copper network was also noted to end at the head of the valley.
- A 1.18 The radio installation and the associated premises was located at the end of the valley. ComReg staff made themselves known to the property owners who granted permission to conduct a closer inspection of the infrastructure on the property (see Figure A.2).
- A 1.19 The property owners confirmed that they are a customer of Eir and that they understand the equipment (as illustrated in Figure A.2) is part of the system used to obtain a telephone service.



Figure A.2: Radio Installation at Customer 3 property location

- A 1.20 No RurTel installation was identified on the property of Customer 3. However, ComReg staff noted an Exicom Condor³ system operating⁴ (see Figure A.3) which appears to be providing service to Customer 3's premises. On further inspection, it appeared to ComReg staff that the Exicom System appeared to provide an extension to the copper network which is located at the head of the valley.
- A 1.21 ComReg staff observed labelling on the Exicom Condor unit at the customer premises which indicated that it was transmitting at frequency 159.0975 MHz and receiving at frequency 163.5875 MHz.

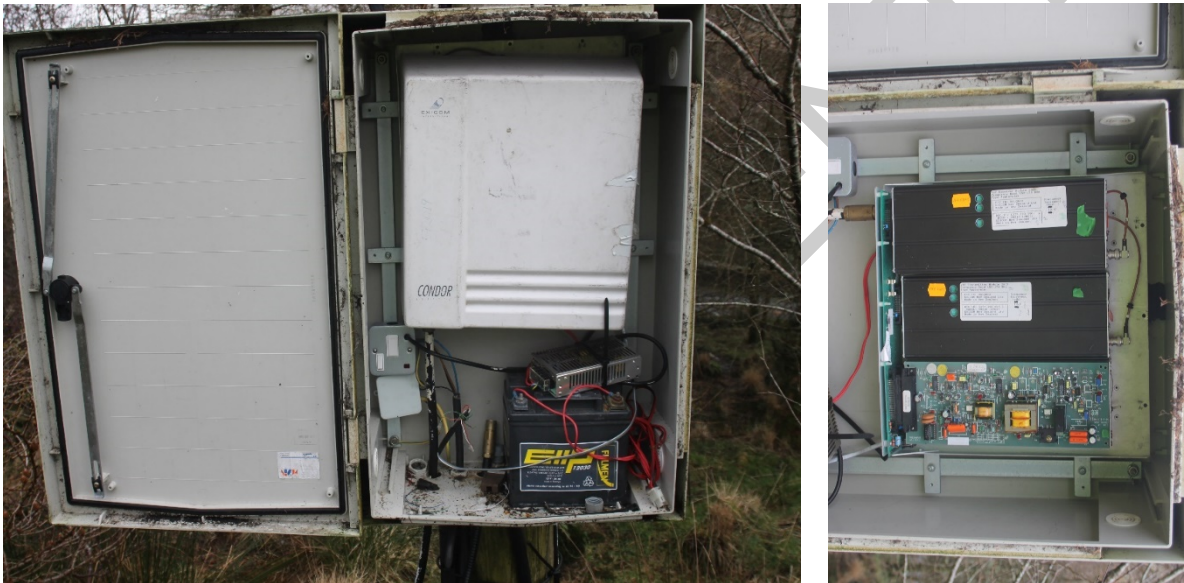


Figure A.3: Exicom Condor System (Cabinet and Inside Cabinet)

- A 1.22 A survey was completed on the installations located at the head of the valley, identified in Figure A.5 below⁵. This head of valley location appears to be the point at which the copper network terminates. ComReg staff understand that from this point, the Exicom Condor system provides a radio link to Customer 3's premises⁶ to provide service.

³ <http://exicom.co.in/pages/condor-single-channel-radio/>

⁴ Exicom systems operate in the VHF frequency range 159 -174 MHz

⁵ Head of valley location: [REDACTED] and Customer Premises location: [REDACTED]

⁶ The customer was also present at this location and provided a history of the system and confirmed that it was being provided by Eir.



