An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Review of the Fixed Radio Links Licensing Regime

Consultation and Response to Consultation

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Chapter 1

1 Executive Summary

1.1 Introduction

1.1 In its Radio Spectrum Management Strategy Statement for the 2019 to 2021 period, ComReg outlined its intention to conduct a review of the Fixed Links Bands and the associated licensing approach. In conducting its review, ComReg considered it important to firstly establish the existing and potential use cases for Fixed Links in Ireland before providing its views on an appropriate licensing framework that would provide for those use cases.

1.2 In order to inform its considerations, ComReg and its expert advisors DotEcon/Axon conducted a detailed and comprehensive stakeholder engagement process with over 90 licensees, vendors, and equipment suppliers. This engagement revealed that any new licensing framework should provide for five existing use cases[1] and two potential use cases[2]. It also provided important background information regarding recent trends in demand for the various use cases identified.

1.3 This consultation builds on this important work by permitting ComReg to set out its considered views on the existing fixed link licensing framework and potential improvements that would better ensure the efficient use of the radio spectrum.

1.2 Importance of Fixed Radio Links

1.4 A Fixed Radio Link, also known as a “Fixed Link” or a “microwave link”, is a wireless connection for the transmission of information between two or more fixed locations. Fixed links are used extensively for Point-to-Point telecoms, as well as for Point-to-Multipoint telecoms to convey voice and data signals. Fixed Links can provide an alternative or a complement to copper cables or fibre and are used for a variety of applications, including backhaul for mobile network base stations; distributing TV signals from studios to broadcast transmitter sites; providing direct voice or data connections to end users and connecting nodes within private or corporate communication networks.

1.5 There are currently twenty radio spectrum bands ranging from 1.3 GHz to 80 GHz allocated for Fixed Links in Ireland. The Fixed Links Bands are far from homogenous though, as demonstrated by the varying propagation characteristics of each of these bands, which in the round provide for a diverse set of use cases for Fixed Links. This

[1] Narrowband telemetry and control applications, broadcast distribution, backhaul from mobile cell sites, fixed wireless access, links within core networks

[2] Advanced FWA & specialist low latency links

highlights the need for a licensing framework that can accommodate such multiplicity, and which encourages licensees to only use spectrum that fits their actual requirements, rather than utilising spectrum that could be better used (or specifically needed) by others.

1.3 Existing Fixed Link Framework

1.6 The existing Fixed Link licensing framework dates to 2009 and has delivered a wide variety of use cases including narrowband telemetry and control, broadcast distribution, backhaul from mobile cell sites, fixed wireless access ("FWA"), and links within core networks, to the benefit of competition and consumers. However, while the current regime has worked well for over a decade, it was established at a time when the number of links was far fewer and the bandwidth requirements of those links was decidedly less. Since 2009, the number of links in use have more than tripled, while the variety of use cases has also increased and with them, a far greater appetite for larger bandwidth. More use cases will undoubtedly emerge in the coming years.

1.4 Demand for Fixed Link Bandwidth is increasing

1.7 Notwithstanding low levels of existing congestion, ComReg's analysis has revealed compelling evidence that bandwidth requirements for Fixed Links are increasing significantly. Increased bandwidth appetite concerns all use cases but is primarily driven by mobile network operator ("MNO") and FWA use. The trends for both user groups are qualitatively similar, and both are displaying rapid increases in bandwidth requirements.

1.8 5G backhaul and advances in the provision of Fixed Wireless will likely notably contribute to increased demand in the coming years. The potential for increased congestion is not symmetric across bands and depends on network deployment across the different use cases. However, even with the increasing availability of high-quality fibre, fixed links are generally viewed as offering certain unique advantages, including flexibility in deployment choices and rapid deployment, that have continued to maintain their popularity.

1.5 Issues with the Existing Fixed Link Framework

1.9 With that in mind, ComReg is mindful that the existing Fixed Link Licensing Framework might lead to further congestion, reducing spectrum availability and harming the efficient delivery of services in the future. In summary, the existing fee structure has three main drawbacks:

- The congestion charge for links in congested areas is quite modest, and much smaller than any reasonable estimate of the opportunity cost that such

users cause to others. This could lead to circumstances where higher value users could be denied access to the spectrum;

- There is a limited amount of spectrum at lower frequencies, but some use cases require lower frequencies because of their requirement for superior propagation. If other licensees have no incentives to avoid lower frequencies when higher frequencies are sufficient for their needs, then it follows that there will be a lack of availability of lower bands, a scarcity that could be allayed; and

- Fees do not reflect the impact of larger channels and do not increase proportionately with bandwidth use; indeed, fees above 40 MHz bandwidth are completely unaffected by additional bandwidth. This means that the incremental charge for links greater than 40 MHz bandwidth is zero. The majority of links are already greater than 40 MHz bandwidth and unaffected by the current fee structure which highlights the clear inefficiencies of the current framework.

1.10 Overall, the current framework appears unsustainable in the face of an ever-increasing demand for bandwidth. While most frequency bands are currently uncongested, demand for fixed links is growing and there is a strong likelihood of greater scarcity arising in future. For this reason, ComReg considers it appropriate to make changes to the fee's framework, firstly to promote the more efficient use of all Fixed Links, but also to best safeguard the availability of spectrum for a wide array of uses going forward.

1.6 A better approach

1.11 ComReg is proposing to use a formula-based approach to set Fixed Link fees. This would serve to ensure that the Fixed Link fee regime is future-proofed and robust enough to meet changes in demand (i.e., for bandwidth, and across different bands). ComReg's proposal would achieve this in three principal ways:

- First, the proposal better reflects the value differences between lower and higher fixed link frequencies by establishing a frequency gradient within the range suggested by opportunity cost estimates for the highest band and the lowest band. This should encourage operators to install equipment in the higher frequency bands instead of lower frequencies in cases where it is feasible to do so;

- Second, it would establish a typical channel size in each band and in addition would require licensees to pay in proportion to that bandwidth. This represents a significant enhancement on the current approach. This should encourage licensees to carefully evaluate any perceived need for additional bandwidth; and

- Third, it increases the differential between congested and uncongested cases so that licensees would have a real incentive to use other, cheaper, Fixed Link Bands or alternative technologies such as fibre, thereby leaving the spectrum available for higher value users.

1.12 The proposed approach achieves these improvements while keeping overall fee levels broadly neutral. Of course, these changes vary across the licensees. Consequently, in aggregate for each licensee, fees would be composed of a range of increases and decreases depending on how licensees currently deploy existing rights of use. However, any overall increase in fees is relatively modest and it may even be possible for licensees to reduce fees by re-dimensioning their networks over an appropriate period. Finally, any changes on foot of this consultation process would be introduced over a three-year period.

1.7 Next Steps

1.13 ComReg will carefully consider all responses to this consultation before arriving at its decision.

Chapter 2

2 Introduction

2.1 Background and Purpose

2.1 The Commission for Communications Regulation ("ComReg") is the statutory body responsible for the regulation of the electronic communications telecommunications, radio communications and broadcasting networks), postal and premium rate sectors in Ireland and in accordance with European ("EU") and Irish law. ComReg also manages Ireland's radio frequency spectrum ("radio spectrum" or "spectrum") and the national numbering resource. Under the Communications Regulation Act 2002, as amended, and the European Electronic Communications Code, ComReg has a range of functions and objectives in relation to the provision of electronic communications networks ("ECN"), electronic communications services ("ECS") and post, which includes ensuring the efficient and effective use of the national radio spectrum resource.

2.2 As noted in ComReg's Electronic Communications Strategy Statement 2021 to 2023[3], radio spectrum, as a medium over which data can be transmitted, is an essential input in the supply of wireless/radio-based ECN / ECS for a diverse range of uses and end-users. It is a valuable national resource as it underpins nearly all communications services in the State. These communication services include mobile telephony, wireless broadband, radio and television broadcasting and radio communications used by commercial business and by air and maritime transport. Many services rely on wireless connectivity as part of the backbone linking mobile base stations, providing feeds to broadcast transmitters and telemetry links that allow the monitoring of disperse infrastructure, for example water reservoir levels and remote power transformers.

2.3 The demand for radio spectrum continues to grow, driven by society's ever-increasing requirements in terms of access to data intensive services while on the move. In this context it is ComReg's goal[4] that the management of spectrum facilitates competition, enhances connectivity, and promotes efficient investment.

2.4 A key service for telecommunication infrastructure development is the fixed service ("FS") which is a radio communication service between specified fixed geographic points. Some examples of FS applications are transport networks (trunking, multi-

[3] Electronic Communications Strategy Statement 2021 to 2023 - ComReg document 21/70: https://www.comreg.ie/publication/electronic-communications-strategy-statement-2021-2023

[4] ComReg's Competition & Investment strategic intention – Goal 1.6: The management of spectrum and numbers facilitates competition, enhances connectivity and promotes efficient investment.

hop, etc.), mobile backhaul networks, fixed wireless access ("FWA")[5] and temporary networks (electronic news gathering and disaster relief).

2.5 On 9 November 2020, ComReg issued a preliminary consultation on the review of the Fixed Links Bands licensing regimes (ComReg Document 20/109[6]).

2.6 The preliminary consultation examined in particular:

- the existing and potential use cases (i.e., those with the potential to evolve and/or emerge over the foreseeable future) for the current Fixed Link Bands[7], and potential use cases for future frequency bands ("Candidate Bands") in Ireland;
- recent trends in demand for all use cases identified nationally and internationally, and forecast the likely demand for each use case over the foreseeable future in Ireland; and
- the need for any of the Fixed Link Bands and/or Candidate Bands to be made available for, or reallocated from, some or all of the use cases identified.

2.7 ComReg also published an interim report (ComReg Document 20/109A[8]) prepared by ComReg's economic and technical experts, DotEcon Limited ("DotEcon") and Axon Consulting ("Axon"), on the current situation regarding the fixed links environment in Ireland and how this may develop in the future. Document 20/109A was informed by, amongst other things:

- interviews, as conducted by DotEcon/Axon and ComReg, with several stakeholders including existing users and equipment manufacturers (the "Stakeholder Interviews");

[5] Fixed Wireless Access means a radiocommunication services between a base station and fixed subscriber terminals locations

[6] Review of the Fixed Radio Links Licensing Regime', Document 20/109, published 9th November 2020 Review of the Fixed Radio Links Licensing Regime | Commission for Communications Regulation (comreg.ie) Hereinafter referred to as "Document 20/109

[7] There are currently twenty radio spectrum bands ranging from 1.3 GHz to 80 GHz which are allocated for Fixed Links in Ireland.

[8] Consultant's Report - Fixed Links Bands Review, Document 20/109A, published 9th November2020 Consultants Report – Fixed Links Bands Review | Commission for Communications Regulation (comreg.ie). Hereinafter referred to as "Document 20/109A

- responses received to a voluntary request for information (RFI) issued in March 2020 to current fixed link licensees[9] (the "Licensee RFI")[10]; and
- responses received to an additional RFI sent by ComReg issued in March 2020 to members of the Independent Regulators Group[11] ("IRG") (the "IRG RFI")[12].

2.8 ComReg provided an introduction to Fixed Links and the associated licensing frameworks along with information on the demand and trends in fixed link licensing. ComReg has not repeated this here. Readers are referred to Document 20/109 and Document 20/109A in this regard.

2.2 Respondents to Consultation 20/109 and 20/109A

2.9 In response to Documents 20/109 and Document 20/109A, 19 responses were submitted by the following interested parties:

- Digitalforge;
- Eircom Limited and Meteor Mobile Communication Limited (trading as 'eir' and 'open eir') ("eir");
- EOBO Ltd ("BBNet");
- ESB Networks DAC ("ESBN");
- Eutelsat S.A ("Eutelsat");
- Inmarsat Ventures SE ("Inmarsat");
- JS Whizzy Internet Limited ("Whizzy Internet");

[9] In March, ComReg issued the request for information ("RFI") to 82 of the 153 licence holders (as of 30 June 2019), selected to cover firms of all user types and broad use cases. ComReg issued the Licensee RFI to a further 12 relevant stakeholders (e.g., vendors and firms providing installation services). The RFI included a questionnaire and a request for the provision of data. ComReg received a response rate of 56% accounting for 35% of licensees and 94% of Fixed Link licences. In light of the disruption caused by Covid-19 to businesses, ComReg extended the deadline for providing responses by over 8 weeks. ComReg welcomes any non-respondent or non-recipient wishing to provide data to contact ComReg, which can issue further of the Licence RFI.

[10] ComReg is satisfied that a representative sample of Licences responded, with responses received from firms with varying business types, numbers of Fixed Links licences and increasing/declining number of Fixed Links licences.

[11] The Independent Regulators Group ("IRG") a group of European National Telecommunications Regulatory Authorities (NRAs) that functions as a forum for exchange of best practices and discussions on regulatory challenges in communications between NRAs.

[12] In total 22 members of the IRG provided responses to the IRG RFI.

- Kerry Broadband Ltd (“Kerry Broadband”);
- Lackabeha Services Ltd (“Airwave Internet”);
- Lighthouse Networks Ltd (“Lightnet”);
- Orion Digital Services Ltd (“Orion”);
- Regional Telecom Ltd (“Regional Telecom”);
- Siklu Communication Ltd (“Siklu”);
- Space Exploration Technologies Corp (“Space X”);
- Three Ireland (Hutchison) Limited (“Three”);
- Viasat Inc (“Viasat”);
- Virgin Media Ireland Ltd (“Virgin”);
- Vodafone Ireland Ltd (“Vodafone”); and
- Wireless Connect Ltd (“Wireless Connect”).

2.10 The following nine parties submitted identical views in response to ComReg 20/109, therefore ComReg refers to the parties in this document collectively as the Wireless Internet Service Providers (“the WISPs”):

- Airwave Internet;
- BBNet;
- Digialforge;
- Whizzy;
- Kerry Broadband;
- Lightnet;
- Orion;
- Regional Telecom; and
- Wireless Connect;

2.11 ComReg thanks the interested parties for their submissions and has published the

non-confidential versions of the submissions in ComReg Document 21/134s.

2.12 Having carefully considered the submissions, the points made therein and other relevant information, this document, among other things, sets out ComReg's assessment of, and views in relation to, the matters raised by respondents.

2.13 This document and accompanying Consultant's Report (ComReg Document 21/134a)[13] also set out proposals and preliminary views regarding:

- a new fee schedule for Fixed Links that facilitates the greatest number of use cases to promote greater use of the spectrum;
- the draft Regulatory Impact Assessment (RIA) of the revised Fixed Radio Link licensing framework;
- frequency bands suitable for the revised Fixed Link licensing framework; and
- technical requirements for the deployment Fixed Links in the bands identified.

2.3 Structure of this document

2.14 This document is structures as follows:

- **Chapter 3:** sets out the responses received to ComReg document 20/109 and 20/109A. This includes ComReg's assessment of the responses.
- **Chapter 4:** sets out a review of the technical requirements for Fixed Links.
- **Chapter 5:** sets out ComReg's view in relation to the Regulatory Impact Assessment.
- **Chapter 6:** details how to request the Assessment tool, submit comments and the next steps in the process.
- Annex 1: sets outs proposals to the band plans for Fixed Links.
- Annex 2: sets out relevant methodologies for setting fees for Fixed Links
- Annex 3: sets out the parameter values for option 2
- Annex 4: provides information on ComReg's Legal Framework and Statutory Objectives

[13] ComReg Document 21/134a – DotEcon Report: Fixed links bands review – conclusions and recommendations – published 17 December 2021.

Chapter 3

3 Response to submissions received to Document 20/109 and 20/109A

3.1 Introduction

3.1 This chapter sets out ComReg's consideration of respondents' views and is structured as follows:

- Matters discussed in Document 20/109 and Document 20/109A; and
- Other matters raised by the respondents.

3.2 Summary of matters discussed in Document 20/109 & Document 20/109A

3.2 The responses received are generally supportive of the preliminary views as set out in Document 20/109 and Document 20/109A.

3.3 The following matters were identified in ComReg 20/109 and 20/109A:

- Use cases for Fixed Links;
- Spectrum availability and channel arrangements;
- Potential block licensing of certain frequency bands;
- Fixed Links application and licensing process;
- Fixed Links applications and licensing guidelines;
- Pricing / variety of methodologies that can be used to calculate applicable fees for Fixed Link Bands;
- The future use of the 1.4 GHz band;
- Reopening of the 13 GHz and 15 GHz band in the congested area;
- The future use of the 26 GHz band;
- The opening of the W-Band (92 – 114.25 GHz) and D-Band (130 – 174 GHz);
- The use of licence exempt / light licensing regimes; and

- Matters raised regarding Fixed Satellite Services

3.2.2 Use cases for Fixed Links

Summary of ComReg's preliminary view in Document 20/109

3.4 For the reasons set out in sections 3.1 – 3.3 of Document 20/109 and as outlined in Document 20/109A, ComReg's preliminary view was that the relevant existing and potential use cases are:

- Narrowband telemetry and control applications;
- Broadcast distribution;
- Backhaul from mobile cell sites;
- Fixed wireless access;
- Links within core networks;
- Advanced fixed wireless ("Advanced FWA) services in urban areas; and
- Specialist low latency links (e.g., for financial trading).

3.5 ComReg sought the views of interested parties on the existing and potential use cases identified, and whether there are other use cases that should be considered in determining an appropriate licensing framework for Fixed Links.

> **Q1:** ComReg seeks the views of interested parties on the existing and potential use cases identified above and whether there are other use cases that should be considered in determining an appropriate licensing framework. In the case of other potential use cases please provide supporting material for your answers.

Views of respondents to Document 20/109

3.6 The WISPs agree with ComReg that the scale of the deployment of licence exempt fixed links is underestimated in Document 20/109 and Document 20/109A. The WISPs contend that this is as a consequence of FWA operators dedicating their limited resources to dealing with customer requirements rather than responding to ComReg's information requests.

3.7 Eir is of the view that fibre can be an effective substitute for some Fixed Links, however the continued use of Fixed Links for fixed and mobile network backhaul will continue to be a substantial driver for Fixed Link licences.

3.8 ESBN is of the view that Fixed Links will continue to be required for, and the expansion of, new and existing networks.

3.9 Siklu notes that backhaul for mobile and fixed networks has traditionally been the main use case for high-frequency bands, however other uses cases such as FWA and advanced fixed wireless services in urban areas, as noted in Document 20/109, are utilising the 70/80 GHz band.

3.10 Three, Virgin and Vodafone all agree that ComReg has identified the main use cases for Fixed Links. Vodafone specified a particular interest to the use of advanced fixed wireless services in their response where beamforming and interference cancellation techniques are available.

3.11 Three and Eutelsat are of the view that there are other services (e.g., mobile service in the 26 GHz band, and Fixed Satellite Services ("FSS") in the 17 GHz – 30 GHz range) which have co-primary allocation in the same bands as Fixed Links and these should be taken into consideration when considering fixed radio link use cases.

ComReg's Assessment

3.12 ComReg welcomes the broad support from respondents for the use cases identified in Document 20/109 and Document 20/109A and notes that no other potential use cases were identified by the respondents. Therefore, the use cases identified in Document 20/109 will be used to inform ComReg's considerations in the relation a future licensing framework for the Fixed Link Bands.

3.13 Regarding the suggestion by Eutelsat and Three that services allocated on a co-primary basis should be taken into consideration with identifying use cases for Fixed Links, ComReg noted in section 2.3 of Document 20/109 that the Fixed Links review necessarily considers information that relates to other spectrum management matters such as the 26 GHz band and FSS.

3.14 Regarding the co-primary allocation of certain bands to Fixed Links and FSS, ComReg notes that both services can be coordinated within those bands and licences can be issued for either service following the completion of an interference analysis to ensure that there is no harmful interference. ComReg further notes that both Document 02/71R[14], as amended, and Document 20/47[15], as amended, set out the conditions under which Fixed Links and terminals for FSS can be deployed on a licence-exempt basis in the same bands. The licence-exempt use is underpinned by relevant EC and/or ECC Decisions which set out the operational parameters to

[14] Permitted Short Range Devices in Ireland - ComReg Document 02/71R: https://www.comreg.ie/publication/permitted-short-range-devices-in-ireland-4

[15] Permitted Licence Exemptions for Terminals for Satellite Services - ComReg Document 20/47R : https://www.comreg.ie/publication/permitted-licence-exemptions-for-terminals-for-satellite-services-2

ensure that the shared usage of the frequency bands avoids any harmful interference.

3.15 Regarding the Vodafone's submission of the techniques such as beamforming and interference cancellation for a nodal solution, ComReg notes that Vodafone did not provide any evidence in relation to this and requests Vodafone to provide further information on these techniques for consideration.

3.16 Finally, ComReg notes that some of these matters are already being considered in separate consultations (e.g., Satellite review[16]), or will be in the future, and any views of stakeholders on those matters will be addressed in those consultations.

3.2.3 Spectrum Availability and Channel Arrangements

Summary of ComReg's Preliminary View in Document 20/109

3.17 ComReg agreed with DotEcon's view[17] that where larger channel bandwidths have been recommended by the CEPT[18] and/or the ITU[19] then these should be made available as part of the fixed ink licensing regime. ComReg also stated that where the ITU and/or CEPT updates its recommendations regarding channel arrangement for Fixed Links, ComReg intended to update its guidelines to reflect these new recommendations, where appropriate.

Q2. ComReg seeks views of interested parties regarding the current and future channel arrangements for all the Fixed Link Bands in ComReg's Guidelines document 09/89R2, and any other channel arrangements recommended or being considered by the CEPT and/or ITU. Please provide evidence and reasoning for your views.

Views of respondents to Document 20/109

3.18 Sixteen respondents commented on the spectrum availability and channel arrangements in the Fixed Links preliminary consultation.

3.19 The WISPs agree with ComReg's preliminary view that large channels (e.g., 112 MHz bandwidth) within frequency bands (e.g., 15 GHz) should be made available

[16] ComReg Document 21/135

[17] Consultants Report - Fixed Links Bands Review – ComReg Document 20/109A:https://www.comreg.ie/publication/consultants-report-fixed-links-bands-review

[18] The European Conference of Postal and Telecommunications Administrations: https://docdb.cept.org/document/category/ECC_Recommendations?status=ACTIVE

[19] International Telecommunication Union: https://www.itu.int/en/publications/Pages/default.aspx

where possible in so far as they do not restrict existing operators who hold licences for narrow channels.

3.20 The WISPs are of the view that ComReg could engage with license holders to ensure that narrow channels are migrated from the middle of the band to one or other of the band edges so that fragmentation is minimised. The WISPs propose a process for migrating licence holders of narrow channels, but at the same time note that it would be difficult to implement and would require buy in and co-operation from all fixed radio link licensees.

3.21 Eir notes that it sees growing demand for high bandwidth Fixed Links to support higher capacity mobile services including 5G and welcomes ComReg's intention to update the guidelines to reflect new arrangement arising from ITU / CEPT updates. Eir is of the view that the 13 GHz and 15 GHz frequency bands are heavily utilised so It may not be appropriate to permit 112 MHz channels in these band or, subject to further study, only permit larger channels in uncongested areas.

3.22 ESBN observes that it mostly uses 28 MHz and 40 MHz channels and has no plans at present for wider channels. ESBN submits that ComReg's proposal to facilitate wider channel bandwidths should not be at the expense of other users in already congested bands (e.g., 13 GHz and 15 GHz). ESBN further contends that ComReg should only open wider channel bandwidths in new and/or currently uncongested spectrum bands as the licensing of even one 112 MHz channel could put additional pressure on congested bands.

3.23 Siklu submits that it has observed a global trend for higher capacities such as 5 Gbps to 20 Gbps in the 70/80 GHz band, and notes that large channel bandwidths are key to supporting higher capacities. Siklu contends that the current ComReg limitation of 2.25 GHz in the 70/80 GHz band is sufficient up to 10 Gbps, however, the 2.25 GHz bandwidth may become restrictive within a year or two, as demand grows for 20 Gbps radios and higher. Siklu therefore encourages ComReg to open access to channels up to 4.5 GHz, as set out in ECC Recommendation (05)07.

3.24 Three notes that it is primarily deploying Fixed Links in the 18 GHz, 26 GHz and 80 GHz bands, and is of the view that ComReg should consider opening 224 MHz channels in bands where sufficient spectrum is available to meet consumer demand for data and the deployment of 5G technology. Three's views on individual bands are as follows:

- **U6 GHz** and **11 GHz** – 80 MHz channels should be made available so that the U6 GHz and 11 GHz bands can be used for Mobile Backhaul in certain rural scenarios;
- **7 GHz** –Three has very few fixed links in this band and plans to vacate the

band entirely due to lack of available spectrum;

- **13 GHz and 15 GHz** –112 MHz channels should be made available so that the 13 GHz and 15 GHz bands can be used for Mobile Backhaul in certain rural scenarios. Three is of the view that with increased fibre deployment and moves to higher frequency bands, it is likely that the 13 GHz and 15 GHz bands will become less congested making it feasible to support wider channel arrangements;

- **18 GHz** – 220 MHz channels should be considered in this band. There are all-outdoor microwave solutions available today which support 224 MHz channel spacings. The 18 GHz band has more available spectrum than the 13 GHz and 15 GHz bands making it suitable for 220 MHz channels;

- **23 GHz, 28 GHz and 31 GHz** –Three does not deploy new Fixed Links in these bands due to limitations in available spectrum;

- **26 GHz** –Three has a very small number of individually licensed Fixed Links in this band and these will be replaced over the short to medium term in favour of radio links in its 26 GHz national licence;

- **38 GHz and 42 GHz** - Three does not deploy new Fixed Links at 38 GHz and 42 GHz due to higher capacity offered by 70/80 GHz band solutions which can achieve similar range to 38 GHz. However, Three suggests that 224 MHz channels should be made available in these bands; and

- **70 / 80 GHz** – No changes required.

3.25 Viasat is of the view that channel arrangement modifications for Fixed Links need to consider the current use and future demands of satellite service applications, and any changes to Fixed Link channel arrangements should only be undertaken in consultation with satellite operators. Viasat is concerned that demand for Fixed Links for greater capacity (including Fixed Links for mobile backhaul) requiring the application of new technologies, (e.g., active antenna systems, etc) may adversely impact the existing radio environment for satellite services.

3.26 Virgin supports the proposal to make available larger channel bandwidths in line with the recommendations of CEPT and/or the ITU. However, Virgin maintains that the potential for interference with other channels will need to be considered by ComReg and operators.

3.27 Vodafone supports any increase in channel bandwidth across 11 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 28 GHz and 38 GHz bands. For the 38 GHz band, Vodafone would like to see future expansion to 224 MHz bandwidth, which would in their view make 38 GHz band a viable alternative to 80 GHz band, when implemented in 2+0

XPIC. Vodafone noted from Document 20/109A that the demand for Fixed Links in the 38 GHz band is in decline and on the Vodafone network Fixed Links in the 38 GHz band only comprises of 4.8% of their total Fixed Link deployments.

ComReg's Assessment

3.28 Regarding the WISPs' proposal that narrow channels could be migrated from the middle of the band to minimise fragmentation, ComReg concurs that the proposal would be difficult to implement as it would require co-operation from all Fixed Link licensees, including agreement between operators as to how to pay for replacement equipment and installation costs. ComReg notes that in its report, DotEcon stated the following regarding band fragmentation:

"… it is worth being aware of the theoretical issue, and operators may comment on whether it is has been an issue in practice, but we do not think it requires action from ComReg. In any case, our analysis has overstated the issue currently (i.e., because of the extremely pessimistic definition of interference), and use of XPIC configurations and carrier aggregation equipment to combine non-adjacent channels would alleviate the problem, particularly in the longer term as equipment is naturally swapped out."[20]

3.29 Therefore, ComReg is of the view that there is currently no requirement for narrow channels to be migrated from the middle of the band to minimise fragmentation. However, ComReg will continue to actively monitor the use of the bands and where fragmentation could potentially become an issue with the opening of larger bandwidths, ComReg would engage with licensees to discuss any potential solutions.

3.30 ComReg notes the views of the WISPs, eir, ESBN, Siklu, Three, Virgin and Vodafone regarding the opening of larger channel bandwidths such as 112 MHz, 224 MHz, etc. which have been recommended by the CEPT and/or the ITU. Therefore, ComReg will open larger bandwidths in line with relevant ECC and/or ITU Recommendations. ComReg has included a section of the bands and channel spacing in Chapter 4 below and a list of potential channels for the Fixed Links frequency bands in Annex 1 below.

3.31 In relation to the opening of 112 MHz channels in the 13 GHz and 15 GHz bands in congested areas, ComReg noted in Document 20/109, that:

- the CEPT and ITU recommended channel arrangements for the 13 GHz band do not provide for 112 MHz channels, and if ComReg was minded to open 112 MHz channels in the 13 GHz band, then only two channels could

[20] Consultant's Report - Fixed Links Bands Review - ComReg Document 20/109A: Consultants Report – Fixed Links Bands Review | Commission for Communications Regulation (comreg.ie)

be made available due to the limited quantum of spectrum in the band;

- the ITU has updated Recommendation F.636-5 (11/2019) to include 112 MHz channel arrangements, and if ComReg was minded to open 112 MHz channels in the 15 GHz band, then only two channels could be made available; and

- to allow for 112 MHz channels in the 13 GHz and 15 GHz band could have the effect of limiting the number of channels available to operators in areas of high demand.

3.32 In addition, DotEcon noted in Document 20/109A, that the number of links in the 13 GHz and 15 GHz bands have declined since ComReg closed the bands to new applications in the congested Dublin metropolitan area in 2014. Consequently, there has been a fall in the bandwidth used in the 13 GHz and 15 GHz bands within the congested area. DotEcon also noted that if ComReg maintained its current practice there could be a risk of high value spectrum being left unused.