Figure A.4: Head of Valley Infrastructure

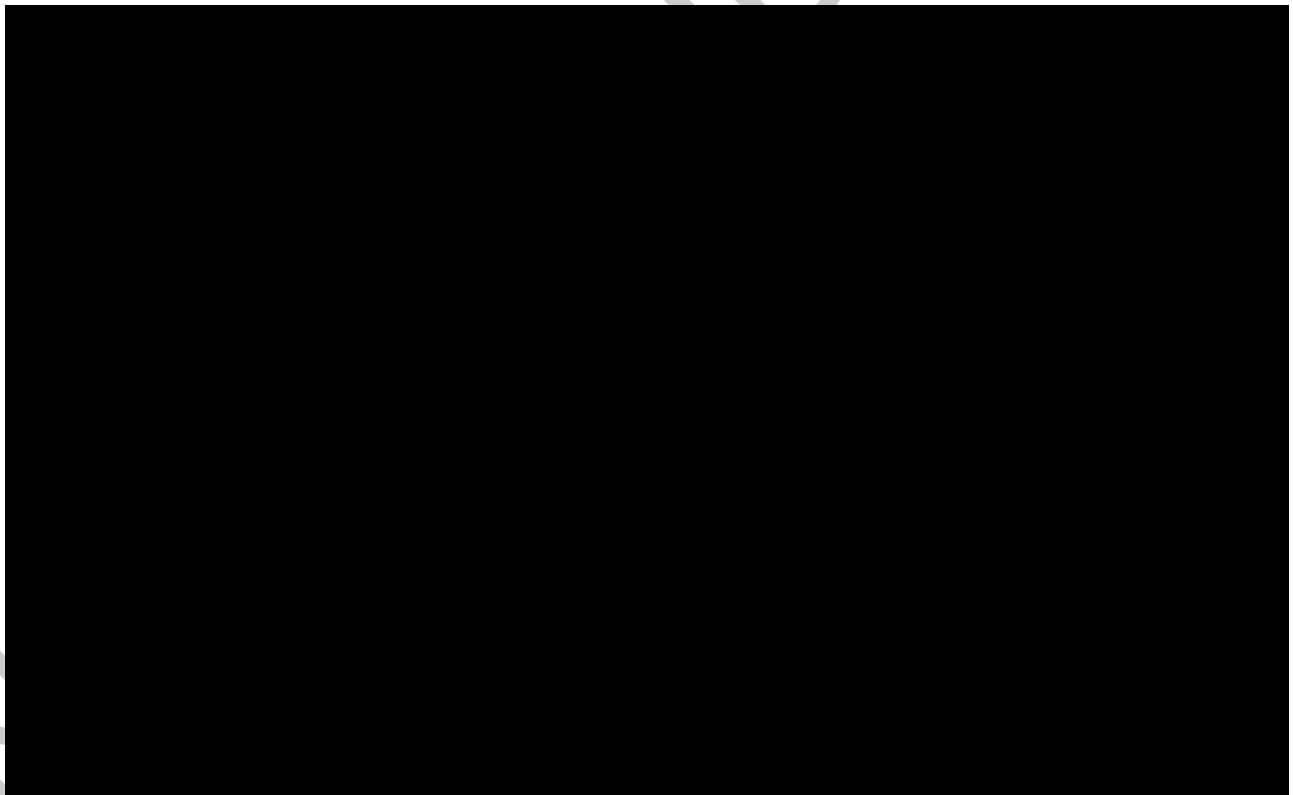


Figure A.5: Customer 3 Path Profile

Survey Conclusion for Customer 3

A 1.23 The results of ComReg staff's field survey for Customer 3 are set out in Table A.3 below:

ComReg Field Survey Results							
Customer #	cct_no	Pair_No	cust_name	cust_add	Eir GSM	Eir 3G	Eir 4G/LTE
3	[REDACTED]	65	[REDACTED]	[REDACTED]	No Signal	No Signal	No Signal

Table A.3: ComReg staff's field survey results

A 1.24 From this field survey, ComReg staff observe that:

- Customer 3's location - while there was no signal from any Eir mobile network (GSM/2G, UMTS/3G or LTE/4G), it was discovered that this customer was not being served by a 2.3 GHz band RurTel system but rather by an Exicom Condor system operating in the VHF band (159 - 174 MHz). On inspection, ComReg staff observed that this system is likely to have been installed many years previously; and
- Upon subsequent inspection of ComReg's licensing database, no licence is in place for the Exicom Condor system identified above.

From the survey results above, ComReg staff observe that Customer 3 is not being served by the Galway RurTel network or using spectrum rights in the 2.3 GHz band.











ComReg staff's overall survey conclusions

A 1.25 From ComReg staff's desktop survey, ComReg staff observe that Customers 1, 2 and 4 are likely to have a sufficient signal to allow Eir to provide a FCS service to same.

A 1.26 In relation to Customer 3, ComReg concluded that Customer 3 is located in a secluded curved valley which presents a very difficult environment to provide radio coverage.

A 1.27 However, ComReg staff did not observe any RurTel infrastructure at the site of Customer 3 following completion of a field survey of the premises. Instead it appears to ComReg staff that an unlicensed Exicom Condor System operating in the VHF frequency range is being used by Eir to provide an extension of the existing copper network through the valley at locations identified in Figure A.5.

ANNEX 2: Correspondence

Date	Details	File Name (available in .ZIP attached)
28-Nov-17	Information request regarding Eir's licences in the 2.3 GHz Band used for its RurTel network	 ComReg Letter to Eir re RurTel_20171128.pc
27-Sep-19	Information request regarding Eir's licences in the 2.3 GHz Band used for its RurTel network	 Eir_RurTel_Information_Request_27092019.
31-Oct-19	Eir Response (4 customers remain in Galway)	 Eir RResponse 31 October 2019.msg
01-Nov-19	Clarification on customer locations sought by ComReg	[Contained in Eir Response of 8 Nov 2019]
08-Nov-19	Eir response provides 4 customer locations for Galway	 Eir Response 8 November 2019.msg
21-Nov-19	ComReg request missing information from Eir based on letter of 27 September 2019	[Contained in Eir Response of 5 December 2019]
05-Dec-19	Eir provides results of Galway survey	 Eir Response 5 December 2019.msg
06-Feb-20	ComReg requests update to information received from Eir	[Contained in ComReg request of 28 February 2020]
28-Feb-20	ComReg request response by 4 March 2020 (none received)	 RE Confidential Information request r
29-Jul-20	ComReg request for views and clarity on Exicom system	 Eir_RurTel_Information_Request_29072020.
28-Aug-20	Eir response to letter of 29 July 2020. Eir note 2 customers remain and that no Exicom system is on premises.	 Eir Response to ComReg RurTel requ
28-Aug-20	ComReg request clarity on which customers remain	[Contained in Eir Response of 31 August 2020]
31-Aug-20	Eir provides clarity that Customer 2 and Customer 3 remain.	 Eir Response 31 August 2020.msg
03-Sep-20	ComReg request further clarity on requirement of new base station for Customer 2	[Contained in Eir Response of 3 September 2020]
03-Sep-20	Response from Eir, noting migration would take place in similar timescales for both (timescales unknown)	 Eir Response 3 September 2020.msg

Conor Berkeley

From: William Mccoubrey [REDACTED]
Sent: 19 November 2020 14:00
To: Conor Berkeley
Subject: Re: [Confidential] Eir's licences in the 2.3 GHz Band used for its RurTel network in Galway

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Conor,

Just to be clear, this is not a new customer. Now that the location has been clarified the team advises that the coverage check for FCS suitability yet to be finalised. Customer 3 is located in the [REDACTED], just off the [REDACTED]. Following a recent coverage check survey, coverage was ok along the [REDACTED] and on the road toward the Customer house, but there's a hill directly in front blocking the signal. A 2G signal was present at times outside the house from [REDACTED]. It was very weak (from -100 to 110dBm), and very often the UE had no service. This was a drive / walk test. Next step is to get a measurement from higher up on the customer house (outside gable) or vicinity.