3.33 Therefore, having carefully considered the views of respondents, ComReg will, as a first step, open 112 MHz bandwidth channels in the 15 GHz band. ComReg intends to further consider opening 112 MHz bandwidth channels in the 13 GHz band when, and if, the relevant ECC Recommendation is revised to include 112 MHz bandwidth channels.

3.34 Regarding Siklu's view that ECC/REC/(05)07 allows for a channel spacing of 4.5 GHz and therefore ComReg should open larger channel bandwidths in the 80 GHz band. ComReg notes that:

- considering m) of ECC/REC(05)07[21] states that ETSI EN 302 217-2-2[22] provides the limits to be applied when a Point-to-Point coordination procedure is applied in the 80 GHz; and

- ETSI EN 302 217-2-2 currently does not contain system parameters beyond 2.250 GHz.

3.35 Therefore, as a coordination procedure is used in the 80 GHz band in Ireland, ComReg does not intend to open larger bandwidth channels in that band at this time. However, ComReg will however revisit this position if ETSI EN 302 217-2-2 is updated in the future to take account of system parameters beyond 2.250 GHz in the 80 GHz band.

[21] CEPT ECC RECOMMENDATION (05)07: https://docdb.cept.org/download/9c4f8690-d0e1/REC0507.PDF
[22] ETSI EN 302 217-2: https://www.etsi.org/deliver/etsi_en/302200_302299/30221702/03.03.01_60/en_30221702v030301p.pdf

3.36 Viasat comments regarding the 18 GHz and 28 GHz bands are addressed in section 3.2.13 below.

3.2.4 Potential block licensing of certain frequency bands

Summary of ComReg's Preliminary View in Document 20/109

3.37 ComReg identifies the 32 GHz, 80 GHz, 92 - 114.25 GHz (W-Band) and 130 – 174 GHz (D-Band) frequency bands as potentially suitable for block licensing in the future.

3.38 ComReg notes DotEcon's view regarding the 32 GHz band and agrees that where there is sufficient demand for access to the band then ComReg should consider licensing the band as appropriate. In that regard, ComReg also notes that CEPT currently does not consider the 32 GHz band as a priority band for 5G and is of the view that the 32 GHz band should remain designated primarily for fixed services and fixed-satellite services.

3.39 ComReg agrees with DotEcon that a reorganisation of the 80 GHz band within the Dublin region may not be an appropriate approach to managing the 80 GHz band given the existing uses already provided.

Q3. ComReg seeks the views of interested parties on block licensing one or more of the frequency bands listed above, and/or any other relevant frequency bands. Please provide supporting material that informs your position.

View of Respondents to Document 20/109

3.40 16 respondents commented on ComReg's preliminary view of the use of block licences for the frequency bands identified.

3.41 The WISPs submit that:

- individual licensing is preferred for small to medium operators as it lowers the barriers for expanding and improving their infrastructure footprint;
- national block licenses are typically out of the financial reach of smaller operators;
- block licences should only be considered if and only if there is sufficiently significant part of the spectrum made available for individual link licenses;
- It is important to consider the positive competition implications for maintaining a low barrier of entry for FWA Operators in any given licensed band; and

- WISPs have a preference to have individual licensed links with licences assigned in as automated a manner as possible to reduce the burden on ComReg and the operators seeking to deploy a link.

3.42 eir considers ComReg's initiative to issue block licences in the 26 GHz band to have been successful and the concept may be advanced as new bands are made available. eir agrees that block licences could be considered for the 32 GHz, 80 GHz, W-Band and D-Band frequency bands.

3.43 Regarding the 32 GHz band, eir does not consider it to be replacement for the 26 GHz band in 2028 as there is not a natural migration path for Fixed Links between these bands given that investment in new equipment would be required. Regarding the 80 GHz band, eir is of the view that the use of block licences should only be considered outside of the Dublin area.

3.44 ESBN supports block licensing for the following reasons:

- it enables licensees to plan and deploy links more efficiently and cost effectively;
- it provides assurance on availability of channels in areas of interest speeds up the planning, licence application and approval process;
- it enables licensees to procure equipment in larger volumes at more cost-effective prices rather than piecemeal fashion whilst planning and applying for individual licences; and
- it can alleviate pressure on already congested bands when licensees migrate links to their block licences.

3.45 ESBN submits that ComReg should consider permitting block licensing in lower frequency bands (such as 6 GHz, 7 GHz and/or 8 GHz). This, it suggests would allow all Fixed Links users to efficiently plan and deploy radio links in a more cost-effective manner whilst simplifying the need for a range of spares from a wide range of bands.

3.46 Siklu does not agree that block licensing should be introduced in the 80 GHz for the following reasons:

- it could lead to inefficient spectrum use as the 80 GHz band has exceptional frequency reuse, particularly in urban areas;
- it could lead to unfair spectrum access as, in its view, it favours a small number of large licensees at the expense of the many smaller ones;
- in its view, it restricts the maximum channel bandwidth available to specific licensees in specific areas, and therefore also the maximum achievable air-capacity; and

- it considers contiguous spectrum to be one of the key advantages of E-band and to be necessary for the implementation of multi-gigabit radios. Any block licensing regime would, in its opinion, reduce the available contiguous spectrum, and thereby restrict air capacity.

3.47 Three does not support block licensing of spectrum in existing bands due to high relocation costs that would be incurred to vacate spectrum and due to the high volume of licenced links in the existing Fixed Links Bands. However, Three is of the view that block licensing might be appropriate for new bands which are currently unoccupied, to ensure more efficient use of the spectrum.

3.48 Three submits that the 42 GHz band could also be considered for block allocation however it is uncertain that this band would attract much appeal given that the 80 GHz band offers a higher capacity alternative to 42 GHz.

3.49 Viasat is of the view that block licensing for Fixed Links should not prevent the development and future use of satellite services allocated on a co-primary basis in the same frequency bands. Viasat is against the introduction block assignments in the 28 GHz band unless compatibility studies prove that coexistence is possible.

3.50 Virgin agrees with block licensing as it would reduce the necessity for multiple applications and therefore streamline the process. However, Virgin does not support the proposal for block licensing in the 80 GHz band because of what it considers to be the likely impact on the availability of this band for future deployments.

3.51 Vodafone supports block licensing as it allows for self-management of Fixed Links and is more spectral efficient through advanced techniques such as interference correction, which is reliant on nodal solutions and works best in a block allocation scenario.

3.52 Vodafone expresses interest in the possibility of using another band to replace the 26 GHz band beyond 2028 if the entire 26 GHz band is reallocated to 5G services. Vodafone is of the view that the 32 GHz band could be a possible replacement, and that a decision on the future use of 26 GHz should be made before the end of 2023 to allow for the purchase of new equipment for the swap out and for project management if migration to another band is required.

3.53 Vodafone would be hesitant to seek a block allocation in the 80 GHz band should a move to block licensing result in a reduction of bandwidths currently allowable. However, Vodafone expresses an interest in block allocation is within the W-Band and D-Band and are of the view that the W-Band is a natural expansion of the 80 GHz band. Currently Vodafone is working with its suppliers to develop hardware to utilise the W-Band and D-Band and is of the view that these bands offer the best opportunity for block allocation.

ComReg's Assessment

3.54 Regarding the WISPs' views on block licensing, ComReg notes that to date block licensing has only been deployed in the 26 GHz band, and all other Fixed Link Bands are subject to individual licensing. When considering suitable licensing regimes for specific frequency bands, ComReg carefully considers, amongst other things, the impact on competition, effective spectrum management, and access to spectrum. ComReg notes the importance of individual licensing of Fixed Links as it allows dynamic scalability for individual requirements. Therefore, regarding the potential suitability of block licensing, ComReg sought views from interested parties on just four specific frequency bands, namely the 32 GHz, 80 GHz, W-Band and D-Band frequency bands.

3.55 Regarding Eir and Vodafone's submissions that the 32 GHz band could be a potential replacement for the 26 GHz band beyond 2028, ComReg notes that the 26 GHz Band 5G Study[23] recommends that there is currently no strong basis to limit the use of any existing licensing regimes for Fixed Links or block allocations or to announce migration plans. ComReg noted in ComReg Document 21/90[24] that it will consider the future use of the 26 GHz Band for wireless broadband ("WBB") ECS and other services during the period 2022-2024.

3.56 Regarding ESBN's suggestion that ComReg should consider permitting block licensing in lower frequency bands (such as 6 GHz, 7 GHz and/or 8 GHz), ComReg notes, that in its report, DotEcon did not identify those bands as potentially suitable for block licensing. DotEcon also stated that most of the existing Fixed Links Bands already contain a large number of links licensed to many different users, and any reorganising of a band in order to introduce block licences is likely to be very costly as it would require migrating a significant number of users across bands.

3.57 In addition, Document 20/109 notes that as the 6 GHz, 7 GHz and 8 GHz bands are currently used by several different users, and ComReg is of the view that those bands are not potentially suitable for block licensing as reorganising of the bands is likely to be very costly in terms of purchasing new equipment and would require migrating existing users across bands. Considering the propagation characteristics of these bands, ComReg notes that there are no suitable alternative bands to which a user might migrate to if the bands were closed to individual block licensing.

3.58 Regarding Three's view that the 42 GHz band could be considered for block licensing, ComReg notes that to date that there has only been limited demand for the

[23] 26 GHz Band 5G Study - ComReg Document 21/07a: 26 GHz Band 5G Study | Commission for Communications Regulation (comreg.ie)

[24] Proposed Strategy for Managing the Radio Spectrum 2022 to 2024 - ComReg document 21/90: Proposed Strategy for Managing the Radio Spectrum 2022 to 2024 | Commission for Communications Regulation (comreg.ie)

42 GHz band since it was made available for Fixed Links in 2012; indeed, the number of licences issued for the band has declined to such a degree that currently there are only 34 live licences in the band. ComReg further notes that the CEPT is developing an ECC Decision on harmonising the 42 GHz band,[25] and a report[26] in response to an EC mandate to develop least restrictive harmonised technical conditions suitable for next-generation (5G) terrestrial wireless systems for 40.5-43.5 GHz. As stated in Document 21/90[27], ComReg intends to continue to monitor and input into the discussions on this matter at the EC and ECC. If any EC and/or ECC decisions are adopted during the 2022-2024 period, ComReg will consider the appropriate implementation of those decisions as required

3.59 Therefore, ComReg does not consider the 42 GHz band a strong candidate currently for block licensing given the lack of demand for Fixed Links in the band and the potential future harmonisation of the band for next-generation (5G) terrestrial wireless systems by the European Commission.

3.60 In relation to the 80 GHz band, ComReg notes that of the four respondents which submitted views on block licensing in the band, only eir supports block licensing and only in areas outside of Dublin. Having carefully considered the respondents' views, ComReg remains of the view that block licensing in the 80 GHz band within the Dublin region is not an appropriate approach given existing uses. ComReg agrees with DotEcon's view that link licences already granted in the band could make any sort of reorganisation to facilitate block licences in Dublin difficult, without which the benefit to regional block licences in 80 GHz may be reduced.

3.61 ComReg notes that there is 10 GHz of contiguous of spectrum available in the 80 GHz band and that currently operators can apply for channels of bandwidth up to 2.25 GHz, and possible higher in the future if ETSI EN 302 217-2-2 is updated to take account of system parameters beyond 2.25 GHz.

3.62 ComReg also notes that the 80 GHz band is currently the only frequency band in Ireland which provides for channel bandwidths greater than 250 MHz at this time. If block licensing was to be introduced, then the assignment of block sizes less than 2.25 GHz may limit the bandwidth which could be utilised for Fixed Links. This could prevent small to medium operators from deploying Fixed Links with Gbps capacity.

3.63 On balance, ComReg does not intend to introduce block licensing in the 80 GHz band but will continue to monitor the use of the band and may revisit this matter in

[25] ECC Decision on MFCN harmonisation, comprising a band plan and technical conditions suitable for 5G, taking into account the radio applications according to ERC Report: http://eccwp.cept.org/WI_Detail.aspx?wiid=769

[26] ECC Work Programme Database – PT1: http://eccwp.cept.org/WI_Detail.aspx?wiid=757

[27] Proposed Strategy for Managing the Radio Spectrum 2022 to 2024 - ComReg Document 21/90: Proposed Strategy for Managing the Radio Spectrum 2022 to 2024 | Commission for Communications Regulation (comreg.ie)

the future, depending on the prevailing circumstances at that time.

3.64 ComReg notes that both eir and Vodafone agree with potentially introducing block licensing for the 32 GHz, W-Band and D-Band bands, and ComReg remains of the view that these bands could be potentially suitable for block licensing in the future. Specifically, regarding the 32 GHz band, ComReg notes that there has to date only been limited demand for Fixed Link licences in the 28 GHz and 42 GHz bands, and no demand in the 31 GHz band, therefore ComReg proposes not to open the 32 GHz band at this point in time, but intends to consider and consult on opening the band when there is clear demand.

3.65 ComReg does not intend to introduce block licensing into the W-Band and D-Band bands now due to the current unavailability of equipment. Rather, ComReg intends to consult on any potential opening of the bands to determine, amongst other things, appropriate fees and assignment process when equipment becomes available. ComReg will continue to engage with operators and equipment manufacturers to understand timelines for when equipment will be available on the market and operators plans for deploying the equipment in their networks.

3.66 Viasat's comments regarding the 28 GHz band are addressed in section 3.2.13 below.

3.2.5 Fixed Links applications and licensing process

Summary of ComReg's Preliminary View in Document 20/109

3.67 ComReg notes that the Fixed Link application process can, on occasion, take more than 10 working days due to high demand. ComReg has at times addressed this issue by augmenting its licensing resources. However, resourcing is not the sole determinant of turnaround times. There are several other notable factors which applicants can themselves address, including:

- applicants providing incorrect information in their application, which results in ComReg staff having to seek the correct information from the applicant;
- providing link budgets so that ComReg staff can check that the correct information has been provided;
- delays by applicants in responding to ComReg communications seeking confirmation of channel changes or additional information; and
- applicants providing ComReg with Fixed Link deployment plans sufficiently in advance to enable ComReg to match resource with likely application needs.

3.68 All these factors can negatively impact licence turnaround time. While ComReg plans

its resources to target a 10-working day turnaround time, an improvement in planning by the applicants, together with early demand forecasts could better allow ComReg to manage resource flow positively.

Q4: ComReg seeks the views of interested parties on the measures that could be taken to improve the turnaround times for fixed links licence applications and would assist licensees in their network planning. Please provide supporting evidence for your answers.

View of Respondents to Document 20/109

3.69 15 respondents commented on ComReg's preliminary view of the application and licensing process.

3.70 The themes of the responses can be categorised as follows:

1 Turnaround times;

2 Increased automation in the application process;

3 Expediting applications and

4 The publication for more information by ComReg.

1. Turnaround times

3.71 ESBN submits that the new function on the eLicensing[28] platform is helpful and has made the applications process for new licences much smoother and transparent. ESBN believes that facilitating larger channels sizes and issuing more block licences would reduce the number of licences applied for and in turn improve the turnaround times.

3.72 Three is of the view that most licence applications are processed within a reasonable timeframe. They would estimate that most applications are processed within one to two weeks of submission.

3.73 Eir submits that in its view the turnaround time for the processing of applications can take on average 3 weeks. Whilst eir would agree that forecasting could assist ComReg in planning its resources, and notes that eir has provided fairly accurate forecasts of application volumes for 2020, eir contends that its recent experience would suggest that more resources should be deployed by ComReg to improve the

[28] eLicensing - https://elicensing.comreg.ie/

turnaround times to less than 10 days.

3.74 Virgin supports any proposal to improve the turnaround times for Fixed Links licence applications. Currently there is uncertainty around when an application will be fully approved, and this can affect an operator's planning.

2. Increased Automation in the application process

3.75 The following proposals were put forward by respondents seeking to increase automation in the application process:

- the application process should guide the applicant to self-validate the application (link budgets availability characteristics); (WISPs)
- applicants should have the ability to pre-emptively select additional lower preference link channels and/or bands in the application procedure so that in the event of the first chosen channel and/or band is not available the lower preference link channels and or bands are assigned; (WISPs)
- ComReg should propose an alternative clear channel when applications are rejected on the basis of the risk of interference to other operators; (eir)
- an interactive approach would make for a more efficient process and reduce the number of applications ultimately reducing the workload on ComReg. (eir)
- ComReg should introduce an online tracking and audit trail capabilities for each application, including an estimated time for approval. (Vodafone)
- an online audit trail or history report that is maintained on a database for every application made within a defined period, so that operators can view reports on all applications made over a period of time and see what their outcome was. This would be particularly useful for rejected or cancelled applications so long as the information is detailed enough. (Vodafone)
- applications for Multiband Aggregation Links should be a single application, so that it is understood to be a multiband application. (Vodafone)
- the above could also apply for Carrier Aggregation solutions that use adjacent channels (Vodafone)
- ComReg should consider the development of a new automated application process instead of the existing XML process that would be more user friendly, would provide guidance on the application process and that would also automatically detect issues upon application. (Virgin)
- an automated response should be generated when an application is being reviewed and when an application has been approved by ComReg. (Virgin)

3. Expediting Applications

3.76 Both ESBN and Three submit that ComReg should enable applicants to expedite a fixed number of applications. ESBN submits that this should be permitted in instances where waiting for the processing of a licence application and award of a licence would cause logistical or financial issues for the applicant. They propose that an applicant could declare a particular link "high priority" in its application (for up to 10% of link applications) to allow ComReg review these more urgently.

3.77 Three submits that applicants should be given a fixed number of escalations that can be used in emergency situations where very quick turnarounds are required. An upper limit could be placed on the number of escalations per operator in a given year so as to avoid abuse of the escalation procedure.

4. The Publication of more information by ComReg

3.78 Eir agrees with ComReg's view that making more information available on already licensed Fixed Links will assist applicants in narrowing down options that are more likely to succeed. This, they suggest, will improve the efficiency of the application process with fewer repeat applications.

3.79 Siklu submits, based on anecdotal evidence, that many of the challenges faced by applicants regarding channel availability and lack of transparency on declined applications could be resolved if ComReg made public the database of existing links.

ComReg's Assessment

1. Turnaround times

3.80 ComReg notes the submission from eir and Virgin regarding turnaround times. ComReg observes that it aims to process Fixed Links licence applications within 10 working days. ComReg welcomes eir's approach of proactive engagement with ComReg by providing application forecasts to enable ComReg to plan its resources to meet the demand for applications and continue to process applications within 10 working days. Unfortunately, not all operators adopt this approach, thereby giving rise to an unforeseen and unplanned increase in applications to ComReg sufficient notice to ensure availability of the necessary resources to process same within the 10-working day turnaround time.

3.81 Notwithstanding, ComReg notes, as shown in Figure 1 below, that contrary to eir's contention, actual turnaround times averaged 7.23 working days during the past year (30/11/2020 to 9/12/2021), within a range of 3.55 to 16.8 working days.

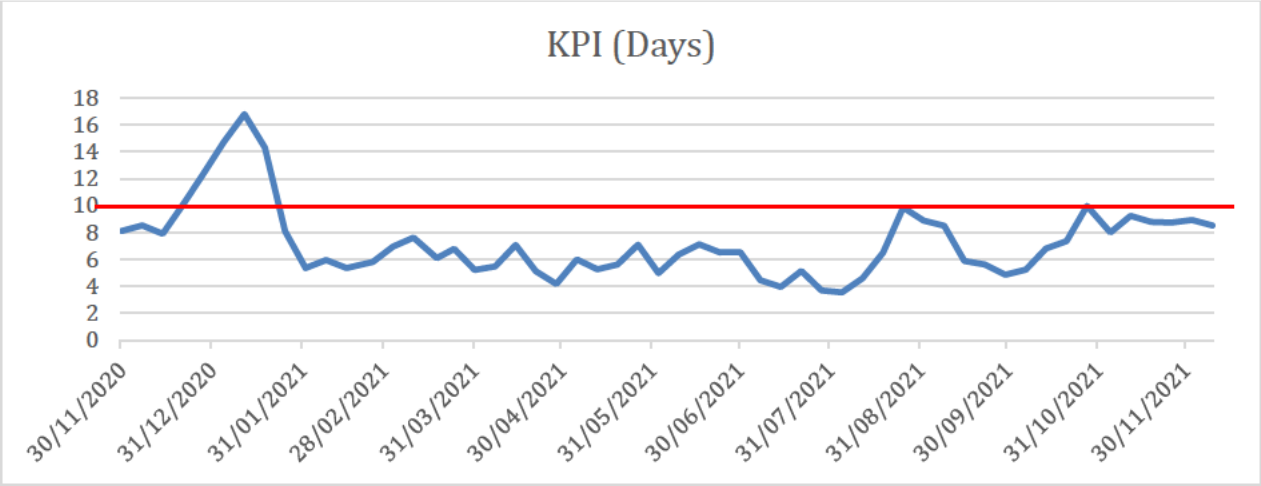

Figure 1: ComReg turnaround times for Fixed Links applications

3.82 As set out further below, ComReg is continually developing its systems to further improve its licensing processes and turnaround times.

2. Increased Automation in the application process

3.83 ComReg welcomes the comments from eir and ESBN that the new functions on eLicensing[29] are proving helpful and that the more information made available on licensed Fixed Links will assist applicants in narrowing down more options.

3.84 Regarding the WISPs' views that the application process should guide the applicant to self-validate the application (link budgets availability characteristics), ComReg notes that it has introduced functionality which allows an applicant to self-validate its XML application file before submitting the application for processing by ComReg.

3.85 Regarding proposals to increase the level of automation in the application process. ComReg observes that some of the enhancements proposed are already in place. For example, ComReg's eLicensing system already validates applications on submission, provides an estimated time for processing based on the number of applications already awaiting processing and sends an automated email to applicants as soon as the application is approved.

3.86 ComReg notes the submission from the WISPs and eir regarding ComReg providing alternative channels to an application. As respondents will be aware, when a requested channel is unavailable, ComReg staff routinely identify a potential alternative channel for the applicant or enquires as to whether the applicant can use another channel as ComReg staff cannot assess whether this is suitable for use with the applicant's equipment. ComReg does not conduct an interference check on the

[29] eLicensing: https://eLicensing.comreg.ie/

applicant's network as the management of an applicant's networks remains a matter for the applicant.

3.87 ComReg is committed to continually improving its licence application processes for users. As detailed in the Fixed Link Annual Report 2021, ComReg document 21/97[30], ComReg introduced several improvements to its eLicensing system in 2021. These improvements included (i) a mapping graphical user interface ("GUI") that allows applicants to view the direction of licensed links at sites prior to applying and (ii) the capability to preview of the applicants link budget on eLicensing.

3.88 These enhancements are designed to assist applicants in determining the likelihood of an application being successful, thus informing the prospective applicant in advance of whether it should proceed with its application or instead consider alternative frequencies. This has enabled a faster and more streamlined application process by making more information available to applicants when engineering their networks while positively impacting ComReg's application turnaround times.

3.89 Regarding the Vodafone proposal that applying for Multiband Aggregation Links or Carrier Aggregation solutions that use adjacent channels should be possible in a single application, ComReg observes that while there are benefits to the implementation of such a solution it is likely to be complex to develop as the analysis would require assessing a potentially large number of licensed Fixed Links across several frequency bands. Currently, interference analysis of Fixed Links applications is undertaken within a single frequency band. However, ComReg intends to consider the matter as part of the ongoing evolution of its radio licensing system.

3.90 Vodafone also suggested that an online audit trail or history report should be made available for every application, so that operators can view reports on all applications made over a period of time and see what their outcome was. ComReg notes that an email notification is provided to the applicants for each application submitted which either confirms a licence has been issued or sets out the reason why an application has been cancelled. While an online audit trail or history report may be beneficial, ComReg has limited resources and budget for developing, testing and implementing additional functionality to its eLicensing system, and it should be possible for an applicant to keep records of its application history itself, drawing on the information it itself has compiled and the information provided to it by ComReg as outlined above.

3.91 Regarding the Virgin submission that the XML is not very user friendly, and an automated application process would be a better option, ComReg notes that Virgin did not propose a possible alternative file format. ComReg observes that the XML file format is an industry standard file format and that all the parameters in the XML

[30] Fixed Radio Link Report- Annual Report for 2021: https://www.comreg.ie/media/2021/09/ComReg-2197.pdf

file are validated as part of the current eLicensing automated application process. Errors in the XML are identified by the eLicensing automated application process and must be corrected by the applicant before an application can be successfully uploaded.

3.92 Virgin also suggested that an automated response should be generated when an application is being reviewed and when an application has been approved by ComReg. ComReg notes that when an application has been submitted, the automated process sends an acknowledgement email to the applicant, and similarly an email is automatically sent when the processing of an application has been completed. As the turnaround times for the processing of applications is generally under 10 working days, the current arrangement would seem to provide sufficient transparency. Notwithstanding, applicants can always contact the ComReg licensing team at licensing@comreg.ie if they have queries regarding a particular application.

3. Expediting Applications

3.93 ComReg is not aware of any instance where delays to the processing of a licence application have caused logistical or financial issues for the applicant. ComReg endeavours to provide as much transparency as possible to applicants at the time of application and via the publication of the Fixed Links Annual Report to enable them to plan the roll out of their networks and obtain the necessary licences. As set out above, ComReg endeavours to process all Fixed Link licence applications within 10 working days

3.94 ComReg notes that Three did not provide any detail regarding what would be considered an emergency that would enable an application to effectively skip the queue. ComReg further notes that due to the diversity of users and uses of Fixed Links that there are inherent difficulties in agreeing what would be considered an emergency that would warrant such an approach.

3.95 ComReg observes that its Fixed Link application process operates strictly on a first-come first-served basis. This ensures equity and fairness for all applicants. ComReg further observes that its application turnaround time is 10 working days and that it has rolled out several enhancements to the licensing process to improve transparency and certainty for applicants. As set out in paragraphs 3.85 ComReg has identified further enhancements to its eLicensing system aimed at further improving the application process and a number of steps that applicants can themselves take to further expedite matters.

4. The Publication of more information by ComReg

3.96 As set out in the Fixed Links Annual Report 2021, ComReg is committed to making Fixed Links information publicly available on https://siteviewer.comreg.ie/. For Fixed Link applicants this would provide more flexibility for their outsourced service

providers in terms of accessing the information rather than having to formally seek passwords to access the applicants' eLicensing accounts.

3.97 In addition, by making information available and in a downloadable format, applicants would be able to re-use it in their own planning tools. For stakeholders in general, having access to Fixed Link information would provide greater transparency regarding what services are deployed in particular areas, and would enable, for example, operators of wind turbines to understand which Fixed Links licensees they need to engage with as part of any planning process.

3.98 ComReg is addressing this matter and will provide further updates as it progresses.

3.2.6 Fixed Links applications and licensing guidelines

Summary of ComReg's Preliminary View in Document 20/109

3.99 ComReg's preliminary view is that the Fixed Links guidelines document (ComReg Document 09/89 R2[31]) should be reviewed on a regular basis to reflect equipment and technological developments. Since 2009, ComReg notes that it has revised the current guidelines document twice (2013 and 2017) to take account of changes to licensing procedures and relevant ECC Recommendations regarding Fixed Services. ComReg will continue to update the guidelines document in line with equipment and technological developments.

3.100 ComReg notes that licensees may also have the need to use new techniques such as Band and Carrier Aggregation ("BCA"), which combines multiple frequency bands over the same radio link to increase the capacity of a link. An example of BCA is using the 15 GHz band with 80 GHz band on the same Fixed Link over 6-8 km. Under the guidelines, the minimum path length for the 15 GHz band would not allow for the use of BCA on a link shorter than 9 km. Therefore, ComReg is of the view that there may be merit in allowing shorter path lengths for fixed links that use techniques such as BCA to increase capacity.

3.101 ComReg is not in favour of reintroducing the option of allowing applicants to submit applications for multiple channels as a package as part of the licensing process.

[31] Guidelines to Applicants for Radio Links Licences – ComReg Document 09/89R2: https://www.comreg.ie/media/dlm_uploads/2017/06/ComReg-0989R2.pdf

Q5: ComReg welcomes the views of interested parties regarding the matters discussed in DotEcon's report and ComReg's preliminary views regarding the Guidelines document and the technical parameters therein. Respondents should provide appropriate supporting information when expressing any views.

Q6: ComReg also welcomes views on any further technical matters regarding the deployment of Fixed Radio Links a respondent may deem relevant. Again, Respondents should provide appropriate supporting information when expressing any views.

View of Respondents to Document 20/109

3.102 15 respondents are supportive of ComReg's view that the guidelines should be updated regularly to reflect any technological or equipment developments that are of benefit for Fixed Links. The following three respondents provided additional views on the Fixed Links guidelines.

3.103 Vodafone notes that the guidelines should include a chapter on the bands and carrier aggregation (BCA) concept.

3.104 Eutelsat submits that the 18 GHz frequency band should be shared between satellite operators and Fixed Links operators.

3.105 ESBN is of the view that ComReg and Ofcom should work together to ease the complexity of licence application for cross border links, and the current regime causes logistical issues for applicants and is disjointed in ESBN's view. ESBN proposes that an agreement or process which allows for a single application and single point of contact would greatly simplify the process as opposed to making submissions separately to each regulator.

ComReg's Assessment

3.106 ComReg notes the views of respondents and observes that it periodically reviews and updates the guidelines document, with the most recent update being in 2017.

3.107 Regarding Eutelsat's view that the 18 GHz frequency band should be shared between satellite operators and Fixed Links operators, ComReg notes that the 18 GHz band is allocated on a co-primary basis for fixed services, such as Fixed Links, and for fixed satellite services. ComReg notes that both Fixed Links and satellite earth stations can be licensed in part of the 18 GHz band[32] and applications are

[32] 17.3 GHz to 18.1 GHz for Broadcast Satellite Service transmit feeder links, and 17.3 GHz to 17.7 GHz for Broadcast Satellite Service receive feeder links.

subject to an interference analysis to determine any potential interference between services. ComReg further notes that certain terminals for satellite services can operate in the 18 GHz and on a licence-exempt basis - please see ComReg document 20/47[33], as amended, for more information.

3.108 Regarding the view submitted by ESBN, ComReg notes that both it and Ofcom are separate entities which operate in different jurisdictions (just as ESBN and Northern Ireland Electricity Networks are) and within different regulatory and legal frameworks, matters further complicated by the UK no longer being an EC member state. While the ESBN proposal would therefore likely prove extremely complex and expensive to implement, ComReg is happy to clarify that its licensing team is in regular contact with the Ofcom licensing team when cross-border Fixed Links are sought. This is to ensure that the process is as seamless as possible for applicants. ComReg intends to continue to liaise with Ofcom in this regard.

3.109 ComReg intends to further update its guidelines to reflect any changes arising as a consequence of this consultation process to include, amongst others:

- the new technologies that are permitted to use Fixed Links;
- licensing information regarding bands and carrier aggregation (BCA is discussed further in section 4.9 below);
- any changes to the minimum requirements and channel arrangements; and
- the frequency bands allocated on a co-primary basis with the fixed service.

3.2.7 Methodologies that can be used to calculate applicable fees for Fixed Link Bands

Summary of ComReg's Preliminary view in Document 20/109

3.110 ComReg noted there are a variety of methodologies that can be used to calculate applicable fees for Fixed Link Bands. ComReg does not envisage a particular approach being suitable to account for all of the various bands and associated uses, given that there are potentially quite different considerations for each band.

[33] Permitted Licence Exemptions for Terminals for Satellite Services – ComReg Document 20/47: https://www.comreg.ie/publication/permitted-licence-exemptions-for-terminals-for-satellite-services-2

Q6 ComReg seeks views from interested parties on:

- specific aspects of the guidelines that should be reviewed (i.e. is there any aspect of the guidelines that may inhibit certain uses or technologies outlined above);
- information that ComReg could provide in order to ensure better coordination of frequencies and encourage the efficient use of the spectrum more generally;
- the structure of the fee schedule (e.g. views on the likely value differences across bands, bands likely to be more or less valuable, congestion charging).
- any pricing methodologies that would be suitable for some or all of the Fixed Link Bands (taking account of demand and supply considerations as may apply to each).

Where appropriate, please provide supporting material with your response.

View of respondents to Document 20/109

3.111 13 respondents provided views on that methodologies that can be used to calculate applicable fees for Fixed Link Bands.

3.112 The WISPs submit that to encourage greater deployment:

- Licence fees should be reduced in bands which are not “heavily used”;
- A quantity discount should be applied on additional licences for a licensee which already has a Fixed Link operating between the same two points;
- geographic targeting of congested areas should be more granular, targeting specific locations within Dublin; and
- fees for additional Fixed Links within bands should increase, as the number of occupied channels within a band increase.

3.113 Virgin states that the fees for Fixed Links can negatively impact deployment, in particular for Fixed Links in bands below 38 GHz, with greater bandwidths.

3.114 Eir submits that fees for Fixed Links should be set at the minimum level necessary to ensure efficient allocations and considers that the existing fee schedule works well in this regard. eir states there is merit in retaining the “relatively straightforward

[existing] approach to pricing".

3.115 Three submit that ComReg should consider the offering pro-rata refunds where licences are cancelled during their 12-month term, which Three considers may improve upon the current system where licensees apply for temporary licences. Three submits that a cancellation fee could be deducted from the refund of the residual value of the licence.

3.116 Vodafone submits that pricing should facilitate Band Carrier Aggregation ("BCA"), whereby a high-capacity Fixed Link (e.g., higher frequency) and long-distance Fixed Link (e.g., low frequency) are combined to offer greater capacity over a longer distance. Vodafone notes that the initial deployment of BCA will be in 18 GHz and 80 GHz, as well as 23 GHz and 80 GHz, but future deployment could include 15 GHz and 32 GHz. Vodafone consider that a BCA link should require a single application and should have a lower fee than the present combined price of both links as the high-capacity link is:

- on a route unlikely to be otherwise in use; and
- sub-optimal without the BCA.

3.117 Vodafone considers that ComReg should merge the two highest band groups in the fee schedule into a combined ">37.5 GHz" band, given the decline in deployment in 38GHz and its ability to provide higher capacity Fixed Links in advance of the use of the W-band.

3.118 Vodafone submits that ComReg should take action to remedy inefficient use and anti-competitive hoarding of Fixed Links in 80 GHz, which is presently viable as a result of the low fees for Fixed Links in 80 GHz in congested areas. Vodafone considers that the issuance of Fixed Links in 80 GHz should be on a "use it or lose it" basis, and that an audit may be necessary to establish what links are in use. Vodafone note that an alternative approach may be to introduce a pricing structure whereby prices are higher for Fixed Links with higher bandwidths.

3.119 Vodafone state that ComReg should consider the pricing relating to Nodal solutions, a form of deployment which allows for innovative technologies such as interference and beamforming increasing spectrum reuse. Vodafone note that this could be incentivised in a manner similar to dual polarisation, though it notes it may also be facilitated through licencing (e.g., block licencing).

ComReg's Assessment

3.120 ComReg welcomes the submissions from respondents on the fee structure for Fixed Links. ComReg proposed new fee structure is set out in Chapter 5 below, which sets out ComReg's views on matters pertaining to the fee methodologies.

3.121 ComReg considers that the majority of the responses above are either answered in the RIA and DotEcon Report, or are no longer relevant (e.g., amending band groupings in existing fee schedule).

Q. 1 ComReg asks respondents to clarify whether the submissions to question 6 of ComReg document 20/109 are either addressed by the Regulatory Impact Assessment in this document and accompanying DotEcon Report.

3.122 Regarding Three's submission regarding pro-rata refunds of licence fees and that a cancellation fee could be deducted from the refund of the residual value of a licence. ComReg notes that Wireless Telegraphy (Radio Link Licence) Regulations, 2009 (S.I. 370 of 2009) do not provide for refund of licence fees or for the charging of a cancellation fee as suggested. ComReg notes that S.I. 370 of 2009 does allow applicants to apply for temporary licences and the fees for such are applied pro-rata to the relevant annual fee using the number of months for which the licence is granted.

3.123 Regarding Vodafone's submission that ComReg should consider pricing structures of Nodal solutions, ComReg concurs with the view of DotEcon that such an incentive is unnecessary and that the use of a Fixed Link for BCA does not reduce impact on the spectrum availability to other users. In particular:

- there would already be incentives for operators to use the technology arising from the ability to deliver services with greater capabilities, and there does not seem to be any need to provide additional incentives through the licensing framework.
- there would be no difference in terms of the impact, or potential impact, on spectrum availability for other operators between using the spectrum for running a single multiband aggregation link or two separate links over the same path.

3.124 Having carefully considered Vodafone's submission and noting the points made by Vodafone, ComReg is of the view that implementing a pricing structure to incentivise nodal solutions may be more appropriate for block licensing rather than individual fixed licensing. ComReg may be open to considering nodal solution pricing as part of any future consultation on opening frequency bands for block licensing.

3.2.8 The future use of the 1.4 GHz band

Summary of ComReg's Preliminary View in Document 20/109

3.125 The future use of the 1.4 GHz Band (1427 MHz – 1517 MHz) was considered in the Multi Band Spectrum Award ("MBSA2") consultation process. For the reasons set

out in consultation document 18/60, ComReg documents 19/59R[34] and 19/124[35], ComReg's preliminary view is that the 1.4 GHz Band (both the 1.4 GHz Centre Band and the 1.4 GHz Extension Bands) should not be included in the proposed award.

3.126 ComReg stated that it would continue to monitor the developments in the 1.4 GHz Band. The future award of the 1.4 GHz Band will be determined by a separate consultation process, which will commence following any final decision and award of spectrum currently being consulted upon as part of the proposed Multi-Band Spectrum Award.

3.127 Document 20/109A notes that the 1.4 GHz band may be used for the continued operation of existing terrestrial fixed wireless services or of other existing use, up to 1 January 2023, and longer if no national demand has been identified for wireless broadband electronic communications services.[36]

Q7: ComReg seeks the views of interested parties on the current and potential future use of the 1.4 GHz Band and whether all of this band should be included in an award for wireless broadband in the future.

Q8: To the extent that respondents are of the view that the 1.4 GHz Band should be awarded for wireless broadband, ComReg seeks the views of respondents on when those rights of use should be assigned.

Where appropriate, please provide supporting material with your response.

Respondents should note that views on the award of the 1.4 GHz band for WBB will form input to ComReg's separate consultation process to consider same, which would commence following the award of spectrum in the MBSA2.

View of respondents to Document 20/109

3.128 The WISPs submit that:

- the 1.4 GHz band be assigned for FWA networks on a locally licensed basis

[34] Proposed Multi Band Spectrum Award Including the 700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands – ComReg Document 19/59R: https://www.comreg.ie/publication/proposed-multi-band-spectrum-award-including-the-700-mhz-2-1-ghz-2-3-ghz-and-2-6-ghz-bands

[35] 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 – ComReg Document 19/124: https://www.comreg.ie/publication/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

[36] COMMISSION IMPLEMENTING DECISION (EU) 2018/661 of 26 April 2018: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0661&from=EN

(subject to availability of cost-effective equipment being available); and

- the licensing model should be such that it is made available on lower cost local licences, or if ComReg believes a national / regional block licensing model is needed, that a section of the band be reserved for local operators.

3.129 ESBN submits that ComReg should only consider the release of the 1.4 GHz centre band (1452 MHz – 1492 MHz) as, in ESBN's view, it has potential to deliver supplementary downlink capabilities for future mobile networks and should leave the 1.4 GHz extension bands (1427 MHz – 1452 MHz and 1492 MHz – 1517 MHz) for usage for Fixed Links.

3.130 ESBN encourages ComReg to preserve the Fixed Link services in the 1.4 GHz extension bands in the long term. [✂ [redacted] ✂]

3.131 ESBN also submits that in the instance where users of 1.4 GHz Fixed Links cannot reuse their equipment in the alternative bands being made available, a reimbursement fund should be made available for Fixed Link users to recompense them.

3.132 eir states that the ongoing work for the 1.4 GHz band was at an early stage and that a decision should be made later when more information is made available by the ECC/ITU.

3.133 Inmarsat submits that the use of the 1.4 GHz band for WBB in Ireland would require careful analysis of the compatibility with MSS operations in the adjacent 1518 - 1559 MHz band as Inmarsat's MSS services are used by ships and aircraft in ports and airports. If ComReg identifies some demand for WBB in the 1.4 GHz band in Ireland, Inmarsat is of the view that use be initially limited to the core band (1452 - 1492 MHz), as this would avoid the need for any significant restrictions on WBB systems or MSS systems.

3.134 Three submits that it does not have any plans to deploy equipment in the 1.4 GHz band.

3.135 Vodafone submits that it sees that support for use of 1.4 GHz for mobile is developing in several countries. Vodafone is of the view the use of this band for supplementary downlink applications would add considerably to network capacity in the longer term,

particularly in rural areas because of its greater coverage capability than the 2.6 GHz band. Vodafone is also of the view that, based on current equipment plans, the centre portion could usefully be used from the start of 2024, with the extension portion following later.

ComReg's Assessment

3.136 ComReg notes that there are currently 69 live licences for rights of use for frequencies in the frequency range 1427 – 1517 MHz, and notes ESBN's view that due to demand ComReg should, in the long term, continue licensing Fixed Links in the 1.4 GHz band.

3.137 Regarding Inmarsat's submission, ComReg notes that the ECC published Report 263[37] in 2017 which considers adjacent band compatibility studies between IMT operating in the frequency band 1492 - 1518 MHz and the MSS operating in the frequency band 1518 - 1525 MHz. ComReg would take account of the conclusions of Report 263 as part of any future considerations on the 1.4 GHz band.

3.138 ComReg notes the respondents' views regarding the 1.4 GHz band, and notes that the current and future use of the 1.4 GHz Band was monitored and considered by ComReg in various consultations including the MBSA2 consultations and the Fixed Links consultation.

3.139 In ComReg Document 20/122[38], ComReg noted that:

- 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 MBSA2 Award; and

- it would continue to monitor developments in the 1.4 GHz band and may provide additional clarifications during this review and following any final decision on MBSA2. The future award of the 1.4 GHz band will be determined by a separate consultation process, which would commence following any final decision and assignment of spectrum in relation to the MBSA2 award.

3.140 ComReg intends to continue to monitor the use of the 1.4 GHz band and following

[37] ECC Report 263 – Adjacent band compatibility studies between IMT operating in the frequency band 1492-1518 MHz and the MSS operating in the frequency band 1518-1525 MHz – published 03 March 2017. https://docdb.cept.org/download/1294

[38] Multi Band Spectrum Award - Response to Consultation and Decision - The 700 MHz Duplex, 2.1 GHz, 2.3 GHz and 2.6 GHz Bands – ComReg Document 20/122: https://www.comreg.ie/publication/multi-band-spectrum-award-response-to-consultation-and-decision-the-700-mhz-duplex-2-1-ghz-2-3-ghz-and-2-6-ghz-bands

the completion of the MBSA2 award, will consult on the award of some or all of the 1.4 GHz band.

3.2.9 Reopening of the 13 GHz and 15 GHz band in the congested area

Summary of ComReg's Preliminary View in Document 20/109

3.141 ComReg advised in ComReg document 14/32[39] that due to the exhaustion of all available channels within the congested area it had suspended the acceptance of applications for new Fixed Links in the 13 GHz and 15 GHz bands within the congested area. ComReg also stated that it would keep the matter of availability of channels in this limited geographic area under review and would advise of any future availability in the 13 GHz and 15 GHz bands if or when it arises.

> **Q9:** ComReg seeks the view of interested parties on the potential re-opening of the 13 GHz and 15 GHz bands in the Congested Area. Please provide supporting information with your response.

View of respondents to Document 20/109

3.142 eir, ESBN, the WISPs, Three, Virgin, and Vodafone do not oppose the proposal to reopen the 13 GHz and 15 GHz bands in the congested area of Dublin.

ComReg's Assessment

3.143 ComReg notes the views of the respondents and notes that the number of links in the 13 GHz and 15 GHz bands have declined since ComReg closed the bands to new applications in the congested area around Dublin in 2014. Therefore, having carefully considered the views of respondents, ComReg intends to reopen the 13 GHz and 15 GHz bands in congested areas and continue to monitor band occupancy following the reopening.

3.2.10 The future use of the 26 GHz band

Summary of ComReg's Preliminary View in Document 20/109

3.144 ComReg noted that as part of the MBSA2, the future use of the 26 GHz Band was considered in ComReg's consultation document 18/60. For the reasons detailed in ComReg documents 19/59R and 19/124, ComReg stated that the 26 GHz band

[39] 13 GHz and 15 GHz Frequency Bands within Dublin – ComReg Document 14/32: https://www.comreg.ie/publication/13-ghz-and-15-ghz-frequency-bands-within-dublin

should not be included in the proposed award and all respondents agreed with ComReg's proposal to exclude this band from that award.

3.145 ComReg has published an Information Notice[40] and consultant's report[41] on the appropriate licensing framework or frameworks and the options for assigning spectrum in the 26 GHz band for MFCN/ECS.

> **Q10:** ComReg seeks views from interested parties on the current use of the 26 GHz Band for Fixed Links. Respondents should note that any views in relation to the future use of the band for other technologies and uses (e.g. wireless broadband-ECS/5G) will be considered separately as part of ComReg's 26 GHz Study due to be published in Q4/2020.

View of Respondents to Document 20/109

3.146 Vodafone observes that the current 26 GHz block licences expires in 2028. It submits that it relies on its 26 GHz block licence assignment to a large extent for the provision of its services. In that regard Vodafone requests that ComReg make a decision on the future use of the band before 2023. This would enable a smooth transition out of the 26 GHz band if that was necessary.

3.147 Three submits that:

- the upper part of the 26 GHz band is not adequate to meet future demand for 5G services in its view;
- ComReg should now consider each of the current allocations (FWALA, Point-to-Point National Block, Point-to-Point Individual) with a view to making more spectrum available for 5G services. If some re-organisation of the band is required, then it is best that that is flagged now so that current users can begin to plan for the change;
- there are relatively few links operating in the Point-to-Point individual licence sub-band and ComReg should now begin to plan for migration out of this sub-band altogether for Fixed Links. This would liberate an additional 168 MHz of spectrum that is contiguous to the 5G sub-band, expanding the total available to 1265 MHz;

[40] Information Notice - 26 GHz Band 5G Study – ComReg Document 21/07: https://www.comreg.ie/publication/information-notice-26-ghz-band-5g-study

[41] 26 GHz Band 5G Study – ComReg Document 21/07a: https://www.comreg.ie/publication/26-ghz-band-5g-study

- the band should be retained as it is for block licensing, as the equipment is already available and rolled out in Ireland; and
- Three requests that ComReg publish a roadmap for the future use of 26 GHz.

3.148 Viasat submits that the 26 GHz frequency band should be retained for Fixed Links. It further submits that ComReg should only consider identifying more than one gigahertz of spectrum for terrestrial IMT/5G if there is market demand for it.

3.149 ESBN submits that there is no immediate need to make any decisions on the future of fixed inks in the band, and ComReg should wait until the 5G situation is clearer.

3.150 eir submits that the 26GHz band block licences have been a successful innovation and an appropriate use of the band in the near to medium term for at least the term of the existing block licences.

3.151 The WISPs suggest that ComReg should make block licences affordable within the 26 GHz frequency band.

ComReg's Assessment

3.152 ComReg notes that there is a strong support for block licensing in the 26 GHz band in the responses. ComReg further notes the WISPs comments about making block licences within the 26 GHz frequency band more affordable however ComReg would like to note that the award process for the 26 GHz band concluded in 2018. ComReg would ask the WISPs to submit their views during any future block allocation awards.

3.153 In relation to Three's comments that there are relatively few links operating in the 26 GHz Point-to-Point individual licence sub-band, ComReg notes that there are 130 live licences in this band with 8 different licensees. Nevertheless, ComReg is of the view that the reorganising of the 26 GHz bands is likely to be very costly in terms of purchasing new equipment and would require migrating existing users to a different band. ComReg will continue to monitor the use of the 26 GHz band for individual licensing.

3.154 Thee submits that it believes there is 1265 MHz available if users migrated out of the 26 GHz band for Point-to-Point links. ComReg observes that this is incorrect and that the correct amount of spectrum would be 1215 MHz.

3.155 ComReg notes in Document 21/136 that it will continue to consider the future use of the 26 GHz Band for WBB ECS and other services during the period 2022 - 2024.

3.2.11 The opening of the W-Band and D-Band

Summary of ComReg's Preliminary View in Document 20/109

3.156 ComReg is of the preliminary view that the D-band and W-band have the potential to address bandwidth requirements for ultra-high-capacity links in urban areas. ComReg notes that the CEPT has published recommendations which set out the channel arrangements. However, and noting the views of interviewees regarding equipment availability, ComReg is of the view that the bands should only be opened once equipment is readily available.

Q.11 ComReg seeks the views of interested parties on the potential future use of the D-band and W-band and the equipment availability for those bands. Please provide supporting information with your response.

View of Respondents to Document 20/109

3.157 15 respondents provided views on the potential use of the W-band and D-bands. All respondents observe that these bands have the potential to meet capacity requirements in urban areas. 14 of the 15 respondents also note that it is too early to provide a clear view on these bands as the technology is still under development. They further note that ComReg should not make these bands available until the technical parameters are known.

3.158 eir, Three and Vodafone submit that once equipment is available the bands should be assigned as block licences.

3.159 Three submits that block licences would maximise the efficient use of the spectrum as the W-bands and D-bands could be aggregated with lower frequency bands to leverage very high capacities.

3.160 Vodafone notes that block licences would enable greater flexibility for operators. Vodafone further notes that for any block assignments the channel bandwidths and maximum bandwidths should align with CEPT and ITU recommendations.

3.161 In its response Siklu notes that the W-bands and D-bands may have potential useful applications for imaging, health scanning and automated assembly. Siklu submits that while W-band and D-band will have some use in fixed wireless connectivity, this will be limited, as neither can compete with E-band for air-capacities and range.

ComReg's Assessment

3.162 ComReg notes the broad support of respondents to its view that the W-bands and D-bands have the potential to address bandwidth requirements for ultra-high-capacity links in urban areas and that the bands should only be opened once equipment is readily available.

3.163 ComReg concurs with the Vodafone view that the bands should be made available in accordance with the relevant CEPT and ITU recommendations.

3.164 Regarding Siklu's views, ComReg notes the propagation limitations of the W-bands and D-bands, however, ComReg is of the view that the bands could provide an opportunity to meet demand for increasingly very high bandwidth access, in particular for Internet-based applications and backhaul/fronthaul for next generation mobile networks. ComReg also notes that the relevant ECC Recommendations state that the bands are suitable for very high capacity on short range links.[42] [43]

3.165 Having carefully considered the respondents views, ComReg does not intend make the W-Band and D-Band available at this point in time due to the unavailability of equipment but may do so in the near future when equipment becomes more readily available. To that end, ComReg will continue to monitor equipment availability and demand for the bands, and ComReg intends to consult on any potential opening of the bands to determine, amongst other things, appropriate fees, and assignment process.

3.2.12 The use of licence exempt / light licensing regimes

Summary of ComReg's Preliminary View in Document 20/109

3.166 Most licence exempt Fixed Links currently operate in the 5.8 GHz licence-exempt band, and because they have operated almost exclusively in rural areas, the risk of interference has been lower.

3.167 Some of the licence exempt bands are important to some users and that the preliminary view is not to make any changes to the 2.4 GHz, 5 GHz, 17 GHz, 24 GHz or 60 GHz bands.

3.168 ComReg notes that the reason the CEPT removed the 17 GHz band from ECC/REC/70-03[44] in 2012 was due to there being no harmonisation measure for the band for wideband data transmission equipment outside of Europe, and CEPT noted in CEPT Report 44[45] there was limited usage of the band across Europe in any event.

3.169 ComReg also notes that equipment is available for the 17 GHz band and the band is

[42] ECC Recommendation (18)02 – Radio frequency channel/block arrangements for Fixed Service systems operating in the bands 92-94 GHz, 94.1-100 GHz, 102-109.5 GHz and 111.8-114.25 GHz : https://docdb.cept.org/document/6037

[43] ECC Recommendation (18)01 – Radio frequency channel/block arrangements for Fixed Service systems operating in the bands 130-134 GHz, 141-148.5 GHz, 151.5-164 GHz and 167-174.8 GHz: https://docdb.cept.org/document/2012

[44] CEPT ERC/REC 70-03: https://docdb.cept.org/document/845

[45] CEPT Report 044 - https://docdb.cept.org/document/44

used for Fixed Links in Ireland, and the CEPT's SRG/MG[46] group has recently discussed the possibility of reintroducing the 17 GHz band in a future revised version ECC/REC/70-03, partly as a consequence of the band becoming more widely used in some European countries.

3.170 ComReg notes the information provided in the RFI responses[47] and in the interviews[48] however it is of the preliminary view that no change of use is required for the current-licence exempt bands, including the 60 GHz band.

3.171 In its report, DotEcon set out potential options for light licensing in the current licence-exempt bands if there were significant interference issues in those bands. ComReg noted that there is currently a light licensing regime in place for the 5 GHz band where radio links deployed in the band require registration.[49] The purpose of the registration requirement is to facilitate the management of the band in the event of changes being necessitated by European standards or regulatory developments and to afford users in the band adequate notice of any anticipated changes rather than to address interference issues between Fixed Links in the 5 GHz band.

3.172 ComReg is of the preliminary view that a light licensing framework is not required at this time to address interference issues in the licence-exempt bands. ComReg notes that to date the use of licence-exempt frequency bands has worked well for many operators, and generally those operators are able to work together to resolve interference issues between Fixed Links using those bands.

Q12: ComReg seeks the views of interested parties on the current and future use of the 5.8 GHz, 17 GHz, 24 GHz and 60 GHz licence-exempt bands, and the requirement to implement a Light Licensing framework to address interference issues in the licence-exempt bands. Please provide evidence in support of your views.

View of Respondents to Document 20/109

3.173 11 respondents provided views on the current and future use of the licence exempt bands and the requirement to implement a light licensing framework to address

[46] CEPT SRD/MG - Short Range Devices - https://www.cept.org/ecc/groups/ecc/wg-fm/srdmg/client/introduction/

[47] Responses received to a voluntary request for information (RFI) issued in March 2020 to current fixed link licensees. See paragraph 10 of ComReg document 20/109 for more information on the RFI responses.

[48] Interviews were conducted by DotEcon and ComReg with several stakeholders including existing fixed radio link users and equipment manufacturers. See paragraph 10 of ComReg document 20/109 for more information on the RFI responses.

[49] ComReg 5.8 GHz Registration: 5.8 GHz Registration | Commission for Communications Regulation (comreg.ie)

interference issues in these bands. The following three respondents provided additional views on the use of licence exempt / light licensing regime.

3.174 The WISPs support DotEcon's recommendation not to close bands that are open and in use. They note that the 5 GHz band has been a key enabler to delivering FWA broadband in Ireland and that the 17 GHz and 24 GHz bands are used extensively for Fixed Links across the country.

3.175 On the matter of interference, the WISPs submit that the deployment of beamforming Mu-MIMO sectors, and high-quality beam efficient scalar horn antennas in the 5 GHz band means that despite the very wide large-scale deployment of licence exempt links across the country, they can manage the spectrum and adequately limit interference to and from other operators. In respect of the 17 GHz and 24 GHz bands they contend that they have yet to encounter any interference on these links and agree that a light licensing framework is not required for these band.

3.176 The WISPs further note that the 60 GHz band will become increasingly important for short range Fixed Links applications. Regarding DotEcon's observation that it has not enjoyed extensive use they observe that this arises as the products operating in the 60 GHz band are only relatively recently being made available at reasonable cost. They further observe that 60 GHz use in their networks has increased dramatically in the past 18 months and will likely continue to increase with the release of new products.

3.177 The WISPs request that ComReg inform the Department of the Environment, Climate and Communications ("DECC") and their advisors Analysys Mason that interference is not a significant issue that affects FWA networks to any great extent. Not least because Analysys Mason felt unable to qualify every FWA network for next generation access ("NGA") status in the recent National Broadband Plan ("NBP") Mapping exercise which meant that the intervention area as defined by the DECC and its advisors threatens to over build all FWA operators' infrastructure as currently deployed NGA capable infrastructure at significant cost to the Irish and European taxpayer.

3.178 The WISPs request that ComReg consider the following changes to the conditions of use for a number of the licence exempt bands;

- to increase the permitted max EIRP in the 5.8 GHz band in rural areas to 36 dBm in line with Ofcom in UK. This would increase the range of rural base stations by up to 41%;

- extend the spectrum allocation of the 17 GHz band as much as possible or at the very least 50 MHz to accommodate higher capacity symmetric links;

- to widen the spectrum allocation of the 24 GHz band from the current allocation of 250 MHz;
- consider facilitating the opening of the 4.9 GHz band under a general authorisation or light licensing model; and
- that the 66-71 GHz band be released under a general authorisation on a technology neutral basis.

3.179 Regarding the 60 GHz band the WISPs and Virgin separately submit that it is important for Fixed Links deployments and urge ComReg to make it available for use. The WISPs request that it be made available under a general authorisation while Virgin is of the view that a light licensing would be beneficial in the license-exempt bands to limit potential interference.

3.180 Siklu agrees with ComReg's view that no change is required in the licensing regime for the 60 GHz band (57 - 71 GHz) which is licence-exempt in all countries where use of this band is permitted.

ComReg's Assessment

3.181 ComReg welcomes the broad support of respondents to maintaining the current status of the 2.4 GHz, 5 GHz, 17 GHz, 24 GHz and 60 GHz licence exempt bands. ComReg also welcomes the information from the WISPs that instances of interference in these bands are rare and are dealt with through close co-operation between the operators.

3.182 With regard to the requests by the WISPs;

- request to increase the permitted max EIRP in the 5.8 GHz band in rural areas to 36 dBm in line with Ofcom in UK.

ComReg observes that Ofcom has introduced a light licensing regime in the 5725 MHz – 5850 MHz part of the band. Under this regime it is necessary to register and pay a fee for all terminals installed.

ComReg notes that, as set out in ComReg document 02/71R, the max EIRP for the 5725 – 5850 MHz part of the band is 2W or 33 dBm. ComReg also notes that the proposal by the WISPs, if adopted, would result in a doubling of the permitted power from 2W to 4W or 36 dBm EIRP. While this would increase the coverage area of the equipment, ComReg is of the view that it would also increase the potential for harmful interference between operators.

ComReg considers that to adopt the same approach as Ofcom would in effect remove the licence exempt status of this band. This, in ComReg's view, would add

to the costs to operators and act as a barrier to entry to potential operators and may even impair competition.

3.183 With regard to the requests by the WISPs:

- that ComReg increase the spectrum available for licence exempt use in a number of bands.

ComReg notes that, generally, it endeavours to ensure that spectrum in Ireland is harmonised in accordance with the relevant European Commission and CEPT harmonisation decisions. Spectrum harmonisation facilitates economies of scale in the manufacture of radio equipment (which lowers both the cost of deploying wireless networks and the cost of wireless devices for consumers) and minimises interference between users.

Regarding licence exempt use, the harmonisation decisions, EC Decision ECC/DEC (20)01[50] and ERC/REC 70-03 apply and are implemented in Ireland by way of ComReg Document 02/71R.

3.184 In regard to the specific requests by the WISPs, ComReg observes that;

- to extend the range of spectrum allocated to the licence exempt use of the 17 GHz band and 24 GHz band would extend their use beyond the current CEPT harmonisation arrangements; and

- the 4.9 GHz band is not harmonised for licence exempt use in Europe.