Will let you know when I have a further update.

Regards,
William

On Wed, 18 Nov 2020 at 16:53, Conor Berkeley [REDACTED] wrote:

Hi William,

In relation to the new customer ([REDACTED]) at [REDACTED], can you please provide details of Eir's migration survey for this customer, similar to what was provided previously for other customers on the Galway network?

Kind regards,

Conor

From: William Mccoubrey [REDACTED]
Sent: 18 November 2020 14:26
To: Conor Berkeley [REDACTED]
Subject: Re: [Confidential] Eir's licences in the 2.3 GHz Band used for its RurTel network in Galway

Hi Conor,

Apologies for the delay in getting back to you. The matter of customer 3 has been investigated further. It would seem an incorrect location was originally given to ComReg. The correct location of Customer 3 ([REDACTED]) is at Eircode [REDACTED]. Customer 3 is served by RurTel.

However, the location originally given by eir to ComReg for Customer 3 does have a (non-RurTel) active customer ([REDACTED]) served by an Exicom VHF Link. Tom is investigating the licensing and will revert shortly.

Regards,

William

On Mon, 16 Nov 2020 at 12:03, Conor Berkeley [REDACTED] wrote:

Hi William,

I note the sentence highlighted below relates to “any other points”, however, specifically in the letter ComReg requests, in relation to Customer 3 that (emphasis added):

*“In light of the above, **ComReg staff requests Eir to promptly engage with ComReg regarding the appropriate licensing of the apparatus for wireless telegraphy currently deployed by Eir to provide service to Customer 3.** As Eir will be aware, it is an offence under the Wireless Telegraphy Act 1926 (as amended) to operate wireless telegraphy apparatus without a licence. Please contact myself or Brendan O’Brien, Manager, Projects and Licensing **as a matter of urgency** and, in any event, **in advance of 12 November 2020**”.*

I note to date that we have received no request from Eir in relation to licensing of the Exicom Condor system. Can you please action this as soon as possible?

Regards,

Conor

From: William Mccoubrey [REDACTED]

Sent: 16 November 2020 09:50

To: Conor Berkeley [REDACTED]

Subject: Re: [Confidential] Eir’s licences in the 2.3 GHz Band used for its RurTel network in Galway

Hi Conor,

I was not aware that a response to the letter is mandatory. It is stated in the letter (emphasis added) "**Should Eir wish to respond** to any of the other points made in this letter, it is requested to so by 12 November 2020."

Regards,

William

On Mon, 16 Nov 2020 at 09:30, Conor Berkeley [REDACTED] wrote:

Hi William,

On 2nd of November I wrote to you in relation to your RurTel licences in Galway and requested a response by the 12th of November regarding:

- the urgent appropriate licensing of the apparatus for wireless telegraphy currently deployed by Eir to provide service to Customer 3;
- the prompt migration of Customer 2 from RurTel to an alternative service; and
- that ComReg is of the current view that it will cease issuing renewal licences to Eir in respect of the Galway network from 31 January 2021.

Could you please provide a response as soon as possible in relation to this letter of 2 November.

Kind regards,

Conor

Conor Berkeley

Bainisteoir, Comhoiriúnacht & Forbairt Speictrim

Manager, Spectrum Compatibility & Development

An Coimisiún um Rialáil Cumarsáide

Commission for Communications Regulation

Uimh. a hAon Lárcheantar na nDugáí, Sráid na nGildeanna, BÁC 1, Éire, D01 E4X0

One Dockland Central, Guild Street, Dublin 1, Ireland, D01 E4X0

Teil | Tel

Rphost | Email

Suíomh | Website www.comreg.ie



An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation



From: Conor Berkeley

Sent: 02 November 2020 16:17

To: XX WILLIAM MCCOUBREY

Subject: [Confidential] Eir's licences in the 2.3 GHz Band used for its RurTel network in Galway

Hi William,

Please see attached regarding Eir's RurTel network in Galway for your attention.

Your response is requested by 12 November 2020, please contact me if you require any clarification.