3.185 In regard to the 60 GHz band, ComReg observes that, in April 2020, it published Revision 12 of Document 02/71R on the permitted short-range devices in Ireland to permit the use of the 57 – 71 GHz band for Wideband Data Transmission devices.

3.186 ComReg notes the submission by Virgin that a light licensing framework would limit the potential for interference and would require further information from Virgin regarding how such a regime would work before it could properly consider such a suggestion.

3.187 Regarding light licensing, as set out in Document 20/109, ComReg does have a registration requirement for radio links deployed in the 5.8 GHz band.[51] The purpose of the registration requirement is to facilitate management of the band in the event of changes being necessitated by European standards or regulatory developments, and to afford users in the band adequate notice of any anticipated changes, rather

[50] ECC/DEC/(20)01: https://docdb.cept.org/document/16737
[51] 5.8 GHz registration: https://www.comreg.ie/industry/licensing/5-8-ghz-registration/

than to address interference issues between Fixed Links in the 5.8 GHz band. [52]

3.188 ComReg observes that the propagation of radio waves in the 17 GHz, 24 GHz and 60 GHz bands means that the potential for harmful interference between operators is considerably reduced in comparison to the 5.8 GHz band. Notwithstanding, ComReg considers that instances of harmful interference in the licence exempt bands are best addressed through co-operation between operators.

3.189 ComReg remains of the view that a light licensing framework is not required at this time to address interference issues in the licence-exempt bands. ComReg notes that to date the use of licence-exempt frequency bands has worked well for many operators, and generally, as evidenced by the responses received, operators are able to work together to resolve interference issues between radio links using those bands.

3.190 ComReg remains of the view set out in Document 20/109 that no change of use is required for the current-licence exempt bands, including the 60 GHz band.

3.191 Finally, regarding the WISPs submission that ComReg inform the DECC and their advisors Analysys Mason that interference is not a significant issue that is affecting FWA networks to any great extent, ComReg observes that the NBP and the associated mapping exercise is a matter for DECC and not ComReg.

3.2.13 Matters raised regarding Fixed Satellite Services

View of respondents to Document 20/109

3.192 The satellite service providers, Eutelsat, SpaceX, and Viasat submitted a number of comments in response to Document 20/109.

Eutelsat

3.193 In its submission Eutelsat submits the following:

- the frequency range 17.7 - 19.7 GHz is necessary for the provision of broadband connectivity, as the operation of satellite ground network across Ireland requires greater satellite downlink capacity than currently allowed in the Republic of Ireland in the range 19.7 - 20.2 GHz;
- the use of FSS in 17.7 - 19.7 GHz would not cause Interference to fixed links. Eutelsat note that ERC decision (00)07, which is implemented by 30 CEPT administrations, determines that national administrations should enable the deployment of fixed stations, coordinated FSS earth stations and

[52] See Registration of 5.8GHz Wireless Access Base Stations -ComReg Document 03/42: https://www.comreg.ie/media/2018/06/ComReg0342.pdf

uncoordinated FSS earth stations in the band 17.7 - 19.7 GHz and exempt uncoordinated FSS earth stations in the same band from individual licensing, to allow their free circulation and use;

- requests that ComReg defer decisions to be taken under this consultation on fixed links in the Ka band until the consultation on FSS concludes, in order to get a global picture of the Ka band and ensure fixed services and FSS share the band appropriately; and

- that ComReg develop an effective licensing framework for both fixed services and FSS and consider allocating frequency range 17.7 -19.7 GHz to fixed services and FSS on a co-primary basis.

SpaceX

3.194 SpaceX notes that ComReg refers to a range of frequency bands being allocated to fixed services and fixed satellite services on a 'co-primary' basis. SpaceX further notes that this would imply both type of services operating on an equal footing rather than on a primary / secondary basis.

3.195 SpaceX further notes that effective deployment of new broadband satellite user terminals will require a licence exempt or blanket licence regime to be established in Ireland.

3.196 SpaceX requests that ComReg provides clarity on the following matters;

- the definition of 'co-primary';

- how it proposes to license fixed satellite services in the 10.7 – 12.7 GHz and 14.0 – 14.5 GHz bands; and

- that the 14 – 14.5 GHz band will continue to be exclusively allocated to satellite services.

3.197 SpaceX suggests that ComReg should publish the location of all fixed service stations on its website to allow other spectrum users to plan around these locations. It further suggests that ComReg examines all of its spectrum licensing decisions through the lens of efficiency to ensure that the spectrum is used most efficiently to the maximum number of users.

Viasat

3.198 Viasat submits that:

- the 28 GHz portion of the Ka band is a critical element of the satellite broadband connected world.
- any changes to Fixed Link channel arrangements should only be undertaken in consultation with satellite operators. That demand for Fixed Links for greater capacity (including Fixed Links for mobile backhaul) requiring the application of new technologies, e.g., active antenna systems, including mesh point-to-point, may adversely impact the existing radio environment for satellite.
- that block licensing for Fixed Links should not prevent the development and future use of satellite services allocated on a co-primary basis in the same frequency bands.
- does not support the introduction of 200 MHz block assignments for new type of Fixed Links in the 28 GHz band unless compatibility studies prove that co-existence is possible.
- supports continued use of the 26 GHz for terrestrial Fixed Links.
- ComReg should only consider identifying more than one gigahertz of spectrum for terrestrial IMT/5G if there is market demand for it. Otherwise, it should not identify more than 1 GHz.

ComReg's Assessment

3.199 While satellite broadband subscriptions in Ireland have declined by more than 34.25% in the period Q3 2020 to Q3 2021[53], ComReg has nonetheless continued to facilitate the roll out of satellite services most notably via the adoption, in 2020, of a new exemption order, S.I. 226 of 2020[54], to ensure that certain Terminals for Satellite Services ("TSS") can be deployed in Ireland on a licence-exempt basis.

3.200 An accompanying technical document, ComReg 20/47[55] "Permitted Licence Exemptions for Terminals for Satellite Services" was also adopted. ComReg 20/47, as amended, defines the technical and operational characteristics of TSS equipment, as set out in the relevant ECC Decisions, eligible for exemption under S.I. 226 of

[53] Quarterly Key Data Report Q2 2021 – ComReg Document 21/88: Quarterly Key Data Report Q2 2021 | Commission for Communications Regulation (comreg.ie)

[54] S.I. No 226 of 2020 - Wireless Telegraphy Act 1926 (Section 3) (Exemption of Terminals for Satellite Services) Order 2020: https://www.comreg.ie/publication/s-i-no-226-of-2020-wireless-telegraphy-act-1926-section-3-exemption-of-terminals-for-satellite-services-order-2020

[55] S.I. No 226 of 2020 - Wireless Telegraphy Act 1926 (Section 3) (Exemption of Terminals for Satellite Services) Order 2020: https://www.comreg.ie/publication/permitted-licence-exemptions-for-terminals-for-satellite-services

2020.

3.201 In 2020, ComReg commenced a project to review the current Fixed Satellite Earth Station licensing regime.[56] The scope of the project is to consult on a new licensing framework for satellite earth stations and terminals and consider, among other things, frequency bands, fees, technology, and international developments in satellite services. The first stage of consultation to review the satellite licensing scheme is scheduled for publication in Q4 2021.

3.202 As such ComReg considers the submissions by the Eutelsat, SpaceX and Viasat regarding the sharing of the fixed services and the fixed satellite services in the 12 GHz, 14 GHz, 18 GHz and 28 GHz bands to be more appropriate to the Fixed Satellite Earth Station licensing regime review. Consequently, these matters will be addressed in the forthcoming consultation on satellite services and ComReg looks forward to receiving submissions from the interested parties in due course.

3.203 ComReg observes that the 18 GHz band is extensively used for fixed services in Ireland. As illustrated in Document 20/109, there are more than 2,300 Fixed Links deployed in this band currently. These links are critical infrastructure links for the provision of services for the fixed and mobile network services providers. Notwithstanding, ComReg notes that ECC Decision (00)07[57] sets out the conditions for the shared use of the band 17.7-19.7 GHz by the fixed service and earth stations of the fixed-satellite service. ComReg further notes that it has implemented ECC Decision (00)07 and satellite operators can now deploy satellite terminals in the 18 GHz band, see ComReg document 20/47 R2 for further information.

3.204 ComReg considers that it may be possible to permit the deployment of co-ordinated satellites earth stations in the 18 GHz band. However, ComReg will address this, and all other submissions related to the allocation, co-ordination, sharing and of the fixed services and fixed satellite services in its forthcoming consultation regarding the fixed satellite earth station licensing regime, one of the outcomes of which could be a new licensing framework for satellite services in Ireland.

3.205 Regarding SpaceX's request for clarification in:

- definition of co-primary basis

[56] ComReg Action Plan for Year to 30 June 2021: https://www.comreg.ie/media/2021/05/Action-Plan-Ye-300621-Update-as-at-14-May-2021.pdf

[57] ERC/DEC/(00)07: https://docdb.cept.org/document/685

The ITU Radio Regulations helpfully provides the following definition[58]:

"*Co-primary Basis: means that nature of the right granted to the assignee of a particular spectrum (band or spot frequency), to use the specified frequency bands is subject to the condition that:*

- *the entity must coordinate with other co-primary licensees in order to limit harmful interference to existing links and services operating in the relevant frequency bands, and to facilitate the introduction of additional links and services in the relevant frequency bands;*
- *Co-primary user must refrain from causing harmful interference to, and may not require protection from operations of other co-primary user in relevant band; and*
- *Co-primary usage of band is subject to protection from:*
    - *harmful interference caused by any other spectrum user that may be authorized to use the same spectrum on secondary basis,*
    - *claims of harmful interference by holders of licenses granting secondary status with respect to frequency"*

ComReg considers this definition provides the clarity sought by SpaceX that co-primary services enjoy equal status in the relevant bands and that co-primary licensees must co-ordinate with each other to mitigated harmful interference.

3.206 Regarding SpaceX's request for clarification in:

- how ComReg proposes to license fixed satellite services in the 10.7 – 12.7 GHz and 14.0 – 14.5 GHz bands;

ComReg considers this to be outside of the scope of this consultation. These submissions will be addressed in the forthcoming consultation on satellite services outlined above and ComReg looks forward to receiving SpaceX's submission in due course.

3.207 Regarding SpaceX's request for clarification in:

- that the 14 – 14.5 GHz band will continue to be exclusively allocated to satellite services;

ComReg observes that the 14 – 14.5 GHz band is allocated in the European common

[58] See ITU National Spectrum Management: https://www.itu.int/en/ITU-D/Regional-Presence/AsiaPacific/Documents/Events/2016/Feb-SMS4DC-Pacific/National%20Spectrum%20Management.pdf

allocation table to the fixed satellite (Earth to Space) on a primary basis and to mobile satellite (Earth to space) and space research on a secondary basis. ComReg is not aware of any proposals within ITU or CEPT to make changes to the current allocation of the 14 – 14.5 GHz band but cannot rule out the possibility of future changes. However, ComReg notes that any such changes would need to be executed via the agreed ITU procedures.

3.208 Regarding SpaceX's submission that ComReg publish the location of all fixed service stations on its website to allow other spectrum users to plan around these locations, ComReg observes that in its Radio Spectrum Management Strategy Statement, document 21/90[59], ComReg identified a work item to publish Fixed Links data on its Siteviewer[60] database. This would, as suggested by SpaceX, enable all spectrum users to identify the location of licensed telecommunications apparatus deployed throughout the country and plan accordingly. ComReg will respond to that consultation and publish its final Radio Spectrum Management Strategy Statement shortly.

3.209 Finally, in regard to SpaceX's suggestion that ComReg examine all of its spectrum licensing decisions through the lens of efficiency to ensure that the outcome is that the spectrum is used most efficiently to the maximum number of users, ComReg provides the following observations.

3.210 Annex 1 of ComReg document 21/90 sets out ComReg's legal framework and statutory objectives relevant to the management of the radio spectrum. ComReg observes that its primary objectives in carrying out its statutory functions in the context of electronic communications are to:

- promote competition[61];
- contribute to the development of the internal market[62];
- promote the interests of users within the Community[63];
- ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under Section 13 of the 2002 Act[64]; and

[59] Proposed Strategy for Managing the Radio Spectrum 2022 to 2024 – ComReg Document 21/90:https://www.comreg.ie/publication/proposed-strategy-for-managing-the-radio-spectrum-2022-to-2024

[60] Siteviewer: ComReg SiteViewer

[61] Section 12 (1)(a)(i) of the 2002 Act.

[62] Section 12 (1)(a)(ii) of the 2002 Act.

[63] Section 12(1)(a)(iii) of the 2002 Act.

[64] Section 12(1)(b) of the 2002 Act.

- 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 Regulations [65] in particular those designed to ensure effective competition [66].

3.211 As such ComReg cannot make decisions through the lens of efficiency alone as proposed by SpaceX. Rather it needs to take a holistic approach to all its decisions to ensure that they are carried out with due regard to all its statutory functions and objectives.

3.212 ComReg welcomes Viasat's support for the continued use of the 26 GHz band for Fixed Links and the identification and assignment of 1 GHz of spectrum for terrestrial IMT/5G subject to market demand. All responses to this consultation relevant to the 26 GHz band are discussed in 3.2.10 above.

3.213 Regarding the 28 GHz band, ComReg observes that this band is allocated to the fixed service and fixed satellite service on a co-primary basis. ComReg further observes that the recently updated ECC Recommendation T/R 13-02[67] makes provision for a new maximum channel bandwidth of up to 224 MHz for Fixed Links in this band.

[65] 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). Note that the European Electronic Communications Code has repealed the Common Regulatory Framework, ie the relevant Directives.

[66] Regulation 16(1)(a) of the Framework Regulations.

[67] ECC Recommendation T/R 13-02:New ECC Report Style (cept.org)

Chapter 4

4 Technical Requirements for Fixed Links

4.1 Overview

4.1 In section 3.2.2 and Annex D of ComReg 21/134a, DotEcon undertakes a detailed review of the current technical parameters, as set out in the Fixed Links guidelines document 09/89R2. As part of its review, DotEcon assesses the parameters and their applicability to the Irish case, in the light of the relevant CEPT and ITU recommendations and the international best practices. This includes:

- the bands plans and channel spacing for Fixed Links;
- the maximum transmit power and automated transmit power control ("ATPC") for Fixed Links;
- the minimum path length for Fixed Links;
- the minimum transmission capacity for Fixed Links;
- the minimum antenna requirements for Fixed Links;
- mandatory equipment class for Fixed Links;
- the high/low designation for Fixed Links; and
- Multi-Band Aggregation concept.

This chapter synopsises DotEcon's conclusions. Readers are referred to the DotEcon Report (Document 21/134a) for a detailed discussion on this review of the technical guidelines for fixed radio links.

4.2 Band Plans and Channel Spacing

4.2 The allocation of frequency bands for Fixed Links in Ireland is aligned with the ITU Radio Regulations and the approach taken in other European countries.[68] The band plans and channel spacings for Fixed Links are in keeping with harmonised CEPT

[68] See ECC Report 173 - Fixed Service in Europe Current use and future trends post 2016 - https://docdb.cept.org/download/6fd0de6b-f796/ECCRep173.PDF

and ITU recommendations.[69]

4.3 DotEcon notes that, for certain frequency bands, ComReg should consider making wider channel spacings available so as to align with the current international recommendations and to support potential future demand for bandwidth. Table 14 of the DotEcon report sets out the recommended changes to the frequency bands in order to reflect recently updated harmonised CEPT and ITU recommendations.

4.4 DotEcon elaborates that ComReg should allow for wider channels by including channel merging[70] in its guidelines on Fixed Links, and that this should be in accordance with the channel merging options set out in the relevant CEPT and ECC recommendations. DotEcon is of the view that, given the demand for larger channels, channel mergers are likely to support efficient use of the radio spectrum and thus would be of benefit to users. DotEcon notes that some operators are already effectively doing this by licensing two adjacent channels and using them as one.

4.5 ComReg agrees with DotEcon's recommendations to make wider channel spacings available where they have been set out in relevant CEPT and ITU Recommendations, and where there is an option that permits channel merging.

4.6 ComReg has included a list of potential channels for the Fixed Links frequency bands in Annex 1 below.

Q. 2 ComReg welcomes the views of respondents on its proposed channel spacings for the frequency bands listed in Annex 1. Please provide evidence and reasoning for your views.

4.3 The Maximum transmit power and ATPC for Fixed Links

Maximum Transmit Power

4.7 To minimise the risk of interference and facilitate greater frequency reuse, ComReg requires Fixed Links holders to use the minimum power necessary for the link to operate to the specified radio availability criteria. This is specified in Annex 2 of ComReg Document 09/89R2.

4.8 DotEcon assessed the different technical requirements for the provision of Fixed Links by eight other European National Regulatory Agencies ("NRAs").[71] From that benchmark, DotEcon notes that in terms of the maximum transmit power allowed by

[69] https://docdb.cept.org/document/category/ECC_Recommendations?status=ACTIVE

[70] Merging any two adjacent smaller bandwidth channels to create one larger bandwidth channel, with its centre frequency between the merged channels i.e., merging any two adjacent 56 MHz channels to create one 112 MHz channel. The ECC/ITU recommendations provides further details on this

[71] UK, Switzerland, France, Czech Republic, Hungary, Portugal, Slovakia and Lithuania

each:

- four NRA's define specific EIRP limits for all the Fixed Links Bands;
- two NRA's define EIRP limits only for a subset of Fixed Links Bands; and
- two NRA's do not set any explicit obligations with regards to transmit power[72].

4.9 DotEcon notes that while ANACOM and ComReg do not include a specific maximum transmit power level, the maximum power requirements are addressed as:

- ComReg applies the minimum level required to maintain availability; and
- ANACOM carries out a case-by-case frequency assignment for each link, usually based on channel arrangements adopted from CEPT/ERC/ECC and ITU-R Recommendation.

4.10 DotEcon observes that ComReg's current approach is well grounded in the internationally recognised recommendations from the ITU. DotEcon recommends that ComReg maintains the requirement for operators to use the minimum power necessary for the link to operate to the specified radio availability criteria and to only consider setting up specific power limits if stakeholders specifically request it.

Automatic Transmit Power Control ("ATPC")

4.11 ATPC is a feature of Fixed Links that automatically adjusts the output power of equipment depending on the signal reception level. The ATPC system increases the power during bad weather conditions that might weaken the signal and reduces the power to normal when these conditions are over.

4.12 DotEcon notes that, in contrast to other European countries, ComReg does not make any reference to ATPC in its guidelines document.

4.13 Of the eight countries (UK, Switzerland, France, Czech Republic, Hungary, Portugal, Slovakia and Lithuania) benchmarked in DotEcon's report:

- two define specific ATPC obligations for all the Fixed Links Bands;
- two define ATPC allowance only for a subset of Fixed Links Bands;
- two define ATPC obligations only for a single Fixed Links Band; and

[72] Lithuania and Portugal

- two do not set any explicit obligations with regards to the ATPC.

4.14 ComReg notes that ATPC is a feature of Point-to-Point links that adjusts transmitter output power based on the varying signal level at the receiver. ATPC automatically increases the transmit power during "fade" conditions such as heavy rainfall. When the "fade" conditions end, the ATPC system reduces the transmit power again. This reduces the stress on the microwave power amplifiers, which reduces power consumption, heat generation and increases equipment lifetime. In light of the above, ComReg proposes that its guidelines on Fixed Links be amended to include the requirement that ATPC be used on licensed Fixed Links.

Q. 3 ComReg seeks views of interested parties regarding the adjustments (if any) to minimum transmit power for each of the frequency bands currently listed in Annex 1 of Document 09/89R2. Please provide evidence and reasoning for your views.

Q. 4 ComReg seeks the views of interested parties regarding the inclusion of ATPC in future versions of the Guidelines.

4.4 Minimum Path Length

4.15 ComReg has implemented a link length policy for Fixed Links operating in bands at 2 GHz and above which indicates the minimum path length appropriate to a particular frequency band.

4.16 Of the eight countries (UK, Switzerland, France, Czech Republic, Portugal, Hungary, Slovakia and Lithuania) benchmarked in DotEcon's report:

- five do not set any explicit obligations with regards to the minimum path length. One, however, applies a surcharge if the length of a Fixed Link is below a given threshold;
- one defines minimum path length values for all the Fixed Links Bands; and
- two have set minimum path length requirements for a subset of low to mid bands.

4.17 DotEcon notes that while there are four NRAs including ComReg that set explicit minimum link path length requirements, the remaining five in the benchmark do not. Accordingly, and while the setting minimum path length requirement is not uncommon amongst other European NRAs, it is not universal.

4.18 DotEcon observes however that the link path length policy set by ComReg is aligned with those put in place by the other three NRA's. DotEcon sees no reason to amend ComReg's minimum path lengths approach, noting that this may not necessarily apply if Multi-Band Aggregation technology were to be used. This is discussed in

section 4.9 below.

4.19 Having carefully considered DotEcon's recommendation regarding the minimum link path length policy, ComReg does not propose to make any changes to such.

Q. 5 ComReg seeks views of interested parties regarding retaining the minimum path lengths for each of the frequency listed in Annex 1 of Document 09/89R2. Please provide evidence and reasoning for your views where you submit that alternative minimum path lengths should be used for certain frequency bands.

4.5 Minimum Transmission Capacity

4.20 ComReg sets a minimum transmission capacity for each Fixed Link Band, which in some cases increases with channel width within a band. This is intended to promote efficient use of the wider channels available in higher frequency bands, thereby supporting higher capacity services than can otherwise be achieved via the available bandwidth the lower bands

4.21 Of the eight countries (UK, Switzerland, France, Czech Republic, Hungary, Portugal, Slovakia and Lithuania) benchmarked in DotEcon's report:

- four do not set any explicit obligations with regards to the minimum transmission capacity;
- three define specific minimum transmission capacity requirements for all their Fixed Links Bands; and
- one defines minimum transmission capacity requirements only for a subset of its Fixed Links Bands.

4.22 DotEcon notes that there is no obvious trend when considering the practices adopted by other European NRAs. DotEcon further notes that when assessing those NRAs that have set specific minimum thresholds, these all fall below the minimum requirements set by ComReg. In light of the above, and absent any clear trends to the contrary, DotEcon recommends that the minimum transmission capacity values currently set out in the guidelines should remain unchanged.

4.23 Having carefully considered DotEcon's recommendation regarding the minimum transmission capacity for each band, ComReg does not propose to undertake any changes to its current guidelines.

Q. 6 ComReg seeks views of interested parties regarding the adjustments (if any) to the minimum transmission capacity for each of the frequency bands listed in Annex 1 of Document 09/89R2. Please provide evidence and reasoning for your views.

4.6 Minimum Antenna Requirements

4.24 ComReg sets a minimum antenna class for each band, which helps to maximise spectrum re-use possibilities while supporting efficient use of the radio spectrum. ETSI defines antennae classes by reference to their suitability for different interference environments.

4.25 The radiation pattern envelope ("RPE") that represents how the maximum gain (dBi) of the antenna varies depending on the azimuth angle to the main beam axis, is classified by the ETSI according to the classes below:

- Class 1: antennas required for use in networks where there is a low interference potential (e.g., low-density deployment areas);
- Class 2: antennas required for use in networks where there is a high interference potential (e.g., high-density deployment areas);
- Class 3: antennas required for use in networks where there is a very high interference potential; and
- Class 4: antennas required for use in networks where there is an extremely high interference potential.

4.26 Of the eight countries (UK, Switzerland, France, Czech Republic, Hungary, Portugal, Slovakia and Lithuania) benchmarked in DotEcon's report:

- four define specific minimum antenna requirements for all the Fixed Links Bands; and
- four do not define any minimum antenna requirements.

4.27 DotEcon notes that it is a reasonably common practice to set minimum antenna requirements for the different Fixed Links Bands. Furthermore, the minimum requirements set by ComReg are aligned with those applied by other European NRAs. DotEcon also notes that given the demography and the high density of antennas in urban areas of Ireland, a Class 3 type antenna seems appropriate for Ireland. In light of the above, DotEcon is of the view that no changes to the guidelines with respect to minimum antenna requirements is required.

4.28 Having carefully considered DotEcon's recommendation regarding the minimum antenna class for each band, ComReg does not propose to make any changes to such.

Q. 7 ComReg seeks views of interested parties regarding the adjustments (if any) to the minimum antenna requirements for each of the frequency bands listed in Annex 1 of Document 09/89R2. Please provide evidence and reasoning for your views

4.7 Mandatory Equipment Class

4.29 ComReg defines mandatory equipment classes based on ETSI standards which, alongside the antenna and transmission capacity requirements, ensures that the equipment used for Fixed Links remains compatible with continuing efficient use of the radio spectrum.

4.30 Of the eight countries (UK, Switzerland, France, Czech Republic, Hungary, Portugal, Slovakia and Lithuania) benchmarked by DotEcon:

- four define a specific standard for the equipment class for all the Fixed Links Bands; and
- four do not define any standard for equipment class.

4.31 Accordingly, it is a reasonably common practice to refer to the ETSI norm "EN 302 217"[73], and/or any of its derivative documents, to set the standards for equipment class for the various Fixed Links Bands. DotEcon therefore recommends maintaining the current standards in respect of equipment class.

4.32 Having carefully considered DotEcon's recommendation regarding the minimum antenna class for each band, ComReg does not propose to make any changes to such.

Q. 8 ComReg seeks views of interested parties regarding the adjustments (if any) to the mandatory equipment class values listed in Annex 1 of Document 09/89R2. Please provide evidence and reasoning for your views.

4.8 Frequency designations at Fixed Link sites

4.33 All Fixed Links deployed in allocated frequency bands operate using Frequency Division Duplex ("FDD") technology. [74] Using FDD on Fixed Links requires one side of the Fixed Link to transmit using one frequency of the duplex pair. ComReg requires that Fixed Links using the same frequencies within a given radius ("high/low search radius") of each other either all transmit on a 'high' frequency or all transmit on a 'low' frequency. This is to avoid harmful interference between Fixed Links and ensures

[73] Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas: ETSI EN 302 217

[74] The 80 GHz band uses frequency division duplex (FDD) and time division duplex (TDD).

receivers are not subject to interference from transmitters at the same location.

4.34 Prior to submitting a Fixed Link application, applicants are required to consult the high/low database on ComReg's website[75] to ensure that their applications do not give rise to a 'high/low' designation conflict.

4.35 ComReg published its Fixed Links survey[76] in 2011 (ComReg document 12/10) in which it outlined that far-field approximation was used to calculate the high/low interference radius using equation 1 below:

Equation 1:

$$R \geq \frac{2D^2}{\lambda} \; or, since \; \lambda = \frac{v}{f}$$

$$=> R \geq 6.7.D^2.f$$

where D = diameter of antenna (meters), λ = wavelength, v = velocity ($3 * 10^8 m/s$), & f = frequency (GHz)

4.36 In 2012 ComReg published a further survey (Document 12/104[77]) and, on foot of same, reduced the high/low search radius for the 23 GHz and 26 GHz band. The high/low search radius table was updated in the ComReg guidelines published in 2013.[78]

DotEcon's review of the high/low search radius

4.37 Of the eight countries (UK, Switzerland, France, Czech Republic, Hungary, Portugal, Slovakia and Lithuania) benchmarked by DotEcon:

- one defines a protocol of not licensing links in conflict under no circumstance;
- one defines a protocol of not licensing links in conflict, licensing only under "special circumstances"; and
- seven do not set any explicit obligations with regards to the high/low designation conflict protocol.

4.38 In its report, DotEcon notes that both the UK and Switzerland apply a high/low search

[75] High/Low Database: https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/radio-links/high-low-database/

[76] Fixed Links Survey - ComReg Document 12/10: https://www.comreg.ie/publication/fixed-links-survey.

[77] Response to Survey and Decision – ComReg Document 12/104: https://www.comreg.ie/publication/response-to-survey-and-decision

[78] Guidelines to Applicants for Radio Links Licences – ComReg Document 09/89: https://www.comreg.ie/publication/guidelines-to-applicants-for-radio-links-licences

radius that is at least as large (and in some cases larger) than that employed by ComReg for the vast majority of the Fixed Link Bands, the only exception being the 80 GHz band in Switzerland.

4.39 DotEcon opines that given the very narrow beamwidth of Fixed Links in the 80 GHz band, interference between Fixed Link sites operating in the 80 GHz band seems very to occur. Consequently, ComReg could consider adjusting the high/low search radius in the guidelines for the 80 GHz band by either reducing it to 50m or even removing it entirely.

Q. 9 ComReg seeks views of interested parties regarding the radius values of the high/low search database, and in particular DotEcon's suggestion to reduce or remove the requirement for the 80 GHz band. Please provide evidence and reasoning for your views

4.9 Multi-Band Aggregation

4.40 Multi-Band Aggregation, also referred to as Band and Carrier Aggregation ("BCA"), is a technique whereby a higher frequency band fixed link is aggregated with a lower frequency band fixed link to create a single combined link through a single antenna. The combination of frequency bands under the same fixed link allows operators to run higher capacity links over longer distances than would otherwise be feasible if the bands were used individually. ComReg notes that both ETSI and CEPT have published reports regarding the Multi-Band Aggregation technique. [79] [80]

4.41 The main use cases applicable to Multi-Band Aggregation include:

- Channel aggregation in low microwave frequency bands (long-haul application);
- Channel aggregation in medium microwave frequency bands; and
- Channel aggregation in traditional microwave frequency bands and W-bands (E-Band).

4.42 DotEcon notes that there are no barriers in the guidelines that would prohibit the use of this technology. However, there are two matters worthy of attention if considering the introduction of Multi-Band Aggregation:

[79] ECC Report 320 – Guidelines on Band and Carrier Aggregation in fixed pointto-point systems – published 2 October 2020. https://docdb.cept.org/download/1439

[80] ETSI GR mWT 015 V1.1.1 (2017-11) – Frequency Bands and Carrier Aggregation Systems; Band and Carrier Aggregation. https://www.etsi.org/deliver/etsi_gr/mWT/001_099/015/01.01.01_60/gr_mWT015v010101p.pdf

- Link Availability; and
- Minimum link length

Link Availability

4.43 Most NRAs, ComReg included, require a specific link availability percentage.[81] When Multi-Band Aggregation is being used, it may not be feasible for the availability requirement to be met for the higher frequency band e.g., the 80 GHz band. DotEcon's suggests that an appropriate alternative approach might be to impose the availability requirement only on the lower band, while the higher band availability could be planned from an interference perspective.