Kind regards,

Conor

Conor Berkeley

Bainisteoir, Comhoiriúnacht & Forbairt Speictrim

Manager, Spectrum Compatibility & Development

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<https://www.comreg.ie/privacy/>

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Annex: 18 Other Matters Raised

A 18.1 In replying to Document 19/124, three respondents, namely Mr. Young, Eir and Three, raised some other matters which were beyond the intended scope of that document. This annex sets out ComReg's assessment of these matters.

A18.1 ComReg's consultation process

Summary of respondents Views

A 18.2 Referencing his previous submission to Document 19/59R, Mr. Young submits that ComReg's consultation process is lacking in certain respects that would otherwise ensure that ComReg's decisions take "*proper account of the significant potential for industry bias in the responses it receives*". Mr. Young submits that, in his view, ComReg's consultation may be under exposed to the views of Irish consumers and taxpayers, and Irish citizens generally. In this regard, Mr. Young:

- a) noted that his previous submission included several suggestions that ComReg could adopt in order to ensure that it receives a broad representation of views; and
- b) provided information on a recent consultation process on Water Management (carried out by the Department of Housing, Planning and Local Government) for comparison purposes noting that:
 - i. the Water Management consultation process was launched on the home page of the Department's website, a prominent notice publicising the consultation and inviting submissions was placed in all of the national print media, and potential respondents were given a choice of mechanisms to respond to its consultation, including a user-friendly document response template and an online survey; and
 - ii. ComReg's consultation process apparently employed no media activity, was not mentioned in any part of the consumer section of ComReg's website, and the consultation document used technical terms, references to separate documents and consultant reports making the consultation process and document inaccessible to non-industry parties.

A 18.3 In addition, Mr. Young submits that ComReg's consultation process has failed, in his view, to take any account of the views of Irish consumers or businesses. In this regard he noted that his analysis of the submissions received by ComReg reveals that all of the submissions were made by industry players with the

exception of his own submission where he submits that ComReg rejected or ignored all his proposals in favour of industry or industry consultants.

- A 18.4 In conclusion, Mr. Young submits that ComReg's consultation process is "*fatally flawed*" as a direct result of its failure to make reasonable efforts to consult with all stakeholders and is in breach of both Government and ComReg's own consultation guidelines¹⁴⁴².
- A 18.5 Mr. Young also submits that a public consultation process that focusses its attention on the views of industry players and consultants, that have a sectional financial and commercial interest in the outcome, is not in reality a public consultation process at all, and should not, in his view, be represented as such. Mr. Young also states that there is a perception that ComReg may have intended, from the outset, to proceed with a number of pre-determined decisions on licence conditions that the industry is happy to accept but which are not favourable to other stakeholders who have not been consulted with.

ComReg's Assessment

- A 18.6 ComReg thanks Mr. Young for his suggestions on the actions that it could take to obtain a broader representation of views. As noted in Document 19/124¹⁴⁴³, ComReg uses a range of different mechanisms (surveys, complaint/query statistics, consumers advisory panels) to seek views from consumers as appropriate to the circumstances.
- A 18.7 Further, while it can be appropriate in certain circumstances to formulate "*a user-friendly document response template and an online survey*", detailed technical and economic issues need to be considered in this consultation process, as also acknowledged by Mr. Young in his submission to 1959R¹⁴⁴⁴. In ComReg's view this necessitates the use of detailed consultation documents and consultants reports with technical terms given the nature of the content.
- A 18.8 In relation to Mr. Young's claim that ComReg's consultation process has failed to take any account of the views of Irish consumers or businesses, ComReg disagrees and refers to its previous assessment of this claim (as set out in paragraph A15.15 of Document 19/124) where ComReg states that:

"ComReg's award proposals have regard to its statutory functions, objectives and duties. Two of its statutory objectives are to (i) promote

¹⁴⁴² ComReg Document 11/34 – ComReg Consultation Procedures – Published 6 May 2011.