Minimum Path Length

4.44 Most NRAs, and again including ComReg, define a minimum path length for each link, depending on the frequency range. Where Multi-Band Aggregation is being used, it would likely be over link lengths that are shorter than those typically operated as a single-band link in the lower frequency band. However, if the appropriate length of links using Multi-Band Aggregation falls below the minimum requirement for the lower band, those links might be unduly prohibited, and in such circumstances, it may be advisable to adjust the minimum link length requirements. DotEcon suggests that a suitable alternative approach might, for example, be to apply a minimum link length requirement for Fixed Links using Multi-Band Aggregation that falls somewhere between the minimums currently set for individual links in the higher band and the lower band.

4.45 DotEcon notes that adjustments might need to be made to the guidelines to accommodate Multi-Band Aggregation.

4.46 ComReg notes that CEPT Report 320 concludes that:

- Mandatory minimum link availability target in planning procedures:
  - The highest frequency band should be planned only from the interference point of view, while its availability should be considered as "best effort".
- Impact of an ATPC[82] range imposed in the licensing conditions:
  - It's expected that the highest frequency band will operate at its lowest

[81] As per Annex 2 of ComReg Document 09/89R2: https://www.comreg.ie/media/dlm_uploads/2017/06/ComReg-0989R2.pdf

[82] Automatic Transmit Power Control means the range of transmit attenuation is dynamically variable with the propagation effects.

modulation schemes and at its highest transmitter power level towards reaching its best, even if poor, availability level. A minimum ATPC range may be not applicable.

- Dual-Band antenna requirements:
    - Where dual band antennas are concerned, the characteristics of the antenna are expected to comply different ETSI classes for both bands.
- Minimum link length:
    - The lowest band considered in a Multi-Band Aggregation Fixed Link, may not respect the rule of some administrations in regard to the minimum link length. Exception for Multi-Band Aggregation may have to be considered when Multi-Band Aggregation is concerned.

Q. 10 ComReg seeks the views of interested parties regarding allowing the use of Multi-Band Aggregation and potential minimum link length requirements and minimum link availability targets. Please provide evidence and reasoning for your views.

4.10 Congestion Area and Bands

4.47 The current Fixed Links licensing framework stipulates that Fixed Links deployed in certain frequency bands within a specific geographic area are subject to a surcharge. This is intended to address congestion and encourage Fixed Links licensees to use alternative platforms in certain congested bands or areas. The Congested Frequency Band Area is defined in S.I. No. 370/2009[83] as:

- The 18 GHz Frequency Band (17.7 GHz to 19.7GHz); or the 23 GHz Frequency Band (22.0 GHz to 22.6 GHz and 23.0 GHz to 23.6 GHz); and
- The geographic area as defined by National Grid 3122 and 3123 (Ordnance Survey of Ireland). [84] A Radio Link is within this area when one or both of its' specified fixed points is located in this geographic area.

4.48 In its report, DotEcon notes that whilst there is plenty of spectrum in aggregate for Fixed Links, there is scarcity in particular bands and at particular locations, in particular the 11 GHz, 13 GHz, 15 GHz and 23 GHz bands in Dublin. Under the

[83] S.I. No. 370/2009 - Wireless Telegraphy (Radio Link Licence) Regulations, 2009: https://www.irishstatutebook.ie/eli/2009/si/370/made/en/print

[84] The Congested Area is a geographic area within the Dublin area in the range E310000 to E320000 and N220000 to N240000, or 53°13'9.44"N to 53°23'14.2"N and 6°21'14.2"W to 6°11'48.32"W

current approach, no new licences are assigned in the congestion areas within the 13 GHz and 15 GHz bands, whereas a congestion charge currently applies for links in the 18 GHz and 23 GHz band.

4.49 DotEcon observes that the current congestion surcharging is quite modest, adding only 20% of the corresponding uncongested fee. In DotEcon's view, the surcharge has had little impact on congestion, as the number of links in the 18 GHz and 23 GHz bands continues to unrestrainedly increase in the Dublin area. Furthermore, and while the bandwidth used in the 13 GHz and 15 GHz bands within the congestion area has reduced, DotEcon does not see this as sufficient evidence to conclude that scarcity in the bands is no longer an issue, given that:

- there is still high usage of the bands in the congested area, despite some fall in the number of licences;
- the fall in demand does not necessarily indicate that the bands are becoming less popular and that we do not need to be concerned about congestion, as the fact that no new links have been possible since 2014 means that we do not know how true demand has evolved (only that some pre-existing licensees have cancelled or not renewed some licences); and
- information received from stakeholders suggests that those bands are expected to continue to be important for links running from high sites into the centre of Dublin for the foreseeable future.

4.50 Therefore, DotEcon recommends that due to continued congestion in the Dublin area, the definition of Congested Frequency Band Area should be retained, and the 13 GHz and 15 GHz bands be reopened to applications and included in the definition, so they are also subject to a congestion charge. The Congested Frequency Band Area would be defined as follows:

- The 13 GHz Frequency Band (12.75 GHz to 13.25 GHz); the 15 GHz Frequency Band (14.5 GHz to 16.35 GHz); the 18 GHz Frequency Band (17.7 GHz to 19.7GHz); or the 23 GHz Frequency Band (22.0 GHz to 22.6 GHz and 23.0 GHz to 23.6 GHz); and
- The geographic area as defined by National Grid 3122 and 3123 (Ordnance Survey of Ireland). A Radio Link is within this area when one or both of its' specified fixed points is located in this geographic area.

4.51 Having carefully considered DotEcon's analysis and recommendations on congestion, ComReg is of the view that in acute congestion cases, the current charging structure does not reflect the scale of opportunity costs likely to be present. Therefore, and on foot of the DotEcon analysis, ComReg proposes to identify the geographic area as defined by National Grid 3122 and 3123 (Ordnance Survey of

Ireland) as a congested area with regard to the 13 GHz, 15 GHz, 18 GHz and 23 GHz bands. These bands would be subject to a congestion charge under the future licensing framework.

4.52 ComReg further proposes to recommence acceptance of new Fixed Link applications for the 13 GHz and 15 GHz bands within the congestion area. ComReg will continue to monitor congestion, and where it considers that congestion could become or is an issue, in this or other areas or frequencies, to give notice to interested parties prior to introducing any anti-congestion measures.

Congestion Monitoring

4.53 DotEcon outlines that while ComReg may set initial parameters for any proposed fee setting framework, it expects that ComReg would need to review the associated parameters periodically, say every 2-3 years, and make any adjustments deemed necessary in light of changes in demand or any other relevant factors.

4.54 Congestion charging is one of the parameters contained within ComReg's preferred option (Option 2) as outlined in ComReg's RIA which follows. In determining congestion, DotEcon has proposed using a geographical grid ("Grid Method") (as described in Annex C of the DotEcon Report), which provides an indication of spectrum availability.

4.55 The Grid Method estimates spectrum availability (congestion) by considering the number of unused channels in a given grid square of size assumed to be small enough that other links are unlikely to be able to use the same channel within that area. DotEcon notes that while this method is unlikely to be entirely precise in measuring congestion, it should nevertheless provide a valuable estimate of spectrum availability. It can therefore be used as a screening procedure to promptly identify any bands or areas where congestion might be developing.

4.56 ComReg is of the view that the Grid Method is an appropriate technique for determining congestion. ComReg proposes to utilise the Grid Method when monitoring for congestion and when reviewing congestion charging parameters in the future.

Q. 11 ComReg welcomes the views of interested parties regarding ComReg's proposal to:
a) identify the geographic area, as defined by National Grid 3122 and 3123, as a congested area, and the 13 GHz, 15 GHz, 18 GHz and 23 GHz bands within that geographic area, as being subject to a congestion surcharge as part of a future licensing framework; and
b) use the Grid Method to monitor congestion.

Please provide evidence and reasoning for your views.

Chapter 5

5 Draft RIA

5.1 Introduction

5.1 In November 2020, ComReg published a consultation[85] and associated DotEcon Report[86] containing its preliminary views on potential adjustments to the existing Fixed Links licensing framework. In relation to fees, ComReg observed that spectrum fees would continue to form a part of ensuring the optimal use of the Fixed Link frequencies. Further, ComReg noted there are a variety of methodologies that can be used to calculate applicable fees for Fixed Link Bands, and it would set out its views in relation to same in the next phase of this review. With that in mind, Annex 2 among other things described the potential methodologies available to ComReg in setting a fees framework for Fixed Links.

5.2 In that regard, this chapter sets out ComReg's draft Regulatory Impact Assessment ("RIA") on the procedure for setting spectrum fees for the Fixed Links Bands and provides ComReg's preferred option having regard to the impact on stakeholders, competition, and consumers. It concludes with an assessment of the Preferred Option against ComReg's statutory remit, including relevant functions, objectives, duties and principles (as outlined in Annex 4).

5.3 ComReg conducted this draft RIA having regard to the following:

- the first DotEcon Report (Document 20/109A);
- the second DotEcon Report (Document 21/134a)[87];
- the supporting Annexes (Annex 2 & Annex 3); and
    - the views of respondents to Document 20/109 and the stakeholder interview and information gathering conducted in 2020.[88]

[85] 'Review of the Fixed Radio Links Licensing Regime', Document 20/109, published 9th November 2020 Review of the Fixed Radio Links Licensing Regime | Commission for Communications Regulation (comreg.ie) Hereinafter referred to as "Document 20/109".

[86] 'Consultant's Report - Fixed Links Bands Review, Document 20/109A, published 9th November2020 Consultants Report – Fixed Links Bands Review | Commission for Communications Regulation (comreg.ie). Hereinafter referred to as "Document 20/109A".

[87] Document 21/134a

[88] See Annex B – Document 20/109A.

5.2 RIA Framework

5.4 A RIA is an analysis of the likely effect of proposed new regulation or regulatory change and, indeed, of whether regulation is necessary at all. The RIA should help identify regulatory options and establish whether the proposed regulation is likely to have the desired impact, having considered relevant alternatives and the impacts on stakeholders. The RIA is a structured approach to the development of policy and analyses the impact of regulatory options. In conducting a RIA, the aim is to ensure that all proposed measures are appropriate, effective, proportionate and justified.

5.5 A RIA should be carried out as early as possible in the assessment of regulatory options, where appropriate and feasible. The consideration of the regulatory impact facilitates the discussion of options and a RIA should therefore be integrated into the overall preliminary analysis. This is the approach which ComReg follows in this Consultation and this RIA should be read in conjunction with the overall Consultation. A RIA will be finalised in the final Decision arising from this Consultation, having taken into account responses to this Consultation.

5.6 In conducting the RIA, ComReg has regard to the RIA Guidelines[89], while recognising that regulation by way of issuing decisions, for example imposing obligations or specifying requirements in addition to promulgating secondary legislation, may be different to regulation exclusively by way of enacting primary or secondary legislation.

5.7 To ensure that a RIA is proportionate and does not become overly burdensome, a common sense approach is taken towards a RIA. As decisions are likely to vary in terms of their impact, if after initial investigation, a decision appears to have relatively low impact ComReg may carry out a lighter RIA in respect of that decision.

5.2.2 Structure for the RIA

5.8 In assessing the available regulatory options, ComReg's approach to the RIA is based on the following five steps:

- **Step 1**: describe the policy issue and identify the objectives;
- **Step 2**: identify and describe the regulatory options;
- **Step 3**: determine the likely impacts on stakeholders;
- **Step 4**: determine the likely impacts on competition; and

[89] Guidelines on ComReg's Approach to Regulatory Impact Assessmen – ComReg Document 07/56a - https://www.comreg.ie/publication/guidelines-on-comregs-approach-to-regulatory-impact-assessment

- **Step 5**: assess the likely impacts and choose the best option.

5.9 In the following sections, ComReg identifies the specific policy issues to be addressed and relevant objectives. (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.

5.2.3 Identification of stakeholders and approach to Steps 3 and 4

5.10 Step 3 assesses the likely impact of the proposed regulatory measures on stakeholders. Hence a necessary precursor is to identify such stakeholders.

5.11 In this RIA, stakeholders fall into two main groups:

I. Consumers (Impact on consumers is considered separately below); and

II. Industry stakeholders.

5.12 The industry stakeholders comprise the providers and users of Fixed Links for the relevant use cases, which include:

- Narrowband telemetry and control applications (Network Utility Operators e.g., in the Electricity, Gas and Water sectors);
- Broadcast distribution (Broadcasters);
- Backhaul from mobile cell sites (MNOs);
- Fixed wireless access (FWA operators, Local Government and Emergency services);
- Advanced FWA services in urban areas (FWA operators); and
- Specialist low latency links (e.g., for financial trading).

5.13 Step 4 assesses 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.

5.14 Of themselves, the RIA Guidelines and the RIA Ministerial Policy Direction provide[90] 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 statutory objectives in managing

[90] Ministerial Direction dated 21st February 2003

the radio frequency spectrum, as outlined in Annex 4, include:

- to promote competition[91];
- contribute to the development of the internal market[92];
- promote the interests of users within the Community[93];
- ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under Section 12 of the 2002 Act[94];
- Regulation 16(2)(a) which requires ComReg to promote efficient investment and innovation in new and enhanced networks[95];
- Regulation 19 of the Authorisation Regulations[96] permits ComReg to impose fees for rights of use, which reflect the need to ensure the optimal use of the radio frequency spectrum; and
- 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 electronic communications services 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

[91] Section 12 (1)(a)(i) of the 2002 Act.

[92] Section 12 (1)(a)(ii) of the 2002 Act.

[93] Section 12(1)(a)(iii) of the 2002 Act.

[94] Section 12(1)(b) of the 2002 Act.

[95] S.I. No. 333/2011 - European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011.

[96] European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (S.I. No. 335 of 2011).

accordance with Regulation 17(6).

5.15 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.

5.2.4 Step 1: Identify the policy issues & the objectives

Policy Issues

5.16 The spectrum available for Fixed Links is a finite resource with many different services and users, and the radio spectrum management of these resources involves the careful consideration of a broad range of factors (e.g., administrative, regulatory, social, economic, and technical) with a view to ensuring that radio spectrum is optimally and efficiently used.

5.17 This may also involve balancing a range of competing factors, including:

- appropriately meeting the requirements of all radio services, including commercial and public uses, such as public safety, national security, and health care; and
- promoting competition including ensuring that users derive maximum benefit in terms of price, choice, and quality, contributing to the development of the internal market, and promoting the interests of users within the Community.

5.18 ComReg also notes that, in achieving its objectives, it seeks to choose regulatory measures which maximise the benefits for consumers in terms of price, choice and quality. Effective spectrum management also requires flexibility and responsiveness to adapt to changes in, among other things, technologies, demand from spectrum users and end-users, market developments and public policy. In that regard, ComReg identifies two broad regulatory tools that are relevant in allowing it to effectively manage to radio spectrum being made available for Fixed Links:

A. Information Policy; and

B. Spectrum Fees.

A. Information Policy

5.19 In Document 20/109, ComReg observed that while spectrum fees will continue to

form a part of ensuring the optimal use of the Fixed Link frequencies, an appropriate information policy should also form a key part of any licensing. Indeed, ComReg is of the view that the information policy of the Fixed Links regime applications is likely to be central to ensuring that licensees make optimal decisions, particularly when installing or renewing links. In particular, ComReg's information policy should be viewed as complementary to the incentives provide by spectrum fees. That is, spectrum fees are likely to be less effective if licensees lack predictable information about a range of issues including, emerging scarcity in particular bands at particular locations and whether a given channel is in use within a radius of a proposed site before submitting an application.

5.20 In practice, achieving efficient use of the available bands depends on good information being available to users about emerging demand, allowing assessment of where congestion is likely to arise. Such information would allow operators to make informed and better network planning decisions, where possible avoiding clashes by moving towards bands less in demand. For example, depending on the rules used for the assignment of frequencies, this may allow a more efficient assignment of frequencies in cases where there are potential interference problems between neighbouring users of different technologies. Such information would also improve the efficiency of the application process.

5.21 In that regard, ComReg already provides useful information to licensees through the frequency band checker and its Fixed Links annual report. DotEcon recommends the following enhancements to same:

- the Frequency Band Usage Checker should help users to understand the current state of availability/congestion, and thereby speed up the application process by reducing the number of applications that cannot be accepted; and
- ComReg should consider refining the information it publishes regularly (e.g., data on rejected applications, or results of the proposed grid method for assessing spectrum availability), to improve the support to users with forming expectations on where congestion may emerge in the future.

B. Spectrum Fees

5.22 Regulation 19 of the Authorisation Regulations permits ComReg to impose fees for rights of use that reflect the need to ensure the optimal use of the radio frequency spectrum. In addition, ComReg is required to 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.

5.23 In that regard, the effective management of radio spectrum requires more than a purely technical consideration of spectrum efficiency and that functional and

economic considerations must also be considered, including the extent to which the utilisation of spectrum meets a user's specific needs and the social and economic value that can be derived from it. This is particularly relevant in the current case where there is a variety of different users, providing different services using different technologies based on existing licence conditions (including spectrum fees).

5.24 While there are various methods of determining the level of a licence fee some approaches (or a combination of same) are likely to be more suitable than others. ComReg does not envisage one particular approach being suitable to account for all of the various bands and associated uses, given that there are potentially quite different considerations for each band.

5.25 While there are various methods of determining the level of a licence fee some approaches (or a combination of same) are likely to be more suitable than others. ComReg's efficiency[97] objectives are typically supported using a market mechanism for assignment, such as a well-designed auction with prices set on the basis of opportunity cost, which can help to[98]:

- establish the efficient assignment of spectrum amongst bidders, based on bidders' willingness to pay (which can be expected to represent the economic value they are able to generate); and
- 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.

5.26 However, where rights of use across many bands are being made available for relatively short periods of time (e.g., annually renewable) an auction would not be practical. In such cases, ComReg must establish another methodology for establishing the fees to be charged that are in line with its objectives noting that the effectiveness of particular methodologies is constrained by the scope and quality of available data.

5.27 In that regard, the main policy issue to consider in this RIA is, in the context of its statutory objectives, how best to establish a licensing framework for the Fixed Links regime, including an appropriate fee schedule.

5.28 As set in Document 20/109, ComReg will be guided by the following factors:

[97] Section 12 (1) (b) of the 2002 Act.

[98] Use of a market mechanism also removes the burden on ComReg to make complex judgements (based on incomplete information) in relation to assigning the spectrum and the suitable level of fees, as it can better elicit relevant information about the value (and efficient assignment) of the spectrum that is likely not available to ComReg.

- Where excess demand exists or may exist in the future, an opportunity cost methodology (or proxy for same) may be appropriate in line with previous approaches; and

- An opportunity cost approach may not be suitable where spectrum is more freely available. In such cases, fees should incentivise potential users to assess its actual need for spectrum and select the most appropriate spectrum band from a range of alternatives.

5.29 ComReg notes that no respondent disagreed with such factors in response to Document 20/109.

Objectives

5.30 ComReg aims to design and carry out its review of the Fixed Links licensing regime in accordance with its broader statutory objectives (as outlined in Annex 4) including the promotion of competition in the electronic communications sector.

5.31 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.

5.32 In addition, the focus of this RIA is to assess the impact of the proposed measure(s) (see regulatory options below) on stakeholders, competition, and consumers. ComReg can then identify and implement the most appropriate and effective means by which to set spectrum fees for the Fixed Links Bands, while achieving its relevant statutory objectives under section 12 of the 2002 Act of promoting competition by, among other things:

- Encouraging efficient use and ensuring effective management of radio frequencies;

- 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;

- Contributing to the development of the internal market; and

- Promoting the interest of EU citizens.

5.33 ComReg notes that, in achieving its objectives, it seeks to choose regulatory measures which maximise the benefits for consumers in terms of price, choice and quality.

5.2.5 Step 2: Identify and describe the regulatory options

5.34 The existing Fixed Link licensing framework has been in place since 2009 and has supported a wide variety of use cases to the benefit of competition and consumers. ComReg will evaluate the existing Fixed Link regime as an option, given its utility to date, and also to fully understand the impact of any change from an alternative option. Therefore, ComReg notes that **Option 1 is to maintain the status quo** and extend the use of the existing Fixed Links licensing framework in the long run.

5.35 In relation to other options, and as set out in Section 4.5 of Document 20/109, ComReg observes that there is a variety of methodologies that could be used to calculate applicable fees for Fixed Link Bands. ComReg does not envisage one particular approach being suitable to account for all of the various bands and associated uses, given that there are potentially quite different considerations for each band. In that regard, and in order to identify potential options, ComReg assessed a variety of different methodologies in Annex 2 of this document.

5.36 In relation to the approach recommended by DotEcon (USPP as an AIP[99] proxy), this option sets fees that are reflective of opportunity cost which should encourage licensees to utilise the spectrum more efficiently, including incentivising the return of unused or underused spectrum. It seeks to achieve this in a practical and sensible way given the difficulties of estimating opportunity cost across a variety of different bands. As advised by DotEcon, this approach sets fees using a formula that seeks to proxy opportunity costs through a small number of parameters. The focus is largely on short run opportunity cost, where a surcharge applies for bands and areas where there is current congestion. However, the formula is designed to also reflect some of the structure of long-run opportunity cost, recognising that demand is increasing and that, even where there is no scarcity at present, there may be benefit in providing incentives for operators to organise themselves efficiently within the bands to avoid future congestion where possible.

5.37 Therefore, ComReg is of the preliminary view that the approach recommended by DotEcon (USPP as an AIP proxy) is clearly a valid regulatory option. This approach is considered as Option 2 for the remainder of this RIA. Option 2 is summarised below but set out in more detail in Annex 3 and Section 4.3 of the DotEcon Report.[100]

5.38 In Annex 2, ComReg also observed that it may be appropriate to consider administrative cost recovery as a regulatory option. As most Fixed Link Bands are uncongested, ComReg notes that a potential approach would be to assign rights of

[99] Universal System Performance Pricing ("USPP") as a proxy for Administrative Incentive Pricing.

[100] All remaining options assessed in Annex 2 are clearly inferior to Option 2, therefore the inclusion in this RIA would serve little purpose.

use on an administrative cost[101] basis for bands in areas that are not subject to congestion and apply an appropriate congestion charge for congested bands/areas[102].

5.39 Prior to setting out its view on whether an administrative cost recovery methodology is a valid regulatory option, ComReg provides the following background assessment:

I. First, ComReg assesses whether Fixed links are subject to potential scarcity.

II. Second, ComReg assesses the potential for significant migration from licence exempt bands into the Fixed Links Bands under an administrative cost recovery option.

III. Third, ComReg assesses the potential for increased spectrum hoarding incentives in the Fixed Link Bands under an administrative cost recovery option

I. **Fixed Links already subject to potential scarcity**

5.40 DotEcon and ComReg are currently of the understanding that congestion is relatively rare, primarily being an issue in the 13 GHz – 23 GHz bands in Dublin and between the city centre and a number of key sites to the south (e.g. Three Rock). Less than 1% of existing links fall into the congested bands in the congestion area as currently defined. However, congestion issues may well arise elsewhere in the future. As noted by DotEcon "*…this is not to say that congestion issues will not arise elsewhere in the future, in particular with ever increasing bandwidth requirements and the potential for fixed links to support fibre networks in rural areas*."[103] DotEcon also provide an initial assessment of scarcity in Annex C.2 of Document 20/109A which indicates potential for congestion across a number of bands in the Dublin congested area.

5.41 Due to congestion, ComReg previously suspended the acceptance of new Fixed Link Applications, in the 13 GHz and 15 GHz frequency bands in Dublin's city centre and the south of the city. During the stakeholder interviews concerns were raised by some Existing Licensees in relation to congestion.

- A number of licensees complained about congestion in specific bands in Dublin city centre and south; and
- A number of licensees expressed concern regarding future congestion in

[101] ComReg notes that the €100 per link referred to in the DotEcon Report and this consultation is based on administrative costs incurred under the current regime and would in any event be higher if an administrative charge was charged to all uncongested links due to the likely significant increased compliance costs imposed on ComReg as a result.

[102] Noting that any such congestion fees would likely be greater than those presently in effect.

[103] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p 81.

higher bands in Dublin.

5.42 Where congestion arises, efficiency requires that spectrum rights of use are assigned to those users that value them the most. If spectrum is licensed at below opportunity cost, then there may be some other party that would have been prepared to pay more for the right of use, but is being inefficiently denied access.

5.43 More generally, an effectively functioning fees framework should ensure that licensees are incentivised to use assigned rights of use as efficiently as possible, avoiding excessive spectrum use where alternatives are available that would cost the licensee less than the foregone value that excluded users could realise from that spectrum. Promoting efficient spectrum use ensures that the best use is made of a scarce resource and minimises the risk that access to spectrum becomes restricted due to inefficient or unnecessary congestion. With that in mind, it is important to assess the potential for congestion arising in the future and to put in place proportionate measures (e.g. reflecting long-run opportunity costs) to address the likelihood of same.

5.44 There is strong evidence that bandwidth requirements for Fixed Links are increasing. Further, the availability of alternative technologies (e.g., fibre) will not stop the general upward trend.[104] With that in mind, the following factors may have some relevance:

- Stakeholders have already noted that their demand for bandwidth is increasing, and raised the point that operators are restricted in the bandwidth they can access by means of the widest channel widths available in certain bands[105];
- Demand for links will not significantly decrease, and will likely even increase in some areas. For example, congestion issues may arise elsewhere outside Dublin. In particular, ComReg notes that:
    - bandwidth requirements are increasing, and there is potential for Fixed Links use cases to expand into previously unserved rural areas; and [106]
    - average link lengths are expected to decrease (e.g., as fibre presence expands, short microwave hops will be required to connect sites to a fibre node) so demand for higher frequencies (e.g., 80 GHz) will

[104] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See Page vi and Annex B.3.
[105] The licensing data is consistent with this view, with operators using the second polarisation to double capacity over a given link, especially when wide channels are unavailable (e.g. we note that increased use of dual polarisation links started earliest in the 11 GHz band, where the largest channels are only 40 MHz)
[106] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p90

increase. [107]

- Increasing bandwidth requirements are required to meet the need for faster speeds [108];
- An increase in capacity requirements and use of dual polarisation where wider channels are not available [109];
- Increased demand for higher frequency bands where channel spacing is typically higher; and
- 5G backhaul will contribute significantly to increased demand in the next few years. [110]

5.45 Further, the potential for increased congestion is not symmetric across bands and depends on network deployment across different use cases. For example:

- In bands up to 8 GHz, and although there does not appear to be any significant spectrum scarcity[111]some stakeholders opined that they have occasionally found it difficult to find an available link in certain bands,;
- There seems to be a consensus that there will be a growing demand for links in the 18 GHz and 23 GHz bands, in part due to the roll-out of multi- band technology solutions that allow for pairing these bands with higher frequency spectrum (e.g., in the 80 GHz band) to achieve high-capacity links over mid-range distances. Given the relatively high current use of these bands there is a risk of further congestion going forward[112];
- A number of stakeholders raised concerns that the E-band might soon become congested, particularly in urban areas. Others believe that there is sufficient spectrum available in the band to allay any imminent congestion concerns, further noting that the W-band is a potential alternative in the future if the 80 GHz band does become congested[113]; and
- Increased bandwidth usage is primarily driven by the MNOs and FWA operators. The trends for these user groups are qualitatively similar, and in both cases, there are rapid increases in bandwidth used, facilitated largely

[107] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p111
[108] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p109
[109] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p109
[110] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p112
[111] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p109.
[112] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p110.
[113] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p11.

at the moment, by increased use of the 80 GHz band.

5.46 Therefore, ComReg is of the preliminary view that the established trend of increasing bandwidth requirements increases the risk of potential scarcity in the future.

II. Migration from licence exempt

5.47 The Fixed Link licence exempt bands are currently composed of the 2.4 GHz, 5 GHz, 17 GHz, 24 GHz and 60 GHz Bands. The main use of licence exempt spectrum is in the 5 GHz, 17 GHz and 24 GHz bands which collectively have approximately 800 MHz bandwidth available.

Band	Bandwidth
2.4 GHz	83.5 MHz
5 GHz	355 MHz
17 GHz	200 MHz
24 GHz	250 MHz
60 GHz	14 GHz

Table 1: Licence Exempt Bands

5.48 Respondents to ComReg's RFI responses[114] noted that FWA links were the most common use case in the Fixed Links licence exempt bands, though there were also some fixed network links, corporate users, and telemetry applications. Most licence exempt links operate outside of the five cities[115] and in some cases outside regional towns. ComReg is aware that there are at least 20,000 FWA customers[116] using licence exempt spectrum in the 2.4 GHz and 5.8 GHz Bands.

5.49 Under this potential option, there is a risk that some or all operators that would ordinarily rely on use of licence exempt spectrum to satisfy existing and future requirements, would instead seek spectrum rights of use in the licensed bands, given the potential attractiveness of access to protection from other users and services at low cost. In effect, licence exempt users would be provided with the benefits of licensed spectrum rights of use which could create incentives to migrate to the Fixed

[114] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See Section 2.7,

[115] Certain licensees operate link(s) in the urban Dublin area (operating between Dublin and Three Rock Mountain).

[116] ComReg notes that this number of subscribers is likely conservative as it concerns residential users and licence exempt spectrum is also used to deliver FWA for businesses and schools. Further, ComReg note the views of respondents in Section 3.2.2 that the number of subscribers are under reported.

Link Bands.[117]

5.50 The precise impact in this regard is somewhat uncertain, in particular as the threat of a future congestion surcharge being applied if demand increases sharply should help to curtail such a response. However, ComReg is of the view that reducing the difference between the costs of licensed and licence exempt spectrum to such an extent would come with some risk of inefficient migration into the licensed bands and possible creation of unnecessary congestion.

5.51 This view is also informed by the RFI responses where it was shown that the operators who use licence exempt spectrum are most sensitive to price. In particular, DotEcon notes that:

"*operators' use of the licence exempt bands and their expressed opinion that licence fees limit use of the main fixed links bands suggests that the demand for other bands could increase significantly if licence fees were lower*."[118]

5.52 It is difficult to determine what frequencies licence exempt users would likely prefer in the event of migration because of the likely different characteristics of individual users. RFI responses suggest that if operators who rely on licence exempt spectrum had to move out of the 5 GHz band, they would consider the 80 GHz band where link lengths permit, or into neighbouring bands where they could achieve higher throughput.[119] However, they could also move into bands with similar propagation – noting that less spectrum is generally available in these band compared with higher frequencies.

5.53 Therefore, ComReg is of the view that there would be an increased risk of inefficient migration from the licence exempt bands[120] and migration patterns would be largely unpredictable and primarily concern the provision of fixed wireless in rural areas.

III. Increased incentives for spectrum hoarding

5.54 Spectrum hoarding can be defined as acquiring or retaining frequencies with a zero

[117] ComReg also notes that the availability of more advanced equipment in the future will allow licensees to utilise greater bandwidth as existing legacy equipment is limited by the bandwidth it can operate at.
[118] See Document 20/109A page 34
[119] See Document 20/109A page 34
[120] ComReg notes that because equipment is typically tuneable within a given band, or sub-band, but not really across different bands, such a process would not occur at once and would instead occur over a period of time. However, as noted from the stakeholder engagement (See Annex B5 of Document 20/109A) - the asset life of the equipment is not a key driver of when equipment is replaced (i.e., replacement of links is driven by end user demand); therefore, some migration may happen sooner. Further, any new links whether from existing license exempt users or new entrants would likely be located in the Fixed Link Bands when license exempt spectrum would have been used if the Fixed Link Bands were subject to more appropriate pricing.

or low expectation of efficient use. Spectrum hoarding can come in different forms[121]:

- Anti-competitive hoarding involves the accumulation of rights of use for strategic reasons to prevent potential competitors acquiring sufficient rights of use to compete downstream[122]. (See Section 5.7 below);
- Inefficient hoarding occurs where licensees obtain more spectrum than necessary because the cost of holding it is low (See paragraph 5.147 – 5.154 below); and
- Speculative hoarding is undertaken with the purpose of reselling for a higher value in the future (though this is primarily an issue for long-lived licences).

5.55 Under the proposed option, relative to the status quo licensees would have a stronger incentive to hoard spectrum inefficiently or anti-competitively[123] because the cost of holding those rights of use reduces significantly. The potential for ComReg to introduce a congestion charge may help to reduce the risk of operators creating artificial congestion through hoarding. However, there could still be scope for inefficient or anti-competitive hoarding up to the point at which congestion charging appears to be a real threat (e.g., in between ComReg's regular reviews).

5.56 Given the relevant background information discussed under I, II and II. ComReg is of the view that fixed links are already subject to potential scarcity in the future and an administrative cost recovery option would likely lead to increased usage and more widespread congestion in the future than is currently the case.

5.57 ComReg now considers whether an administrative approach described above is a valid regulatory option.

ComReg assessment of administrative approach

5.58 Based on the information before it, ComReg is of the preliminary view that administrative cost recovery is not a valid regulatory option in the context of ComReg's statutory framework and is unlikely to be objectively justified and proportionate (compared to the current framework) as required by Regulation 15 of

[121] In all cases, hoarding restricts the supply of scarce spectrum resources to the rest of the market for its intended use. This results in the underutilisation of spectrum, to the detriment of other operators, competition and ultimately of consumers.

[122] ComReg also observes that the notion of anticompetitive spectrum hoarding can be better understood by reference to recital 122 of the EECC which provides: "In order to avoid the creation of barriers to market entry, namely through anti-competitive hoarding, enforcement of conditions attached to radio spectrum rights by Member States should be effective…" and Recital 133, which provides: "National competent authorities should, however, always ensure the effective and efficient use of radio spectrum and avoid distortion of competition through anti-competitive hoarding".

[123] Speculative hoarding is unlikely to be relevant and is not considered further in this consultation because fixed links rights of use are annually renewable and cannot be traded in secondary markets.

the Authorisation Regulations. Factors informing this view are outlined below.

5.59 **First**, the proposed option would not accord with the objective of promoting competition because, among other things:

- Such an approach would be highly unlikely to encourage the efficient management and use of the radio spectrum as required under Section 12 of the Act because:
    - it fails to take account of the different characteristics (e.g., propagation and capacity) of each of the Fixed Links Bands. For example, DotEcon does not recommend this type of administrative approach, "*as some differential should be maintained between higher and lower frequency bands to avoid lower frequencies being filled by users who could easily use higher frequencies, precluding lower bands to users who need their propagation advantages*".[124]
    - It fails to account for potential scarcity in the future and that there could be an opportunity cost to a new licence even if there is no current scarcity in that band, as given long equipment lifetimes, the new fixed link may to be in place for many years and scarcity may emerge over that lifetime. [125]
    - There are no incentives to choose bandwidth that is in line with actual requirements, and it would likely increase the incentives for inefficient hoarding of spectrum because the cost of holding additional spectrum would be low.
    - It would potentially lead to increased congestion and even the creation of new congestion areas across the state due to an increase in number of links and associated bandwidth resulting from risk of migration from the licence exempt bands and hoarding, as described above.
    - Licence exempt spectrum which is currently used in the delivery of services by operators (that are effective in managing interference) could become unnecessarily underused and the future use of these bands would need to be considered.
- There would be an increased risk of distortion or restriction of competition to the detriment of users because licensees would have stronger incentives for

[124] Page 34, Document 21/134a.
[125] Document 21/YY, p12

anti-competitive and inefficient hoarding[126] as the cost of holding those rights of use reduces significantly and licensees may hoard spectrum in bands most suited to competitors.

5.60 **Second**, creating the conditions for promoting efficient investment and innovation in new and enhanced infrastructures involves ComReg exercising its regulatory functions in an appropriate and predictable fashion, thus providing regulatory certainty. As noted by DotEcon, "*it is important that fees for Fixed Links are predictable, if ComReg is to encourage efficient investment. Otherwise, it could create a hold up problem, where investment is avoided because of highly uncertain and potentially large future fees (which operators cannot easily avoid by moving to other bands or alternative technologies such as fibre once equipment is installed)*."[127]

5.61 Under an administrative cost approach, a new licensing framework would likely be required after a short period to account for changes in demand for the Fixed Links Bands as described above. For example:

- ComReg may need to consider whether permitting licensees to renew rights of use annually in the context of increasing levels of congestion is appropriate[128], which may require a future reassignment and a transition process; and

- In the absence of fees being effective in reducing incentives for spectrum hoarding, and pursuant to Regulation 17(10), ComReg may need to consider introducing rules in relation to spectrum hoarding and include specific rollout conditions for all Fixed Link licensees which would be reported to ComReg on an annual basis and prior to any decision to renew rights of use. Such rollout conditions could impose significant costs on licensees but may be required in the absence of an effectively function fees framework.

5.62 Considering the above, licensees would have no certainty on whether such a licensing framework and associated fees (e.g., €100 per link) would be retained over a sufficiently long period. Any investment undertaken under this proposed option would likely become inefficient in the event of a new framework being introduced..

5.63 **Third**, as set out under Option 1 below, there is no evidence that existing fees have choked off efficient demand. On the contrary, the Fixed Links regime has largely flourished, and users have benefitted from the general availability of spectrum rights

[126] For example, ERG-RSPG report on the management of radio spectrum in order to avoid anticompetitive hoarding notes that:
"*Under an administrative spectrum management regime, where spectrum usage rights are distributed according to a first-come-first-served principle and the administrative charges are low, the incentives to hoard could be expected to be rather high*."

[127] Page 47, 21/134a.

[128] Such issues create concerns around asymmetric access to the spectrum and spectrum hoarding.

of use and have been successful in delivering services across a range of use cases. In that regard, the existing fee schedule provides ComReg with reliable information about the level at which fees would not choke off efficient demand and fees do not need to be set excessively low (increasing hoarding possibilities) to avoid such risks.

5.64 **Fourth**, ComReg notes that such an approach would significantly undermine ComReg's spectrum management function by reducing its ability to manage the risks created by an inefficient framework. For example, under administrative cost pricing ComReg would be prevented from implementing a frequency gradient, potentially resulting in hoarding, producing scarcity in higher/lower frequencies in new areas. As noted above, an effectively functioning fees framework should ensure that licensees are incentivised to use assigned rights of use as efficiently as possible, avoiding excessive spectrum use where alternatives are available that would cost the licensee less than the foregone value that excluded users could realise from that spectrum.

5.65 Accordingly, considering the above and based on the information currently before it, ComReg is of the preliminary view that an administrative cost recovery should not be included as an option in the draft RIA.

5.66 Considering the preceding discussion and taking into consideration information provided in submissions in response to Document 20/109, Document 20/109A, ComReg considers that the following two regulatory options are available to it.

Option 1 – Make available for assignment all rights of use to the Fixed Link Bands on the same basis as the schedule of Fixed Link licence fees taken from Part 2 of the 2009 Regulations.

5.67 Under Option 1 the existing fee schedule would continue to apply. In assessing this option ComReg also considers small changes that could be made to the existing regime (e.g., CPI existing fees).[129]

Option 2 – Make available all rights of use to the Fixed Link Bands using a USPP (as an AIP proxy) approach that sets fees for all bands using a formula. The approach would be introduced gradually over a three-year period[130] and include the following elements:

[129] Existing fees are currently not indexed to inflation – therefore a potential option would be the indexing existing fees to CPI. However, such a change can be assessed under Option 1 and avoids the need for unnecessary repetition on the impacts of a particular option.

[130] With 3-year phasing:

- 1/3 weight to new prices and 2/3 to old prices in year 1;
- 2/3 weight to new prices and 1/3 to old prices in year 2; and
- new prices from year 3.

- A base price per MHz;
- A schedule of band specific values that determine the relative value difference between upper and lower frequencies;
- a 'typical bandwidth', for each band which reflects the most common channel size used or likely to be used within that band;
- a 'small link gradient that applies to links with a channel size smaller than the typical bandwidth for the band;
- a congestion charge; and
- an administrative cost floor below which prices cannot fall.

5.68 This option would be subject to a 3 – 5 year review and ComReg also seeks views from stakeholders on an appropriate timeframe for such a review. ComReg would be minded to hold the initial review 3 years following the full implementation of this Option.

5.69 A more detailed explanation of Option 2 and the variables attached to same is set out in Annex 3, and Section 4 of Document 21/134a. ComReg also notes that an Assessment Tool is also available for existing Fixed Link licensees to assess the extent to which fees would change in response to this option (See Section 6 also).

Q. 12 ComReg seeks views from stakeholders on when the proposed new framework should be reviewed (within a 3 to 5 year period from any Decision).

5.2.6 Steps 3 and 4: Impact on industry stakeholders, competition, and consumers

Identification of stakeholders

5.70 Step 3 assesses the likely impact of the proposed regulatory measures on stakeholders. Hence a necessary precursor is to identify such stakeholders who, in this RIA, fall into two main groups:

I. industry stakeholders as described above; and

II. competition and consumers.

5.71 ComReg sets out below a comparative analysis of each of the three options regarding pricing outlined above, in terms of their impact on stakeholders, competition and consumers.

5.72 For the purposes of the assessment below, stakeholders are categorised broadly

into existing Fixed Links licensees (“Existing Licensees") and future and potential holders of Fixed Links.[131]

5.73 ComReg considers this to be the more useful than to examine each user case given that outcomes are more dependent on the attributes of the licensee and their requirements and not the use case itself.

Impact on industry stakeholders

5.74 This section provides information on the impacts on industry stakeholders (as outlined above) arising from the regulatory options above.

5.75 ComReg notes that there are two broad categories of impacts relevant in this section:

- **First**, the impact of the regulatory option on spectrum fees paid by Existing Licensees or would be paid by future licensees (i.e., “Financial Impacts”); and
- **Second,** the impacts arising from how rights of use are assigned in each of the regulatory options (i.e., “Assignment Impacts”).

5.76 In relation to the Financial Impacts, ComReg notes that any changes to the existing fees have the potential to impact stakeholders in different ways such that some stakeholders may pay more, or less, compared to fees currently paid for similar spectrum rights of use.

5.77 Relatedly[132], and regarding Assignment Impacts, the preferred option should better incentivise the efficient assignment of spectrum rights of use such that an appropriate charging structure should create incentives for the installation of new links in the future).

5.78 ComReg assesses Financial Impacts and the Assignment Impacts on stakeholders in turn below.[133]

5.3 Financial Impacts

5.79 In order to assess the financial impact of Option 2 on Existing Licensees, ComReg has conducted a comparative analysis of the fees paid by those Licensees compared

[131] This may include entrants based in the State, in other Member States or further afield that providing innovative new services such as the Potential Use Cases, international providers of services in existing use cases wishing to operate in the State or even existing users that wish to enter into the provision of services in other Existing Use Cases.
[132] ComReg notes that fee’s impacts refer to a static analysis where licensees are assigned the same rights of use. However, it possible, even likely, that licensees will consider alternative bands or amounts of spectrum across different areas in response to ComReg’s proposed changes.
[133] These assessments are not provided in any particular order and the issues they address can overlap.

to Option 1. The assessment that follows is necessarily static (i.e., it is based on existing Fixed Link deployment[134]) and is conducted to highlight possible impacts, noting that final fees paid by Existing Licensees would depend on choices made by those licensees in determining how to dimension their networks in the future.

5.80 ComReg considers this to be a conservative approach to estimating the impact of Option 2 on Existing Licensees because it assumes that operators would continue to use existing rights of use in the same way (which may not be the case in practice). For example, Existing Licensees may rationalise or change their use of Fixed Links under Option 2. This could arise due to licensees substituting between bands in response to changes in the relative prices, or from rationalising on other rateable factors such as bandwidth in response to higher price.

5.81 ComReg notes that equipment is generally only tuneable across a small range of frequencies and some rationalisation could occur over the short run – however any significant reorganisation would likely be linked to equipment being replaced as part of its natural life cycle. However, there is likely to be more flexibility for certain operators. For example, the stakeholder interviews and RFI observed that the asset life of the equipment is not a key driver of when it is replaced (i.e., replacement of links is driven by end user demand). [135]

5.82 Under Option 2, the total fees paid by Existing Licensees would be broadly neutral, increasing by just €0.37 million annually compared to Option 1. Of course, these changes vary across the licensees. Consequently, the overall increase is composed of a range of increases and decreases depending on how those licensees currently deploy existing rights of uses (i.e., bands, bandwidth, location).

5.83 Therefore, while the impact on stakeholders overall is broadly neutral, some licensees would experience a decrease in fees while others would experience an increase. It is not possible to outline each of these impacts individually, given the confidential nature of the matter. However, ComReg would note that any increase or decrease is modest (either in % or absolute terms), and licensees can assess those impacts using the Assessment Tool provided as part of this consultation.

5.84 It is notable that the variation in fees is not contingent on the stakeholder group (e.g., MNOs/FWA Operators); indeed one finds that there are variations within stakeholder groups. Rather, the differentiating factor is how licensees have chosen to dimension their networks and the Fixed Link Bands on which they have relied. In that regard, an assessment of the financial impact according to particular stakeholder groups is unlikely to be informative.

5.85 With that in mind, the remainder of this section assesses the financial impact on fees

[134] This assessment is based on licensing data as of 1 November 2021.
[135] Document 20/109A - Annex B5.

in two parts:

- The first part assesses how fees vary (increase or decrease) across both options. (“Fee Variations”); and
- The second part provides an assessment of why fees vary across both options and the key factors driving same. (“Key Factors Driving Fee Variations”).

5.86 Stakeholders should carefully consider the reasons why fees may increase or decrease as this should help to inform any future considerations it might have in dimensioning their network and help mitigate any increases in fees in particular bands or areas.

Fee Variations

5.87 As noted above, while Option 2 is broadly neutral, the overall 3.8% fee increase reflects a re-weighting based on the individual characteristics of each Fixed Link. At a high-level therefore, the change in fees represents a change in the composition of fees paid. This necessarily implies different impacts to stakeholders given the heterogenous nature of Fixed Links and how licensees have deployed their networks.

5.88 As noted by DotEcon, “*some licences will see increases, but others decreases in fees. For many classes of user, these changes will largely net out. Therefore, the proposed pricing formula is largely a restructuring of fees, rather than a general shift in level. In any case, we propose that changes are phased in over three years*”. [136]

5.89 Under Option 2, 51% of Existing Licensees that would pay lower fees[137]. It is important to note that any overall reduction in a licensee’s Fixed Link fees would arise because of a reduction in uncongested fees[138]. Under Option 2 uncongested Fixed Links would become less expensive, with the median[139] fee decreasing from €1,125 under Option 1 to €947 under Option 2 (across approx. 10,000 Fixed Links).

5.90 Under Option 1 fees for uncongested links are capped at €1,500 per link. However, fees per uncongested link tend to be higher compared to Option 2 because more fees are distributed closer to the cap. Under Option 1, there are a large number of uncongested links (i.e., circa 5,700) priced above €1,000.) and heavily weighted in the €1,000 to €1,400 range.

[136] Document 21/YY, p11.

[137] Assuming there was no change in the current use of fixed links i.e. this is a static comparison.

[138] All congested fees increase (see congestion charges below).

[139] In statistics and probability theory, the median is the value separating the higher half from the lower half of a data sample, a population, or a probability distribution. For a data set, it may be thought of as "the middle" value. The median value may be appropriate than an average when comparing distributions as it is less sensitive to outliers.

5.91 Under Option 2, fees are not capped as the fee logically increases in proportion to the bandwidth used. However, based on existing Fixed Links, there is a more even spread of fees across all price ranges (particularly those below €1,000). For example, there are approximately 5,500 Fixed Links with fees under €1,000 per link and 4,900 Fixed Links with fees above €1,000 per link (approximately 800 links are above the €1,500 cap under Option 1).

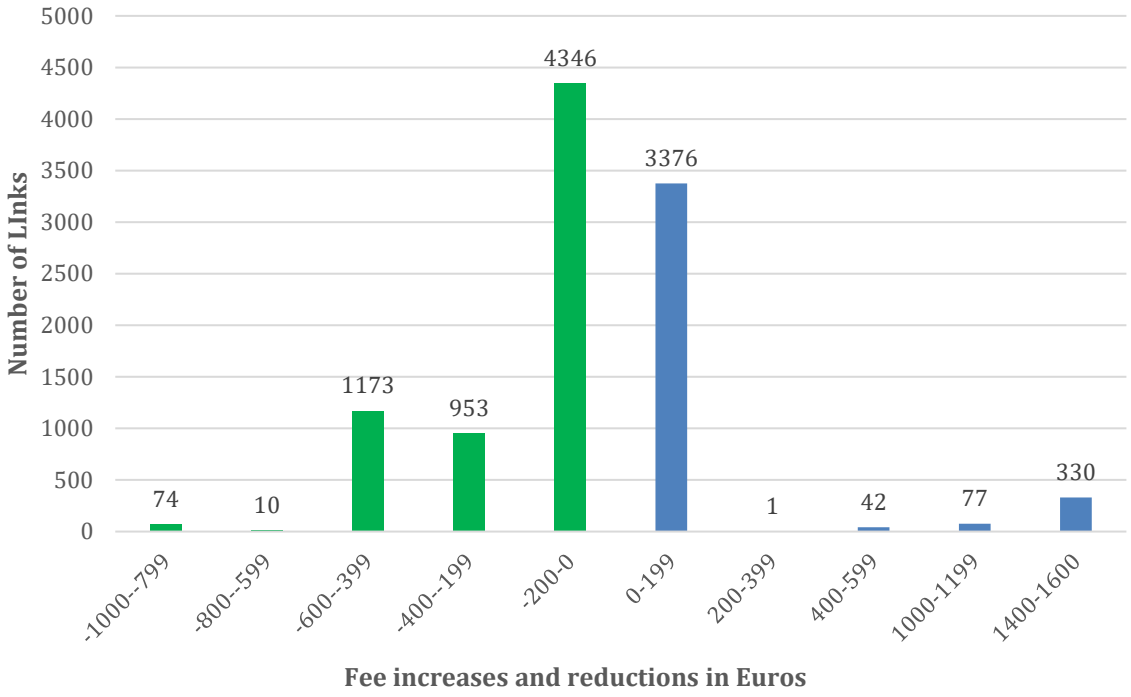

Figure 2: Fee increases and reductions under Option 2

5.92 Figure 2 illustrates the distribution of fee variations under Option 2 compared to Option 1. The fees for approximately 6,500 uncongested links would reduce, with most reductions in the €0 - €600 range. For licensees that use the typical bandwidth[140], uncongested fees per link would be lower under Option 2 and only marginally higher in the case of 13 GHz and 18 GHz links.

5.93 On the other hand, around 3,800 uncongested links would experience an increase, around 88% of which are in the €0 - €200 range. As noted below ('Charging for increasing bandwidth) the reason for certain uncongested links increasing compared to Option 1 primarily relates to the bandwidth used for those links (i.e., under Option 1 fees do not increase proportional to bandwidth used and not at all after 40 MHz). See section 5.6 (Spectrum management and efficiency) below for a further discussion.

[140] This reflects the most common channel size used within a band (e.g., 28 MHz is the most common bandwidth used by Existing Licensees in the 13 GHz Band)

Band	No. of Links	Average Change (%)
1.3/1.4	29	-90.0%
1.3/1.5	42	-90.0%
2.0/2.3	16	-54.3%
L6	84	-14.5%
U6	99	13.3%
L7	7	-52.2%
U7	170	-22.3%
L8	179	-18.7%
U8	3	-80.5%
11	1146	-0.2%
13	984	3.2%
15	1171	-2.3%
18	1903	44.4%
23	1231	12.0%
26	95	-49.8%
28	358	-28.2%
38	1072	-69.1%
42	35	-24.2%
80 GHz	2116	14.5%

Table 2: Average change in fees per band

5.94 Under Option 2, as described in Table 2, 14 of the 18 existing bands would experience a reduction in Fixed Link fees on average[141]. However, the extent to which an existing licensee's fees increase depends on the bands in which it operates currently. Licensees whose fees are increasing are primarily located in the 18 GHz and 23 GHz bands where average change is between 12 – 44%. However, as previously discussed because the bands form a chain of substitutes there is scope for Existing Licensees (over different periods of time) to switch many Fixed Links out of bands with higher fees into bands with lower fees.

5.95 Licensees whose fees would reduce under Option 2 would likely prefer that Option over Option 1. Such stakeholders would benefit from reduced fees if existing rights of use were retained. Further, such stakeholders may also decide to reconsider how its Fixed Links are deployed such that the required connectivity can be delivered more cost effectively by moving out of congested bands/ migrating to higher frequency bands etc.)

5.96 Existing Licensees whose fees would decline are likely to have two main concerns:

- Under Option 2, Fixed Links would no longer be capped at €1,500 resulting in some higher fees for Fixed Links that Existing Licensees may require in

[141] This is the average of all changes across fixed links fees in their respective bands, under Option 2.

the future [142]; and

- To the extent such licensees required rights of use (or additional rights of use) in congested areas in the future, they would face higher fees for same.

5.97 However, such concerns (were they to arise) are clearly manageable given the incentives provided by Option 2 and licensees will be able to calculate the most cost-effective approach to deploying such links.

Key Factors Driving Fee Variations

5.98 Under Option 2, ComReg notes that there are three key factors informing any variation in fees, and in particular fee increases relative to Option 1:

1. Bands assigned;
2. Bandwidth assigned (specifically above 40 MHz); and
3. Congestion charges.

1. Bands Assigned

5.99 As set out in Table 2 above, five bands would experience a fee increase under Option 2 relative to Option 1:

- the upper 6 GHz - 13% increase;
- 13 GHz - 3% increase;
- 18 GHz - 44% increase;
- 23 GHz – 12% increase; and
- 80 GHz - 15% increase.

5.100 The most impacted Existing Licensees are those who would experience an increase in fees of greater than or equal to 10% (of existing fees) and/or an increase of greater than €10,000 under Option 2. The change in fees that would be paid among these licensees is driven largely by their links which exceed 40 MHz bandwidth[143] particularly in the 18 GHz[144] and to a lesser degree 23 GHz bands. In that regard,

[142] Under Option 2, fees for uncongested fixed links would have a greater variance, with a significant number of fixed links becoming more expensive (fatter tails to the right of the distribution).
[143] Under the existing fee schedule an otherwise identical Fixed Link of 40 MHz or 120 MHz would have the same fee - the additional 80 MHz was in effect free. Under the proposed fee model this Fixed Link would now be more expensive, with the fee rising in proportion to the bandwidth.
[144] ComReg notes that the increase in fees in the 18 GHz Band is driven by changes in how additional bandwidth is charged.

ComReg notes that the key driver of fee increases for Existing Licensees under Option 2 is that the incremental charge for additional bandwidth above 40 MHz is no longer zero. (See "Charging for increasing bandwidth below).

2. Bandwidths

5.101 ComReg estimates that under Option 2, links with bandwidth exceeding 40 MHz (c. 5,500 Fixed Links) would account for approximately 24% of total fees.[145] This is roughly commensurate with its share of total bandwidth, noting that under Option 1 the additional bandwidth above 40 MHz did not account for any fees paid. This clearly raises the need for measures to address the lack of charging for additional bandwidth considering the ever-increasing demand for bandwidth.

5.102 Table 3 shows the average fee under Option 1 and Option 2 for the typical bandwidth within each band. In short, fees reduce for the vast majority of bands where the most typical bandwidth is used by licensees

Average change in fees per band			
Bands	**Typical Bandwidth**	**Option 1**	**Option 2**
L6	29.65	€1,200	€1,026
L7	14	€1,100	€470
L8	29.65	€1,200	€976
U6	40	€1,200	€1,362
U7	28	€1,200	€932
U8	7	€1,100	€228
1.3/1.5	1	€1,000	€100
1.3/1.4	0.5	€1,000	€100
2.0/2.3	14	€1,100	€537
11	40	€1,200	€1,197
13	56	€1,500	€1,582
15	56	€1,500	€1,482
18	55	€1,125	€1,263
23	56	€1,125	€1,072
26	28	€900	€456
28	56	€1,125	€765
38	56	€825	€268
42	56	€150	€100
80 GHz	500	€150	€163

Table 3: Average change in fees for typical bandwidth

[145] To estimate this ComReg examined the fees for existing Fixed Links under the new fee model, with and without bandwidths capped at 40 MHz.

5.103 Fees for most uncongested bands increase compared to Option 1 in scenarios only where licensees require additional bandwidth above that typically used in the band. Above that typical bandwidth, fees increase in proportion to the bandwidth used.

5.104 Licensees that require additional bandwidth currently only require double the bandwidth for all bands except the 80 GHz Band[146] (i.e., in practice fees do not increase in perpetuity because there are limits on the requirements licensees have and on what equipment can deliver in practice). Further, only 7% of links have bandwidth above the typical bandwidth with over 80% of those links in the 18 GHz and 80 GHz bands. Therefore, and by definition, the vast majority of fees are captured under the typical bandwidth categorisation and the fees described in Table 3 above.

5.105 ComReg also notes that for lower typical bandwidths (i.e., 14 MHz and lower), under Option 2, fee increases above that bandwidth can be relatively modest because existing fees under Option 1 are relatively high for lower bandwidth categories to begin with. For example:

- In In the 1.3 – 1.5 GHz Bands, a licensee requiring the typical bandwidth of 1 MHz, under Option 2, would pay €100 compared to €1,000 under Option 1. For double the bandwidth, fees under Option 2 increase to €200 compared to €1,000 under Option 1; and
- In the lower 7 GHz Band, a licensee requiring the typical bandwidth of 14 MHz, under Option 2, would pay €470 compared to €1,100 under Option 1. For double the bandwidth, fees under Option 2 increase by to €940 compared to €1,200 under Option 1.

3. Congestion charges

5.106 The number of links (and associated licensees) which would require a congestion charge is relatively small (c. 358 Fixed Links and 27 licensees) and this congestion premium would account for just 7% of total fees[147], noting that under the existing fee regime congestion charge accounts for <1% of total fees

5.107 Under Option 2, congested Fixed Links would become more expensive, with the median fee increasing from €1,080 to €2,841 (across approx. 350 Fixed Links with an average increase of €1,805 per link). There is also a greater spread of fees above €1,700. The left-hand side of Figure 3 provides some rational for the ineffectiveness of the existing congestion charges, with those charges under Option 1 weighted too

[146] Currently, Existing Licensees only use double the typical bandwidth where additional bandwidth is required. Only the 80 GHz band, has links with triple or quadruple the typical bandwidth. It should also be noted that the price per typical bandwidth in the 80 GHz band is low.

[147] To estimate this, ComReg examined the fees for existing Fixed Links under the new fee model, with and without congestion charges.

heavily in the €900 - €1,100 range.