¹⁴⁴³ See paragraphs A15.13 to A15.16 of Annex 15 of Document 19/124

¹⁴⁴⁴ "*To put this simply, the detailed technical and economic issues, and the complex nature of the considerations and technical jargon that are inherent in this process, and as set out by Comreg and its consultant reports, are not likely to be easily understood by the average citizen or mobile user, and will very likely discourage many from responding to Comreg's consultation invitation. (emphasis added)*", Page 7 of Mr Young's submission to Document 19/59R.

competition and (ii) promote the interests of users within the Community.

Eight draft Regulatory Impact Assessment (RIAs) are set out in this document covering matters such as the proposed coverage and rollout obligations for the Proposed Bands, quality of service and network availability, and indoor mobile voice and text connectivity. As explained in Annex 6, the impact of the various options on industry, consumers and competition is explicitly considered in each of these draft RIAs.”

A 18.9 With regard to Mr. Young’s statements that ComReg has either ignored or rejected all his proposals in his previous submission, ComReg disagrees and notes the following:

- a) Mr. Young’s views, similar to those of other respondents, were considered in the development of ComReg’s proposals in Document 19/124. ComReg notes that many of Mr. Young’s proposals related to the connectivity studies, and that these proposals were considered by ComReg (see Annex 3 of Document 19/124) and its consultants DotEcon (see Document 19/124b) and Oxera (see Document 19/124f); and
- b) Mr. Young’s proposals that ComReg should use Eircode’s to measure the coverage obligation has been incorporated in ComReg’s proposals (see paragraphs 7.119 – 7.121 of Document 19/124).

A 18.10 Finally, ComReg does not accept Mr. Young’s submission that its consultation process is “fatally flawed” and is in breach of both Government and ComReg’s own consultation guidelines, or that it had a number of pre-determined decisions on licence conditions. In this regard, ComReg observes that:

- a) the consultation process has been comprehensive, spanning multiple years and has provided 7 separate consultation opportunities for the submission of views by interested parties in relation to ComReg’s proposals¹⁴⁴⁵. In relation to these consultation opportunities, ComReg has, on several occasions, extended the consultation period to allow interested parties time to better consider and submit their views;
- b) the consultation documents have been informed by a wide range of information, including the views of respondents, the views of Irish consumers as noted above, international harmonisation decisions from the EU/EC/ECC, international best practice reports and guidance set out by European bodies such as the CEPT, the RSPG and BEREC,

¹⁴⁴⁵ Document 14/101, 18/60, 18/103, 19/59R, 19/124, 20/32 and 20/56

equipment availability, and the award status in other European Countries (see for example chapter 2 and Annex 3 of this document)

- c) its licence condition proposals have evolved over the duration of the consultation process and are not pre-determined; and
- d) the consultation has adhered to its consultation procedures, noting for example that *“All views will be considered and account taken of the merits of views expressed. It should, however, be noted that the process is not equivalent to a voting exercise on proposals and ComReg will exercise its judgement having considered the merits of the views expressed.”*

A 18.11 In addition, ComReg observes that it has not excluded any stakeholder from commenting on any of its proposals in this consultation process. Indeed, ComReg agrees with Mr. Young that *“... there may be a wide range of stakeholders on any particular issue, not just those with a direct financial or other interest”* and as noted above ComReg has carried out a comprehensive consultation process.

A 18.12 Separately, ComReg notes that it actively seeks public engagement when consulting on higher level matters, including the development of its spectrum management strategy, which dealt with the overall proposal to release the spectrum being made available in this award process.¹⁴⁴⁶

A18.2 Removal of previous submission

Summary of Respondents Views

A 18.13 Based on his assessment of ComReg’s consultation process, Mr. Young requested that his previous submission to Document 19/59R not be used to justify any of the decisions being made by ComReg in the Proposed Award.

ComReg’s Assessment

A 18.14 ComReg clarifies that it is not appropriate or possible for it to simply disregard Mr Young’s previous submission, as among other things:

- a) ComReg’s consultation procedures¹⁴⁴⁷ makes its very clear that *“all views will be considered and account taken of the merits of views expressed”*; [Emphasis added]; and

¹⁴⁴⁶ <https://www.comreg.ie/publication/media-release-comreg-consults-on-its-strategy-to-manage-irelands-radio-spectrum-from-2016-to-2018>

¹⁴⁴⁷ ComReg Document [11/34](#), “ComReg Consultation Procedures”, published 6 May 2011.