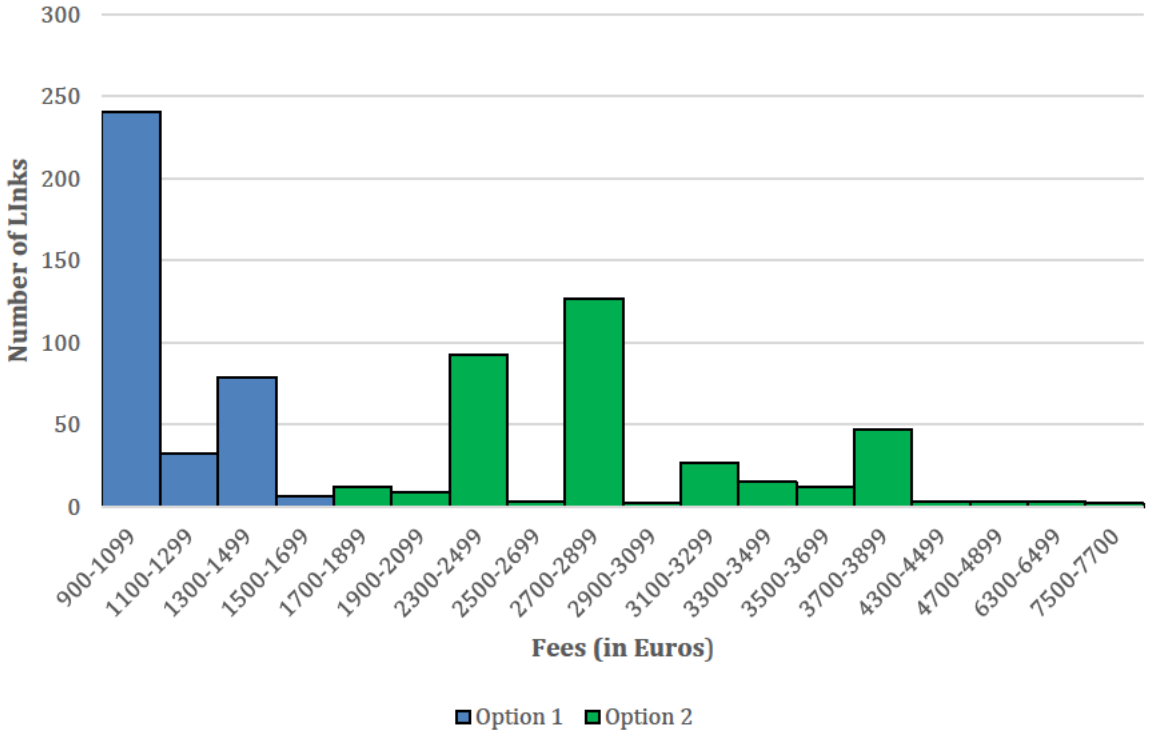

Figure 3: Distribution of Congested Links

5.108 Therefore, while stakeholders that would experience an increase in fees are likely to prefer Option 1 over Option 2, such stakeholders may also welcome the flexibility provided by Option 2 noting that the vast majority of links are uncongested and fees for such links are typically lower, as described above.

Conclusion on stakeholder Impact

5.109 The impact of Option 1 is neutral on all stakeholders because this is the status quo option.

5.110 The extent to which Existing Licensees may prefer either Option 1 or Option 2 depends on a number of factors including the level of fees and the extent to which such licensees would prefer additional flexibility:

- 51% of licensees would pay lower fees and would **likely prefer Option 2** because of these reductions[148]. Further, such licensees may be able to reduce their fees further by re-dimensioning their network by migrating into bands and bandwidth where fees are lower; and

[148] For licensees that use the most common bandwidth, uncongested fees per link will be lower under Option 2 (marginally higher in 13 and 18 GHz links).

- 49% of licensees would pay higher fees and would thus **likely prefer Option 1.** However, because increases are relatively modest such licensees **may prefer Option 2** because it may be possible to reduce fees by re-dimensioning the network by migrating into bands where fees are lower. In particular:
    - Fees for uncongested links primarily increase where bandwidth requirements are above common bandwidths of 28 MHz or higher.
    - The combination of bandwidth above 40 MHz in the bands between 17 GHz and 37 GHz is where fees under Option 2 are highest compared to Option 1.
    - This increase is driven primarily by links in the 18 GHz and to a lesser degree the 23 GHz band, that exceed 40 MHz in bandwidth.

5.111 New licensees are **likely to prefer Option 2** because fees decrease for most links and new licensees can dimension their networks from the outset in line with the incentives provided by that option. New licensees will benefit from the fact that primary focus of Option 2 is on the incentive potential an appropriate charging structure creates for the installation of new links.[149] Such licensees will be able to choose the most cost- effective combination of bands and bandwidth that best meet its link length and bandwidth requirements.

5.112 Under Option 1, new licensees would be faced with uncertainty about whether that framework would persist in the long run and may delay investment decisions and ultimately entry. Further, because Option 2 is more likely to prevent congestion issues arising, it is significantly more likely that spectrum will be available when a new licensee requires it. Alternatively, under Option 1 a new licensee may have to choose a sub-optimal combination of bands and bandwidth because of congestions in certain bands and areas that would not exist under a more efficient option.

5.4 Assignment Impacts

5.113 Assignment Impacts refer to the nature and quantum of spectrum rights of use to be assigned to licensees. The choice of preferred option can impact an operator's ability to obtain the rights of use necessary to satisfy efficient demand and deliver one or more use cases. ComReg assesses the Assignment Impacts under the following headings:

I. Efficiency and congestion;

[149] Page 31, Document 21/134a

II. Simplicity; and

III. Stable and predictable fees.

5.114 ComReg notes that there is overlap between some of the items discussed in this section and other areas of the consultation. To avoid repetition, ComReg, where appropriate, will refer readers to the relevant sections.

I. Efficiency and Congestion

5.115 As outlined in 'Charging for increasing bandwidth' below, ComReg is of the preliminary view that increased bandwidth requirements increase the risk of potential scarcity in the future. This creates Assignment Impacts for stakeholders to the extent that future users may be unable to access sufficient spectrum because a preferred option failed to promote more efficient use. This could arise through ComReg not having an appropriate charging structure that creates incentives for licensees to consider their requirements at the point of installation of new links.

5.116 ComReg does not repeat the assessment here but under 'Spectrum management and efficiency' that follows, ComReg outlines its preliminary view that Option 2 best promotes spectrum efficiency considerations and would be more likely to reduce congestion scenarios in the future. Therefore, Option 2 is more likely to reduce assignment risks associated with spectrum availability in the future.

II. Simplicity

5.117 DotEcon advises that simplicity for users is important to ensure that users and potential users do not face undue burdens in the assignment process.[150] In particular, new users should not be discouraged from applying for rights of use. The preferred option should reduce the extent to which a potential licensee is assigned rights of use which were made based either on poor information or a lack of understanding of the assignment process.

5.118 Option 1 seems most unlikely to create confusion for Existing Licensees; indeed ComReg has received no information from stakeholders that would suggest a difficulty with the current framework. Similarly, potential or new licensees are likely to find Option 1 relatively straightforward as the schedule of fees is clearly laid out and only requires a licensee to select its band(s) and bandwidth from the schedule.

5.119 Under Option 2, there is a risk that a new licensing framework could create Assignment Impacts that would not arise under Option 1. ComReg considers this unlikely because the practical implementation of the formula is very straight-forward, and licensees are generally very well versed in the matter of Fixed Links. Licensees

[150] ComReg does not have a specific simplicity objective, except to the extent that excessive complexity would compromise its ability to provide for an efficient assignment.

simply have to know their requirements or range of requirements for a specific link and the associated fee would be calculated automatically on that basis.

5.120 Therefore, while Option 1 is likely to be simpler for licensees in the short run, any additional complexity created by a new approach under Option 2 is likely to be marginal. Consequently, there are unlikely to be any Assignment Impacts arising from simplicity/practicality under either Option.

III. Stable and predictable fees

5.121 As set out "Efficient Investment' under Option 2, the use of a formula-based approach helps to ensure the pricing regime is future-proofed and robust to changes in demand (i.e., for bandwidth, and across different bands) and developments in congestion (which may increase or decrease in different bands and/or locations). Importantly however, Option 1 would likely require changes in the future arising from matters such as increased bandwidth requirements outlined earlier in this document, and consequently fees under this Option are inevitably likely to change in the not-too-distant future (see "Spectrum management and efficiency" below)

5.122 Therefore, Option 2 is more likely to result in stable and predictable fees.

5.123 Overall, ComReg is of the preliminary view that Option 2 would result in more positive Assignment Impacts.

5.5 Impact on competition

5.124 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 fee methodology and an assessment of ComReg's compliance with some of its statutory obligations, particularly that of promoting competition, in accordance with Section 12 of the 2002 Act of by. These include:

a) Encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources[151] ("Efficiency and Spectrum Management - Section 3.4.1");

b) Ensuring that there is no restriction or distortion of competition in the electronic communications sector[152] ("Distortions to competition" – Section 3.4.2);

c) Promoting efficient investment and innovation in new and enhanced

[151] Section 12(2)(a) of the 2002 Act.
[152] Section 12(2)(a) of the 2002 Act.

infrastructures[153] (“Efficient Investment” – Section 3.4.3); and

d) Safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition[154] (“Infrastructure based competition” – Section 3.4.4). [155]

5.125 The remainder of ComReg’s ‘Impact on Competition’ assessment, arising from each of the regulatory options, is assessed under the headings provided in (a) to (d) in the preceding paragraph. In doing so, ComReg notes that it previously set out its assessment of the impact of the Options on each of the stakeholders earlier. This assessment is not repeated here and instead ComReg refers to the relevant aspects of same in completing its assessment.

5.6 Spectrum management and efficiency

5.126 ComReg’s spectrum management role requires that operators with spectrum assignments in the relevant bands are incentivised to efficiently use those spectrum assignments. In that regard, ComReg agrees with DotEcon that the primary focus is on the incentive potential an appropriate charging structure creates for the installation of links. [156]

5.127 With that in mind, ComReg assesses the efficiency of each Option under the following headings, in common with the discussion in the DotEcon Report (Document 21/134a):

I. Fees should best reflect the fact that a unit of spectrum (MHz) in the lower frequency bands has a higher value than higher frequencies because of increased propagation. (“Frequency gradient”).

II. Licensees should be subject to fees for additional bandwidth (“Charging for increasing bandwidth”).

III. Spectrum should be made available in way that reduces the extent to which a frequency band(s) is fragmented into blocks that are unusable by others (“Fragmentation Risk”).

IV. Where scarcity occurs, fees should best reflect the opportunity cost of the spectrum (“Congestion Charges”).

5.128 Before, assessing each efficiency consideration below, readers are referred to Table

[153] Regulation 16(2) of the Framework Regulations.
[154] Regulation 16(2) of the Framework Regulations.
[155] Impact on consumers assessed separately below.
[156] Consultant’s Report - Fixed Links Bands Review – ComReg Document 20/109A

3 and Table 5and reminded that under Option 1:

- The 'Band Category' refers to the category of bands (e.g.,17 GHz to 37 GHz) that a link is required for and a particular fee applies; and
- The 'Bandwidth Category' refers to the category of bandwidth (e.g., 20 MHz to 40 MHz) that is required for a link and a particular fee applies.

I. Frequency Gradient

5.129 All things being equal, licensees would typically prefer to locate links in lower frequency bands where propagation of links is greatest. As noted in the first DotEcon Report:

> "*Operators, in response to the RFIs and through the stakeholder interviews, emphasised that link length policy is the most important factor in the selection of a band, and beyond that they simply select an appropriate size channel".* [157]

5.130 While licensees typically have a range of bands that can be used to deliver a specific use case[158], it is likely that bands with longer links, that fall within that range, will be chosen once appropriate channel spacing is available. Accordingly, absent sufficient incentives, licensees are more likely to pick lower frequency bands when higher frequency bands would have been sufficient to accommodate their needs, even though there is less bandwidth typically available in those bands which, in turn, makes them more prone to congestion.

5.131 DotEcon notes that there is a good case for maintaining a differential between lower and upper bands as this avoids the problem that lower frequency bands become occupied with users who could have easily moved to alternative higher bands when initially installing links in cases where they did not actually require the superior propagation of lower bands. [159]

Option 1

5.132 ComReg notes that existing fees under Option 1 are based on a Frequency Gradient such that the ratio between lowest frequency bands (1.3 GHz – 15 GHz) and highest frequency bands (42 GHz – 80 GHz) for a given bandwidth is 10 to 1. For example, in the lowest frequency band category (1.3 GHz – 15 GHz) the fee for 0.25 MHz to 3.5 MHz is €1,000 compared to €100 in the 42 GHz – 80 GHz bands. This 1:10 ratio

[157] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p54

[158] As set out in ComReg Document 20/109A, "most use cases have a degree of flexibility and are able to use a range of bands around some range of feasible alternative bands which varies from use case to use case". See Table 1: Key bands for each use case

[159] Page 30, Document 21/134a.

holds for all bandwidth categories.

5.133 To determine whether the existing frequency gradient sufficiently reflects the value difference between the upper and lower frequency bands, DotEcon estimated the difference in opportunity cost between upper and lower frequencies (if there was scarcity).[160] The ratio between the highest opportunity cost and lowest opportunity cost for links of a given size, and given level of congestion, is informative of the relative prices at which flexible operators may prefer one band over another.

5.134 This modelling[161] shows that value differences is significantly greater than the 10:1 ratio that is used under Option 1. DotEcon advises that while there is uncertainty around these opportunity cost estimates, the current charging scheme does not seem to provide a strong enough incentive to avoid the lower bands if they were acutely congested. The cost modelling suggests that the ratio of opportunity cost in congested areas between lower and upper bands is in the order of **1:15 to 1:54** depending on bandwidth used and the location of links considered. [162]

5.135 Therefore, ComReg is of the view that while a frequency gradient is present under Option 1, this 1:10 level is unlikely to reflect the likely value differences between the bands. Consequently, it is not equipped to provide a strong enough incentive to discourage the use of the lower bands when higher frequency bands would more than suffice; this shortcoming could therefore lead to inefficiencies in the assignment of spectrum rights of use in the future.

Option 2

5.136 DotEcon considers that it is beneficial to try to reflect at least some of the likely structure of long run opportunity costs within fees. Option 2 achieves this by establishing some reasonable differential in per MHz fees across different bands reflecting the intrinsically more limited supply of low frequency spectrum and to provide an incentive for users with flexibility to leave lower bands available for those with less flexibility.[163]

5.137 Under Option 2, the ratio between the highest opportunity cost and lowest opportunity cost for a given link and level of congestion is used to determine the relative ratio between bands. This is likely to be informative of the relative prices at which flexible operators may prefer one band over another. As noted, this is likely to be in the range of **1:15 to 1:54,** depending on factors such as the bandwidth used, and the location

[160] DotEcon also advise that even without acute congestion, there is a still good case for maintaining a differential between lower and upper bands. This avoids the problem that lower frequency bands become occupied with users who could have easily moved to alternative higher bands when initially installing links, not needing the superior propagation of lower bands.
[161] See Annex 3
[162] See Table 9, 10 and 11 of Document 21/134a.
[163] Document 21/134a, P28.

of the links considered. Within this range, ComReg considers that a ratio of 1:30 would be appropriate (See Annex 3).

5.138 Furthermore, and as set out in Table 4 below, ComReg notes that Option 2 provides a 1:30 ratio between the highest and lowest frequency bands, providing a more accurate reflection of the relative value differences between all 20 Fixed Links Bands (i.e., each band is assigned its own ratio). This compares to Option 1 which retains the 1:10 ratio only for the highest and lowest categories of bands rather than between each of the bands under Option 2. There is little incentive for an operator (who is able to do so) to choose the higher frequency band within a category of bands (e.g., 17 – 37 GHz) since the price is the same regardless of the band it chooses.

5.139 Of course, the higher ratio under Option 2 does not mean that fees are three times higher compared to Option 1 (i.e., 1:10 v 1:30) as this refers only to the ratio between the lower and upper frequencies. For a given band, the minimum price per MHz for that band[164] is simply the base price multiplied by the band ratio. The base price for the lowest frequency band (1.3 GHz) is determined independently of the band ratio (See Annex 3).

Frequency Bands	Option 2	Option 1
1.3/1.5	30.00	10
1.3/1.4	30.00	
2.0/2.3	29.49	
L7	25.83	
L8	25.31	
U6	26.19	
U7	25.62	
U8	25.03	
11	23.02	
13	21.74	
15	20.36	
18	17.66	7.5
23	14.73	
26	12.54	
28	10.51	
31	8.58	
38	3.68	5.5
42	1.00	1.00
80GHz	0.25	1.00

[164] Adjustments to account for the bandwidth used and whether a congestion charge should be applied is made subsequent to this.

Table 4: Band ratio (Option 1 v Option 2)

Conclusion of frequency gradient

5.140 Based on the assessment above, ComReg is of the preliminary view that Option 2 Based on its assessment above, ComReg is of the preliminary view that Option 2 is likely to better reflect the relative differences in value between each of the bands and provide better incentives for operators to choose appropriate bands, that is lower frequency bands would be chosen only when the particular characteristics of that band are required (e.g. the additional propagation and/or available equipment in lower bands).[165]

II. Charging for increasing bandwidth

5.141 An effectively functioning fees framework should ensure that licensees are incentivised to use assigned rights of use as efficiently as possible (i.e., the least amount of spectrum necessary to deliver a service at certain levels) and not rely on additional rights of use when a service could be delivered using less. If the cost of holding additional spectrum rights of use is either too low or even non-existent, the incentives to use those rights of use efficiently are reduced. This could even lead to inefficient spectrum hoarding.

5.142 Indeed, ComReg notes the views of Vodafone in relation to the 80 GHz Band who opine that:

- the current pricing framework has led to a situation whereby a licensee could be retaining licences but not using them, as they are the cheapest licence per Mbps capacity available today; and
- a licensee can hold licenses, with very large bandwidths for very little cost per year and not deploy, resulting in apparent congestion of the band in certain areas.

5.143 It follows that any preferred option should reduce the incentives for such situations or other incidents of inefficient hoarding occurring in any of the Fixed Link Bands. This is a particular concern arising from Option 1 and is discussed below.

Option 1

5.144 Under Option 1, fees for each bandwidth category above the lowest bandwidth category increase slowly in steps[166] up to 40 MHz, and not at all after that (i.e., the fee for a 40 MHz link is the same as a 2 GHz link). DotEcon notes that because fees

[165] DotEcon notes that such approach would allow for long run opportunity costs to be built into a limited extent, reflected by a variance in per MHz fees across the fixed links bands and charging in proportion to bandwidth

[166] Steps of 10% from the lowest bandwidth category up to 40 MHz.

increase slower than proportionately with bandwidth used and not at all above 40 MHz bandwidth, the current charging structure fails to reflect emerging demand for higher bandwidths. [167] ComReg notes the following issues with the assignment of additional bandwidth under Option 1.

5.145 **First**, where bandwidth is available there are poor incentives for licensees to choose bandwidth categories that best reflect actual requirements. The increase in prices as a licensee moves to a higher bandwidth category is very modest (and zero after 40 MHz) and unlikely to deter licensees from acquiring additional bandwidth when a lower amount would suffice. If scarcity becomes more of an issue in the future, the prevailing fees framework needs to favour more efficient operators that are able to deliver services with lower amounts of spectrum (i.e., reduce inefficient hoarding).

5.146 **Second**, within bandwidth categories, fees are entirely unaffected by additional bandwidth. For example, the fee for a 3.5 MHz link is the same as a 20 MHz link and only increases when moving into the 20 – 40 MHz bandwidth category which is really only pertinent for the higher bandwidth categories which involve greater amounts of bandwidth. Fees are entirely unaffected beyond 40MHz which effectively means the incremental charge for links above 40 MHz is zero. This is likely to become increasingly relevant in the future for at least the following two reasons:

- increased bandwidth requirements generally means that there is going to be an increased requirement for higher bandwidth lengths (e.g., the majority of links are already above 40 MHz and unaffected by the current fees structure); and

- take up of more advanced equipment in the future will provide operators with increased flexibility to increase bandwidth (i.e., provide a higher bandwidth ceiling than existing legacy equipment. [168][169]

5.147 **Third**, the bandwidth categories themselves do not reflect the need for additional bandwidth, with two of the four bandwidth categories accounting for just 5% of all links (see Table 5 below). It is likely that over time more and more links will require bandwidth above 40 MHz given the clear evidence of growth in demand for larger contiguous bandwidth (i.e., demand shifting away from the smaller channels used historically and an increase in used of the wider channels e.g., 56 MHz and even moving up to 112 MHz).

[167] Document 21/134a, p31

[168] See https://www.ceragon.com/products/ceragon-products

[169] To some extent the lower bandwidth capabilities in legacy equipment has limited the extent to which operators have been able to obtain additional spectrum at zero incremental rate. (i.e., if existing equipment was able to operate at a higher bandwidth such licensees might already have done so and would likely do so in the future once that limitation has been removed.)

Bandwidth category	% Links
0.25 – 3.5 MHz link fee	1%
3.5 – 20 MHz link	5%
20 - 40 MHz link	43%
40 – 2000 MHz link	51%

Table 5: Links in each bandwidth category under Option 1

5.148 Much of the difficulty with Option 1 arises because the fees for the lowest bandwidth categories are too high to be increased proportionately as bandwidth increases. An increase in fees in proportion to bandwidth required using the lowest bandwidth category as a base would likely to choke off efficient demand. For example, if fees increased proportionately in the 1.3 – 15 GHz band category the price for the 20 – 40 MHz bandwidth category would be over €11,000 instead of €1,200. Such an approach may have been appropriate in the past when lower bandwidth categories were more popular, and a higher fee was necessary to encourage efficient use of that spectrum. However, with emerging demand for higher bandwidths, Option 1 could create inefficiencies going forward and more suitable incentives may be required to ensure the efficient use of the spectrum across all bandwidth requirements (whether large or small) and prevent inefficient spectrum hoarding.

Option 2

5.149 Option 2 moves away from the bandwidth category approach and instead determines the most common channel size used for each band and charges a fee for that 'typical bandwidth'. The fee for additional bandwidth above the typical bandwidth increases in proportion to the bandwidth used (i.e., double the fee for double the bandwidth).

5.150 DotEcon notes that where there is significant congestion, efficient pricing requires licensees to pay in proportion to bandwidth used because the assignment of additional spectrum precludes some other potential users (with the opportunity cost defined by the highest value amongst these potential alternative users) If there are many excluded alternative users (reflecting a high level of scarcity), the effect of diminishing returns will be weak, as there will be some other next highest value excluded user with closely similar value as the highest value excluded user. [170].

5.151 Separately, even where there is no current issue of acute scarcity, e.g. (uncongested links) DotEcon advise that charging by bandwidth would seem to be appropriate, to ensure operators do not acquire licences for larger channels than they need and minimise the risk of avoidable congestion arising in the future. This is likely to be

[170] See Document 21/134a – p 31-32.

particularly relevant for cases where congestion is not currently an issue, but demand is increasing and inefficiently assigned spectrum might become an issue.

5.152 ComReg agrees with DotEcon and is of the preliminary view that this approach is more efficient in the assignment of bandwidth than Option 1 because:

- it is more reflective of current circumstances where demand for increased bandwidth is emerging, particularly in the higher frequency bands. For example, all bands from 11 GHz and above (except 26 GHz[171]) have a typical bandwidth usage of 40 MHz or more;
- fees increase in proportion to the bandwidth used;
    - thereby ensuring that for congested links additional rights of use are more likely to be assigned to those who value that spectrum the most; and
    - for uncongested links it minimises the risk of inefficient assignment and the risk of avoidable congestion arising in the future;
- there are no situations where fees are entirely unaffected for increasing bandwidth requirements and licensees will have to carefully consider any need for additional bandwidth;
- the starting point for determining the appropriate fee is based on typical bandwidth usage (rather than the fee for the lowest bandwidth category under Option 1); and
- lower bandwidth links can still be efficiently provided for and in any event may better reflect the typical bandwidth for a given band (e.g., 1 MHz is the typical bandwidth for the 1.3/1.5 GHz band.) [172]

5.153 Notice that this is not an argument for fees being higher but rather that fees should be assigned based on the typical bandwidth usage within the band (which by definition most licensees would fall under) and increase in proportion for bandwidths higher than that. Indeed, for typical bandwidth usage, fees are broadly stable compared to Option 1 in the lower frequency bands and fall from 28 GHz onwards reflecting the impact of the upper and lower band ratio. The increased cost of bandwidth above the typical bandwidth provides appropriate incentives for licensees

[171] The widest channels available in the 26 GHz and 31 GHz bands are 28 MHz

[172] Indeed, fees for what would fall under the lowest bandwidth category under Option 1 (e.g., 1 MHz link) would be significantly lower under Option 2.

to consider their actual need for the largest channel spacing (i.e., up to 2 GHz). [173]

5.154 The vast majority of fees are captured under the typical bandwidth categorisation. As noted above, only 7% of links have bandwidth above the typical bandwidth with over 80% of those links in the 18 GHz and 80 GHz bands. Only in the 80 GHz band are there links with triple or quadruple the typical bandwidth. However, ComReg is satisfied that the likely higher incidence of links above the typical bandwidth in the 80 GHz Band compared to other bands should not choke off efficient demand because the frequency gradient is lowest for 80 GHz and the price per typical bandwidth in the 80 GHz band is low (i.e., €163).

Conclusion on charging for increasing bandwidth

5.155 Based on the assessment above, ComReg is of the preliminary view that Option 2 is likely to better reflect the reflect emerging demand for higher bandwidths and encourage licensees to choose bandwidth levels that best reflect their requirements.

III. Fragmentation risk

5.156 There is always a risk that a band(s) can become fragmented to some extent given that users tend to have different bandwidth requirements (larger or smaller) given their use case. Fragmentation arises because of the assignment of smaller channels where larger channels are required or will be required in the future (i.e., gaps between smaller channels preclude allocation of large channels).

5.157 Fragmentation would not be an issue if users all want the same channel size and spectrum is offered in that channel size. In such circumstances, gaps would be useable by all parties. However, there is a risk of a band(s) becoming fragmented, if a licensees smaller bandwidth requirement (e.g., 28 MHz) is spaced in such a way that users who require a larger and more typical bandwidth (e.g., 56 MHz) might not be facilitated even if there is enough spectrum available overall. As noted by DotEcon:

> "*This could occur if the channel widths demanded by operators increase and, while there is sufficient unused spectrum available to accommodate a new larger channel, the organisation in of the existing links in the band preclude the new higher capacity link from being installed".*[174]

5.158 This creates a risk of inefficiency if currently unused spectrum is fragmented and cannot be utilised to its full potential by larger bandwidth users who have a

[173] Further, charging in proportion to the bandwidth used also directly deals with the issues raised by Vodafone above.

[174] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p145

requirement for same.[175] This has not been a substantial issue to date, but the general trend towards larger bandwidths increases the risk of fragmentation becoming more prevalent in the future in areas where a significant number of smaller channels remain in use.

5.159 DotEcon undertook some preliminary analysis and observes that fragmentation becomes more of an issue in the larger channel widths. With 28 MHz channels there is some impact of fragmentation in some areas, but no issue in the majority of the country. The number of "problem areas" increases in the options for assigning 56 MHz channels; the presence of 112 MHz channels appears to have a fragmentation impact in a large proportion of the country.

5.160 While a certain amount of fragmentation is inevitable given the differing bandwidth requirements of users and the matters cannot be fully resolved by either Option, the assessment below evaluates the extent to which either option would mitigate future fragmentation, particularly with the larger uncongested bands in mind.

Option 1

5.161 Under Option 1, the fee structure means that licensees are incentivised to choose larger channel sizes over small ones. (i.e., smaller channel sizes are significantly more expensive than larger ones on a per MHz basis). This would appear to suggest that the assignment of smaller channels (which are the source of fragmentation) are less likely to arise under Option 1.

5.162 However, the definition of a smaller channel is not an absolute. Rather, it varies according to band and is ultimately relative to the size of the so-called larger channels in that band. Under Option 1, there is no reference point with which to determine whether a particular channel size is large or small. In practice, smaller channels are simply those channels that are smaller than the common channel size within a band.

5.163 The use of bandwidth categories under Option 1 results in one fee covering a range of different channel sizes. This range is notably significant above 40 MHz, increasing the possibilities for more licensees to have bandwidth smaller than the common bandwidth (i.e., while there will be a common bandwidth there is a greater risk of more licensees having bandwidth below that.) Alternatively, under Option 2, a fee would apply solely to the common bandwidth and smaller channels would be charged a premium on same.

Option 2

[175] There is an internal efficiency trade-off between encouraging efficiency and While this is in some ways supportive of efficient spectrum use (operators with limited bandwidth requirements do not need to acquire larger channels that are then partially unused), it does create potential fragmentation issues where the unallocated frequencies are not in sufficiently large contiguous blocks to allow access to greater bandwidths (even if there is enough free spectrum overall to do so)

5.164 The typical bandwidth approach under Option 2 is less likely to result in fragmentation in the future for two main reasons.

5.165 **First**, it provides a focal point in terms of the channel size within a band. Fragmentation is less of an issue the more users have a minimum common channel size and spectrum is offered in that channel size because any gaps would be useable by all parties. A licensee is free to choose a lower or higher bandwidth, but the starting point would be the typical bandwidth and, by definition, the bandwidth likely to be required.

5.166 Furthermore, ComReg notes the recommended 'typical bandwidth' for each band was undertaken by on a forward-looking basis such that while lower bandwidth channel spacing maybe more common now, a higher 'typical bandwidth' spacing was chosen where there was a clear evidence of a requirement for same in near future (e.g., the typical bandwidth of 56 MHz was chosen for the 38 GHz band, even though the modal channel size is currently 28 MHz as of 2021). [176]

5.167 **Second**, under Option 2, while users of a smaller channel would pay less than users of a larger channel, fees do not reduce proportionately below the typical channel size because the effect of a user licensing a smaller channel may be to preclude a marginal user of the typical channel size (e.g., if the price for 56 MHz typical bandwidth was €1,000 the price for a 28 MHz channel would be €750). As noted by DotEcon:

- the pricing structure proposed would also help by creating incentives for users to use larger channels rather than multiple small channels with the same total bandwidth, increasing the potential for spectrum in use to be kept contiguous and better organised in the formal channel plan. [177]
- would give an incentive for smaller channel users to come together and share a wider channel, which is desirable as it avoids these smaller users scattering across the band, leaving unusable gaps. [178]

Conclusion on fragmentation

5.168 Based on the assessment above, ComReg is of the preliminary view that while the risk is low across both options[179], Option 2 provides better protection against excessive fragmentation of bands which would unnecessarily preclude the issuing of

[176] Document 21/134a, p42
[177] Page 15-16, Document 21/134a
[178] Page 32, Document 21/134a
[179] Further, long-term technology changes will assist in reducing any fragmentation that exist. DotEcon advise that the use of XPIC configurations and carrier aggregation equipment to combine non-adjacent channels would alleviate the problem, particularly in the longer term as equipment is naturally swapped out. However, the timeframe for these changes is unclear and the fee structure can assist in the interim.

wider channels in the future.