- b) ComReg has already considered Mr. Young's previous submission in Document 19/124, as discussed above.

A18.3 ComReg's Decision Making Process and consideration of previous submissions

Summary of Respondents Views

A 18.15 Eir, in its response to Document 19/124, comments on ComReg's decision making process, which it refers to as 'staged'. Specifically, Eir submits:

- a) *"eir notes that to the extent that ComReg purports to engage in 'staged' decision making whereby certain aspects of MBSA2 are partially decided now, while other, inextricably related issues are deferred to a later decision"; and*
- b) *"it is disappointed that ComReg has largely dismissed concerns raised in our previous response to ComReg 19/59. In doing so ComReg does not appear to have either fully considered the concerns raised or given detailed reasons for dismissing them".*

A 18.16 Further Eir raises concerns that it (i) had not been able to agree or disagree on many aspects of the draft Decision due to a scarcity of information on relevant details, and (ii) had not had sight of a Draft IM or Draft Regulations.

A 18.17 Eir, in its response to Document 20/32, submits that it:

- a) *"is concerned that ComReg is proposing detailed rules for design principles which are still the subject of an ongoing consultation process. This process is not appropriate and ComReg cannot simply dismiss the concerns of interested parties in the way it has done"; and*
- b) *"is of concern that the detailed rules being consulted on are in relation to the matters proposed by ComReg in the draft Decision. ComReg appears to have ignored all responses that did not agree with its proposals... We note that ComReg intends to publish responses to ComReg 19/124 and invite comments. However this will not be done until after the current consultation closes. There is a complete lack of proper and fair consultation process with industry. ComReg is consulting on the detailed implementation of proposals that are themselves subject to an ongoing consultation process whilst at the same time keeping interested parties in the dark as to the views of others on the proposals. This does not appear to be a fair consultation procedure".*

A 18.18 Three makes a similar submission in its response to Document 20/32:

- a) *“...it is surprising that ComReg has chosen to publish its Draft Information Memorandum (IM) without first taking account of the views of interested parties as submitted in response to the document 19/124 (the Previous Consultation). While a desire to progress to the award as quickly as possible might have led to the decision to publish the Draft IM before taking account of views on the award design, this risks causing further delay in the event that ComReg is required to again consult on the IM because of significant changes to the award process.”; and*
- b) *“This Current Consultation [Document 20/32] process is intrinsically linked with the Previous Consultation [Document 19/124] process. We note ComReg’s reason for proceeding with the Current Consultation before the appropriate step of reviewing the submissions to the Previous Consultation, providing its own response, and publishing a Draft IM for the final process to be used. We would caution that these issues cannot be side-stepped as they are of fundamental importance. ComReg needs to ensure that the views of respondents are properly taken into consideration, as is necessary in a genuine consultation process”.*

ComReg’s Assessment

A 18.19 ComReg will address the above under the following headings:

- ComReg’s Decision Making Process; and
- Consideration of Responses.

ComReg’s Decision Making Process

A 18.20 ComReg notes the concerns of Eir and Three regarding ComReg’s decision making process, in particular ComReg’s publication of a Draft IM after its draft Decision¹⁴⁴⁸, and makes the following comments:

- a) the claims that ComReg provided new information in the Draft IM which was not consulted upon are inaccurate. The Draft IM is a reflection of the draft decisions published by ComReg as set out in Chapter 9 of Document 19/124. In this regard, the Draft IM gives interested parties a further opportunity to see and comment on how ComReg’s draft decisions would

¹⁴⁴⁸ ComReg notes Three’s view that it may be required to again consult on the IM because of significant changes to the award process.

be implemented¹⁴⁴⁹; and

- b) the consultation process used by ComReg is consistent with that carried out in its other spectrum awards in which both Eir and Three partook and were successful in¹⁴⁵⁰.

A 18.21 Further, ComReg flagged to interested parties, in Section 10.2 of Document 19/124, the next steps in the consultation process:

“10.9 ComReg intends to publish in the spring of 2020 a draft Information Memorandum outlining in detail the processes and procedures it currently envisages employing when implementing its spectrum release proposals as referred to in the draft Decision. Interested parties will be invited to comment on that draft Information Memorandum when it is published.

10.10 Following receipt and consideration of submissions received in response to this document, the above draft Information Memorandum, and other relevant material, ComReg intends to publish a response to consultation and final Decision.

10.11 ComReg will have due regard to all comments received before publishing its final Information Memorandum. ComReg notes that any material changes made in the final RIAs and final decision may require subsequent changes to be made to the draft Information Memorandum and ComReg reserves the right to do so, if required.”

A 18.22 ComReg has not engaged in incremental decision making as regards any substantive matters in relation to the Proposed Award. Chapter 10 of this document sets out ComReg’s Decision in relation to the Proposed Award. To the extent appropriate, all earlier submissions in relation to the process were taken into account by ComReg in the various stages subsequent to arriving at the Decision set out in Chapter 10.

A 18.23 Given the amount of material that ComReg has had to consider in order to decide upon a proposed award such as this at a high level and the level of specific detail required in a robust Information Memorandum, ComReg considers it entirely appropriate to defer the production of a draft information memorandum until a fairly later stage in the overall consultation process, which it did in this instance. The final IM when published will be an implementation of and reflect the decision made in this document.

¹⁴⁴⁹ ComReg notes that, in this award process, the period between draft Decision and Draft IM was longer than intended due to the impact of COVID-19 and ComReg’s subsequent work on the Temporary ECS licences.

¹⁴⁵⁰ See the MBSA 2012, the 3.6 GHz and 26 GHz Award 2018 spectrum awards - <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/>

Consideration of Responses

A 18.24 With regard to comments made that ComReg has not fully considered the views of respondents, and that the consultation is not proper or fair, ComReg firstly refers again to the next steps as set out in Section 10.2 of Document 19/124 and notes the following:

- a) it (and its expert advisors) have considered at length, including in this document, the issues raised by respondents;
- b) it has, at the request of respondents, carried out additional steps of consultation, resulting in the publication of Document 20/56 and the subsequent inclusion of an Auction Format RIA (see Chapter 7); and
- c) it has published all submissions received to Documents 19/124, 20/32, 20/56 and 20/78 and allowed interested parties to comment on same.

A 18.25 ComReg notes Eir's concerns (as expressed in response to Document 19/124) that it has not yet seen a Draft IM or Draft Regulations, but in response to Document 20/32 it expresses concern that ComReg is proposing detailed rules for design principles which are still the subject of an ongoing consultation process.

A 18.26 With regard to Eir's statements that (i) ComReg has dismissed concerns raised by it in response to Document 19/59R and (ii) there is a scarcity of information in both the draft Decision and Draft Regulations, ComReg firstly notes that Eir does not specify which concerns ComReg has not addressed. Secondly, the draft Decision in Chapter 9 of Document 19/124 and the Draft Regulations is the result of the views of respondents and ComReg's assessments of same in the previous chapters of the document (and the consultation process as a whole). The detail of ComReg's decision-making process is set out in the consultation document and not just in its draft Decision.

A 18.27 Eir has stated that ComReg "*appears to have ignored all responses that did not agree with its proposals*". ComReg does not agree with this statement. ComReg has been informed and, where appropriate, has changed its proposals based on the input of respondents where this input is justified and aligned with ComReg's statutory objectives. In this regard, ComReg also notes Section 2.2.3 of Document 11/34 (ComReg Consultation Procedures) which states:

"All views will be considered and account taken of the merits of views expressed. It should, however, be noted that the process is not equivalent to a voting exercise on proposals and ComReg will exercise its judgement having considered the merits of the views expressed."

A 18.28 ComReg is therefore of the opinion that:

- a) it has properly taken into consideration the views of same; and
- b) has conducted a fair and proper consultation process.

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