IV. Congestion charges

5.169 In relation to Congestion Charges, where there is congestion (i.e., as already occurring in the 13 – 23 GHz bands) rights of use should be assigned to the users who value it most.

5.170 The impact of congestion charge on efficiency under both options is assessed under the following headings which form separate parts of the congestion charge:

- The level of the congestion charge; and
- High usage charges.

Option 1

Level of congestion charge

5.171 Under Option 1, a congestion charge of 20% of the corresponding uncongested fee applies in areas determined to be congested. For example, in the 1.3 GHz – 15 GHz band category, the fee for 0.25 to 3.5 MHz bandwidth category is €1,000 compared to €1,200 in congested areas (i.e., the congestion charge is quite modest, adding only 20% of the corresponding uncongested fee).

5.172 DotEcon notes that setting fees based on opportunity cost[180] supports an efficient assignment of spectrum as the 'excluded users' [181]under the efficient allocation would have incentives to use other (cheaper) Fixed Link Bands or alternative technologies such as fibre, leaving the spectrum available for the higher value users.[182]Such an approach is consistent with ComReg's view that efficient spectrum assignment[183] generally requires rights of use to be assigned to those users who value it the most and can make the best economic use of it.

5.173 In that regard, DotEcon approximates that the short-run opportunity cost for the congested 13 GHz, 15 GHz and 18 GHz bands for a 56 MHz bandwidth is over €10k per annum. This is estimated based on users that may need to migrate up to higher bands and may need additional intermediate stations. DotEcon notes that a key concern is that if lower frequency bands (with better propagation) become congested, this could force some users up to higher frequency bands, requiring additional

[180] The opportunity cost is the value that is forgone by assigning spectrum to the user rather than making that spectrum available to other users. (i.e., the opportunity cost is set by the valuation of the excluded user).
[181] Where a band becomes congested (i.e., with Existing Licensees) there are a group of excluded licensees and fees charged to existing users should be reflective of opportunity cost (set by the valuation of the marginal excluded user) in order to encourage efficient use.
[182] Document 21/134a, p27
[183] Subject to measures that reduce the risk of restrictions or distortions to competition.

intermediate stations (or possibly a shift to fibre in some cases). [184]

5.174 With that in mind, DotEcon notes that the current congestion surcharge of 20% is very likely too low. It is clear that the current congestion prices are significantly below the modelled short-run opportunity costs because the maximum congested fee under Option 1 is €1,800 compared to a modelled opportunity cost of €10,000.

5.175 However, DotEcon also notes that "*the surcharges do not necessarily need to be at such a high level to promote efficient use of the spectrum, as at least some users are likely to be able to shift bands more easily and so would do so in response to more modest fee differentials between bands, but these certainly still need to be large enough to at least compensate for possible equipment cost differences and somewhat less robust connections at higher frequencies.*" [185]

5.176 Notwithstanding, ComReg agrees with DotEcon that existing congestion fees under Option 1 are likely too low and therefore unable to encourage more efficient use of the radio spectrum. In particular:

- Under Option 1 congestion charges are significantly below the actual short-run opportunity costs associated with acute congestion and more relevantly not large enough to at least compensate for possible equipment cost differences and / or less favoured propagation at higher frequencies;
- Any impact that may exist reduces significantly as licensees move to higher frequencies which could become congested in the future. For example, in the 42 – 80 GHz band category the impact of the congestion charge is an inconsequential €20 - €50 depending on the bandwidth category; and
- The congestion charge has no impact above 40 MHz (i.e., in the same way fees above 40 MHz bandwidth are entirely unaffected by additional bandwidth) such that any bandwidth above 40 MHz is only €50 - €500 more expensive, depending on the bandwidth category.

5.177 Therefore, while the 20% congestion charge provides notional incentives to avoid the band in the congested areas, the impact (if any) is likely to be quite small.

High usage charges

5.178 Under Option 1, ComReg applies a congestion charge for links in the 18 GHz and 23 GHz bands where at least one end of the link is within the congested area. A high

[184] The methodology for estimating opportunity cost and the results of the model is described in greater detail in **Error! Reference source not found.**of Document 21/134a.

[185] Document 21/134a, p29.

usage fee applies when a licensee has five or more links over the same path.

5.179 The high usage charges worked well in encouraging users to avoid having many links in the same path. For example, there was a relatively high number of high usage links when this approach was first introduced (e.g., 102 in 2010). However, licensees appear to have migrated usage over time to avoid these charges and there have been no high usage charges applied since April 2019 (having fallen to 10 or less links per year for each of the previous 4 years).

5.180 However, with increased bandwidth usage in the future, it is possible that high usage charges may become less effective in preventing localised congestion. As noted by DotEcon, a high usage approach needs to avoid creating perverse incentives by making the total fees that a licensee would pay significantly different dependent on whether it licenses a given bandwidth as a single channel or as multiple channels across different links.[186] This problem is present under Option 1 because fees do not increase beyond a 40 MHz bandwidth and being assigned additional bandwidth can be achieved across one link (avoiding the need for multiple links when the high usage charge might apply).

5.181 It also leads to situations where different licensees could be treated differently depending on how Fixed Links are assigned (i.e., a licensee that is assigned multiple links, but the same cumulative bandwidth could be subject to a high usage charge but an alternative licensee with less links, but same bandwidth would avoid the high usage charge).

5.182 Therefore, Option 2 is likely to better reflect the emerging demand for higher bandwidths and better encourage licensees to choose bandwidth levels that best reflect their requirements.

Option 2

Level of congestion charge

5.183 As we know, DotEcon estimates that the short-run opportunity cost for the congested 13 GHz, 15 GHz and 18 GHz bands for a 56 MHz channel is over €10k per annum.[187] To implement congestion charging to better reflect opportunity costs of that scale would require setting the congestion charge value at 6 rather than 1.2 under Option 1. Under Option 2, ComReg intends to take a conservative approach and set the congestion charge at 3. (See Annex 3).

5.184 Congestion fees need to be large enough to incentivise potential licensees to at least consider whether it would be more efficient and cost effective to be assigned

[186] Document 21/134a, p35.

[187] The approach to setting opportunity cost is described in Annex B of the DotEcon Report (Document 21/134a).

alternative rights of use in other bands. Further, DotEcon[188] observes that congestion charges set at a sufficiently high-level puts users of uncongested links on notice that they may face surcharges in the future if congestion arises.

5.185 Under Option 2, it is possible that a congestion charge of 3 (See Annex 3) may be set too low, however, it is likely to be more effective at encouraging efficient use than Option 1 and ComReg can change the charge in the future in response to how licensees use Fixed Links in the future.

High usage charges

5.186 Under Option 2, fees are charged in proportion to the bandwidth used (i.e., linear in bandwidth)[189] and so the impact is neutral between more channels or larger channels if this leads to the same overall bandwidth in use. With that in mind, a high usage path surcharge only applies if more than half of the total spectrum across the group of bands is used. (i.e., the surcharge would apply to half the total spectrum across a range of bands regardless of number of channels used).

5.187 This is likely to be more effective in preventing localised hoarding than Option 1 (which was primarily aimed encouraging use of fibre[190]) although both effects are possible in both.

Conclusion on congestion charges

5.188 Based on the assessment above, ComReg is of the preliminary view that Option 2 better reflects the short-run opportunity cost of spectrum rights of use in congested bands and better ensures that rights of use to those bands are held by those who value the spectrum the most.

5.7 Distortions to competition

5.189 Potential distortions or restrictions to competition in the assignment of Fixed Links rights of use could arise in two main ways.

I. Anti-competitive hoarding.

II. Fee's choking off efficient access.

5.190 The remainder to this section assesses each option under I and II in order determine whether that Option would potentially create restrictions or distortions to competition.

[188] Document 21/134a, p56.
[189] This is subject to surcharges for small channels – represented as "m" in the formula under Option 2.
[190] Guidelines to Applicants for Radio Links Licences – ComReg Document 09/89R2: See Section 2.12 https://www.comreg.ie/media/dlm_uploads/2017/06/ComReg-0989R2.pdf

I. Anticompetitive hoarding

5.191 As described in paragraph 5.54 above, anticompetitive hoarding involves the accumulation of rights of use for strategic reasons to prevent potential competitors acquiring sufficient rights of use to compete downstream. [191]

5.192 The remainder of this section assesses anti-competitive hoarding[192] under Option 1 and Option 2.

Option 1

5.193 Option 1 has delivered a variety of important use cases, including narrowband telemetry and control, broadcast distribution, backhaul from mobile cell sites, fixed wireless access, and links within core networks.[193]These services have been delivered since at least 2009 and ComReg is unaware of any anti-competitive hoarding having occurred in that time. This is unsurprising given that there is high availability of links, with <1% of links congested, and all of these are only located in specific geographic locations in Dublin.[194] Further, no high usage charges have been required since April 2019 indicating that there is unlikely to have been any localised hoarding.

5.194 Relatedly, there is unlikely to have been any issues around asymmetric access[195] to spectrum arising from any incumbency advantages Existing Licensees may have. While these links are typically renewed annually by licensees (originally assigned on a first-come first served basis), congestion is highly limited and the assignment of links in such areas is unlikely to have restricted or distorted competition given the availability of alternative frequencies to other licensees.

5.195 However, ComReg notes that such a situation may not continue and there is the potential that restrictions or distortions to competition may arise in the future. We note that bandwidth requirements for Fixed Links are increasing and the increasing

[191] ComReg also observes that the notion of anticompetitive spectrum hoarding can be better understood by reference to recital 122 of the EECC which provides: "In order to avoid the creation of barriers to market entry, namely through anti-competitive hoarding, enforcement of conditions attached to radio spectrum rights by Member States should be effective…" and Recital 133, which provides: "National competent authorities should, however, always ensure the effective and efficient use of radio spectrum and avoid distortion of competition through anti-competitive hoarding".

[192] Inefficient hoarding is assessed under 'Spectrum Management and Efficiency' above.

[193] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See Section 2.1, for further discussion on these use cases.

[194] Congestion mainly arises in a number of key high sites with good visibility to the city centre (e.g., Three Rock).

[195] Anti-competitive hoarding can arise from asymmetric access to spectrum and particularly by incumbents or Existing Licensees. Such issues could arise in the provision of fixed links. For example, if a frequency band(s) important in the delivery of a particular downstream service(s) became congested and sufficiently substitutable frequencies were not available. Asymmetric access can arise because Existing Licensees may have incumbency advantages from being able to renew such frequencies and could be protected from new entry.

availability of more advanced equipment will allow licensees to utilise greater bandwidth links. This would exacerbate the existing pricing inefficiency (i.e., fees don't increase in proportion to bandwidth used) and could lead to asymmetric access concerns.

5.196 The extent to which such scenarios would restrict or distort competition depends on the levels of congestion, the importance of the frequencies and the availability of alternatives. For any given use case, there is typically a range of frequency bands that can be used. As noted by DotEcon, a consequence of there being a chain of substitutes is that even if one band is scarce, it may be possible – at least in the long-run once equipment is renewed – to shuffle users to different bands such that spectrum can be freed up. [196] There is no particular frequency band that holds special relevance in the provision of a particular use case(s) because there are typically a range of bands available for any particular use case. [197]

5.197 However, depending on level of congestion there could be incentives for anti-competitive hoarding for some use cases (e.g., Advanced FWA) over others (e.g., mobile backhaul)[198] particularly in the longer run as demand for bandwidth grows and potential use cases emerge. FWA is already an established service in Ireland and is one of the primary use cases for Fixed Links, both for connecting end users and for backhaul into the core network.

5.198 Further, as noted by DotEcon[199], advanced FWA[200] has already emerged, allowing operators to offer fixed wireless broadband services at much higher speeds. These typically use dense networks of links at higher frequencies and are aimed at competing directly with fixed networks in urban areas. This provides valuable competition to existing fixed and mobile broadband services and the use of spectrum for same should not be precluded because of incentives for incumbents to hoard spectrum rights of use.

5.199 While FWA services are typically spread across several bands (depending on their specific speed and length requirements), advanced FWA has the narrowest range of frequencies of all use cases identified by DotEcon which are likely to be suitable (i.e.,

[196] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See Section 4.2.1.

[197] As noted by DotEcon "*Whilst there will be a "sweet-spot" in terms of optimising the trade-off between capacity and propagation for any given use case, in practice there is typically a wide range of feasible frequencies and particular use cases are not limited to single bands*." See page 52, Document 20/109a.

[198] Hoarding in relation to backhaul is unlikely as other higher frequency bands may become available (e.g. W-Band and D-Band) along with other technologies that are available to MNOs, such as integrated access backhaul (IAB) that would not require such high frequencies. See page 9, Document 20/109A.

[199] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See p48/

[200] Advanced FWA can use new technologies (such as dynamic beamforming) that can support much higher capacities using mmWave bands, creating the potential to use Point-to-Multipoint and/or mesh systems to provide high-speed broadband in urban areas. See Document 20/109A (Section 4.1). See also Section 3.2.2 and Vodafone and Siklus view on relevance of advanced FWA.

a short chain of substitutes).[201] These are the bands that offer the large bandwidths required to run high-capacity links but can still operate over distances that are long enough to be economical and not suffer from propagation issues. (e.g., 37 – 39.5 GHz[202]). In that regard, because it is the use case that would likely compete with existing FWA, fixed and/or mobile operators and because it operates across the narrowest range of frequencies, such operators may attempt to hoard spectrum inefficiently in these bands in the future.

5.200 Overall, ComReg is of the view that the fee schedule under Option 1 is unlikely to result in anti-competitive hoarding, particularly in the short run. However, and while the risk is generally low, anti-competitive hoarding scenarios cannot be ruled out in the longer run as more advanced use cases become available.

Option 2

5.201 Under Option 2, the cost of holding additional bandwidth increases in proportion to the bandwidth used and consequently, any anticompetitive hoarding strategies would be significantly more costly. More generally, Option 2 is less likely to result in unnecessary congestion and inefficient use which create the conditions for asymmetric access and hoarding.

5.202 Further, congestion charges set at a sufficiently high-level puts users of uncongested links on notice that they may face higher fees in the future if congestion arises. This has a discipling effect because hoarding is premised on rights of use becoming congested, precluding competitors or new entrants from using those rights of use. However, if such a situation arose congestion charges would apply, significantly increasing the costs of holding hoarded spectrum compared to Option 1.

5.203 Finally, as noted above, the high usage charges provided an additional protection against localised hoarding by imposing an additional charge if a user occupies more than half of the available spectrum in the band.

5.204 Therefore, the risk of anticompetitive hoarding under Option 2 is highly unlikely.

Conclusion on anti-competitive hoarding

5.205 ComReg is of the preliminary view that while the risks of anticompetitive hoarding are low under Option 1, Option 2 provides additional protections that would better encourage the development of new and competing use cases.

II. Fees choking demand

[201] Consultant's Report - Fixed Links Bands Review – ComReg Document 20/109A: See Figure 1,

[202] For example, a US ISP Starry is currently using a combination of light-licensed shared spectrum in the 37 – 39 GHz band and its recently acquired exclusively licensed spectrum in the 24 GHz band. See page 48, Document 20/109A

5.206 Distortions or restrictions to competition could arise due to the level of fees choking off efficient demand for spectrum rights of use. (i.e., spectrum would have been used to provide services, if the fees were set lower). Fees have a role in encouraging efficient use and preventing unnecessary congestion in various spectrum bands, however, such fees should not be set at a level that would choke off any particular use. Prices that are set too high could lead to scarce spectrum being unused, or under-used (e.g., with an operator choosing not to deploy sites at the expense of diminished coverage or service quality).

Option 1

5.207 ComReg is not aware of any particular use case that has been restricted or choked off due to the existing level of the fees. Indeed, the detailed stakeholder engagement conducted in 2020 did not uncover any use cases that were restricted through the existing fee levels or structure.

5.208 Further, in response to Document 20/109, only Virgin Media raised any issue regarding the level of current fees:

> "*the annual fees especially on the frequencies 38 GHz and below on higher bandwidths can impact or impede the use of these frequencies. This issue becomes more apparent when operators are dealing with cross border links and are therefore in a position to compare to the equivalent Ofcom pricing model*."

5.209 It is not clear from this response what aspect of existing charging is impeding the use of these frequencies in the view of Virgin. Further, the eight fixed wireless operators[203] have not raised any particular issues instead noting that:

> "*A new hopefully Improved fee schedule for Fixed Links that facilitates the greatest number of use cases, in order to ultimately promote greater use of the spectrum that are identified in this consultation and the responses".*

5.210 Separately, in response to Document 20/109, Eir noted that in its experience the current fee structure seems to work well.

5.211 Finally, ComReg agrees with DotEcon's view that "The current pricing regime has worked reasonably well to date and does not appear to have set fees at an excessive level that is inefficiently choking off demand". [204]

5.212 Therefore, ComReg is of the preliminary view that fees are unlikely to choke off demand under Option 1.

[203] Airwave, BBNet, Digitalforge, Whizzy, Kerry Broadband, Lightnet, Orion, Regional Telecom and Wireless Connect
[204] Document 21/134a, p38.

Option 2

5.213 As set out on the impact on stakeholders earlier, and while impact on stakeholders overall that would arise from the adoption of Option 2, there would inevitably be some in adjustment in fees paid by individual licensees. Licensees who experience a fee decrease (estimated at 51%) are unlikely to be choked off from delivering efficient demand since existing services are already being delivered at a higher level under Option 1.

5.214 Further, Option 2 has the additional benefit of supporting the development of rural ECS services and networks, noting that the decline in fees is greater in uncongested Fixed Links, which occur primarily in non-urban areas (e.g., outside of Dublin and the main cities). Fixed Links in such areas support the provision of ECS to rural consumers and businesses as rural ECS network are particularly reliant upon Fixed Links given the topographical and economic challenges in using alternatives in rural areas (e.g., fibre).

5.215 ComReg notes however that fees for several Fixed Links will increase, most notably in the case of:

- Fixed Links in the congested areas (Dublin city centre and south); and
- Fixed Links with high bandwidths (>100 MHz) in 18 GHz, 23 GHz and 80 GHz.

5.216 In relation to licensees whose fees may be higher, it is possible that those higher fees could affect demand. However, while this risk is arguably greater under Option 2, ComReg notes that any fee increases would be relatively modest in either % increase or in terms of absolute increases.[205] Further, any of the larger increases would be borne by the larger licensees who hold the greatest number of links in any event.

5.217 Fee increases are a result of the incentives under Option 2 that are necessary to promote the efficient use of spectrum, specifically the *Bandwidth charge* and the *Congestion charge* which would increase the weighting on larger bandwidths and congested links respectively. ComReg has already explained in detail why such incentives are necessary to achieve an efficient assignment of Fixed Links (see “Assignment Impacts”).

5.218 Further, ComReg notes that in instances where an operator faces an increase in fees, it could take actions to limit its exposure to that price increase over a period of

[205] For example, some smaller licensees have a large % increase which corresponds to a small absolute increase and vice versa (i.e., an increase of from €500 to €1,000 is a 100% increase but just €500 in absolute terms).

time. For example, an operator could, where distance and capacity permit:

- switch its Fixed Links to a less expensive band (e.g., a higher band);
- in Dublin, switch its Fixed Links to a uncongested band (e.g., a higher or lower in band; and
- economise on its bandwidth or rationalise its Fixed Links.

5.219 ComReg notes that use cases with those least potential for switching, and therefore at a greater risk of having demand choked off, are those which rely on the peripheral bands where propagation is specifically required such as 1.4 GHz (e.g., radio broadcasters). ComReg notes however that the average change in individual Fixed Link in these bands decreased, and therefore the viability of the use cases with the narrowest range of potential bands are not negatively impacted. ComReg notes that fees for links in the 1.3/1.4 GHz bands have reduced from €1,000 to €100 per link.

5.220 Therefore, ComReg is of the view that the fee level under Option 2 is unlikely to choke off efficient demand.

Conclusion on fees choking off demand

5.221 The fee levels under Option 1 and Option 2 are unlikely to choke off efficient demand in the future.

5.8 Efficient investment and innovation

Option 1

5.222 Creating the conditions for promoting efficient investment and innovation in new and enhanced infrastructure investment involves ComReg exercising its regulatory functions in an appropriate and predictable fashion, thus providing regulatory certainty. As noted by DotEcon, "*it is important that fees for fixed links are predictable, if ComReg is to encourage efficient investment. Otherwise, it could create a hold up problem, where investment is avoided because of highly uncertain and potentially large future fees (which operators cannot easily avoid by moving to other bands or alternative technologies such as fibre once equipment is installed).*" [206]

5.223 Any option should provide certainty that the regulatory framework which often underpins investment decisions will not change unnecessarily and require operators to make subsequent and additional investments and/or changes to their network. Promoting competition and encouraging efficient investment, in ComReg's preliminary view, means allowing for a cost-effective deployment of Fixed Links and preventing inefficient duplication of investment caused by predictable changes to the

[206] Page 36, Document 21/134a

regulatory regime.

5.224 As noted by DotEcon "*Fixed links licences are annual, but the equipment used for fixed links has a long asset life, often over ten years. Therefore, it is important that fees for fixed links are predictable, if ComReg is to encourage efficient investment. Otherwise, it could create a hold up problem, where investment is avoided because of highly uncertain and potentially large future fees (which operators cannot easily avoid by moving to other bands or alternative technologies such as fibre once equipment is installed).*" [207]

5.225 With that in mind, it is important that any option considers the likely long run development of the market so as to avoid future changes to the regulatory framework that could have been foreseen or give rise to additional cost.

5.226 Under Option 1, it is likely that investment in networks used to deliver services up to now could be considered efficient given the benefits to consumers and competition. However, it is unlikely that this Option can persist in the long run for the reasons set out above. In particular, the increased requirement for additional bandwidth is not compatible with an Option that provides no incentives for efficient use beyond 40 MHz.

5.227 Therefore, ComReg would be unable to provide regulatory certainty that Option 1 would persist in the long run.

Option 2

5.228 Option 2 has been designed to accommodate all existing and potential use cases that are likely to require Fixed Links. Investments in new use cases (e.g., advanced FWA) are more likely to arise under Option 2 which promotes innovation in new and enhanced infrastructure.

5.229 Option 2 seems sufficiently future-proofed given that it also takes account of changes in demand conditions (e.g., increased requirement for bandwidth) that are likely to arise in the medium to long-term so that changes in demand conditions in the future should not require significant regulatory intervention. As noted by DotEcon:

> "*Use of a formula-based approach also helps to ensure the pricing regime is future-proof and robust to changes in demand (i.e., for bandwidth, and across different bands) and developments in congestion (which may increase or decrease in different bands and/or locations).*" [208]

5.230 Further, it provides flexibly to adjust the formula in a straightforward fashion to the extent that issues arise (e.g., if one of the variables is set too low) without requiring

[207] Document 21/134a, Page 36
[208] Document 21/134a, p32-33

large scale structural changes (i.e., an entirely new framework). As noted by DotEcon:

- "*ComReg should be free to adjust the fees in response to changes in fixed links demand, but it should be clear on its reasons for doing so, any major changes it does make should be phased in and operators should be given sufficient notice of any changes ComReg is considering.*" [209]

- "*setting the fees using a formula provides a limited and transparent set of ways in which ComReg can changes the fees – this should help users form reasonably accurate expectations on the fees they will pay over the lifetime of a link they are about to install.*" [210]

5.231 It is also proposed that Option 2 would be introduced over a three-year period thereby providing users with sufficient time to consider how to dimension their network and to plan future investments accordingly.

5.232 Finally, Option 2 is less likely to create unnecessary congestion zones that would compromise efficient investments made on the basis of sufficient spectrum rights of use being available in certain locations.

5.233 Therefore, ComReg is of the preliminary view than Option 2 better promotes efficient investment incentives.

5.9 Infrastructure based competition

5.234 Infrastructure based competition is competition among operators that physically own networks. This could be a fixed operator competing with a mobile operator or two operators which have similar networks competing against each other. As a general point, the Fixed Links regime provided under either Option would enhance the possibilities for infrastructure-based competition because it would allow operators to deploy services using Fixed Links when alternative infrastructures are available (e.g., fixed/fibre).

5.235 Fixed Links continue to enhance infrastructure across the state.

- Fixed Links are provided in urban areas (five cities) to interconnect dense networks of small cells which typically only requires short links, but at high bandwidth[211]. Fixed Links are typically used in many cases where operators

[209] Document 21/134a, p36
[210] Document 21/134a, p36
[211] Where there are a large number of cells within a small area (for example attached to street furniture or contained in shop hoardings), it may be either cost prohibitive or simply infeasible to run fibre to each site. Therefore, there is likely to be significant and growing demand for short wireless links to connect small cells.

would be unable to secure permission to install fibre to each of these sites and/or it would likely be prohibitively expensive. Fixed Links are also used in urban areas for customers requiring higher bandwidth connections, typically provided as dedicated Point-to-Point links.

- Fixed Links are used in rural areas or hard to reach locations. A key role for such links is for FWA so as to provide bandwidth connectivity to isolated customers and businesses in areas where fibre deployment is not economically viable. In less densely populated rural areas, there can be a lack of infrastructure-based competition due to the cost of fixed rollout.

5.236 As noted above, the risk of congestion arises in both rural and urban areas. The promotion of infrastructure-based competition in these areas relies on spectrum rights of use in the Fixed Links bands being available to the greatest extent possible at various locations. This competition is threatened by unnecessary congestion because licensees would need to consider alternative bands in the congested locations. These bands may not be able to meet the link length and bandwidth requirements. [212]

5.237 ComReg notes that Option 2 provides incentives for operators to dimension their network over time and choose the most cost-effective combination of bands and bandwidth when delivering services. ComReg considers therefore Option 2 has the potential to improve infrastructure-based competition by encouraging operators to properly consider how their Fixed Links are deployed and thereby how that could deliver connectivity more efficiently than rivals.

5.238 Given the benefits to efficiency as described above, the prospects for the extension of infrastructure-based competition may be greater under Option 2.

5.10 Impact on consumers

5.239 ComReg observes that the notion of what may benefit consumers 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.

5.240 Further, it can be generally assumed that what is good for competition, and what

[212] For example, there is a risk that the demand for certain use cases (e.g., advanced FWA technologies) would not be served or might be underserved by Option 1 because of the greater risk of congestion arising from this Option. Similarly, wireless backhaul could be employed as an alternative to fixed or fibre connections (e.g., backhaul, broadcast distribution, links within core networks) and where appropriate links are not available, the cost of fibre deployment would be high increasing the overall cost of providing connectivity.

promotes investment in infrastructure, is, 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 while at the same time not deterring entry or efficient investment. With that in mind, ComReg reminds the reader that Option 2 is preferred in terms of the likely impact on competition.

5.241 ComReg is also already satisfied that Option 2 would not choke off[213] efficient demand for the delivery of services.[214]

5.242 In relation to congested links, Option 2 should ensure that Fixed Links rights of use are assigned to those bidders who most value those rights of use and who are therefore best placed to maximise consumer welfare (by using their assigned spectrum efficiently)[215]. This is a result of setting fees for congested rights of use by reference to both an estimate of the short-run opportunity cost of spectrum (e.g., congestion) and of the licence itself (e.g., bandwidth).

5.243 Existing Licensees would have the opportunity to retain their existing rights of use or migrate, making those rights of use available for new licensees (potentially new entry) who are willing to pay a price reflective of the short-run opportunity cost. ComReg additionally notes such criteria (i.e., assigning rights of use to those users that value scarce spectrum the most) should also result in the greatest benefits to downstream competition and consumers.

5.244 Alternatively, under Option 1, some Existing Licensees could hold rights of use in congested areas at a price significantly below its short-run opportunity cost which could preclude access to other users who would be willing to pay more. Inflexible excluded users may not have good alternatives leading to certain areas and consumers being underserved or not at all.

5.245 In relation to uncongested links, consumers are also likely to benefit more from Option 2, because there would be an overall reduction in Fixed Link fees in uncongested areas. As previously noted, for licensees that use the most common bandwidth, uncongested fees per link will be lower under Option 2 which should benefit end-consumers. Further, and as noted above, increased infrastructure-based

[213] Demand for a Fixed Link or Use Case is inefficiently choked off where a fee results in a Fixed Link (or Use Case) being uneconomic, where a lower price could both be economically viable for users and cover the necessary opportunity cost of the spectrum. The economic viability of a given use case will depend on both the spectrum licence fee and the value of the Fixed Links for that use case (e.g., the ability to generate profits).

[214] See paragraph 5.63 above.

[215] 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.

competition arising from the overall incentives provided under Option 2 should benefit consumers by improving operator competitiveness and the services they provide, which includes mobile, fixed and FWA networks.

5.246 In relation to existing and potential use cases, ComReg notes consumers are likely to prefer Option 2 because it (and unlike Option 1) has been designed to accommodate all existing and potential use cases that are likely to require Fixed Links in the future. This provides for a range of outcomes and differentiated services which increases the choice for consumers while also allowing for mobile operators to complement their existing spectrum holdings or fixed connections, while improving existing and future services to consumers.

5.247 ComReg notes that the use cases that are delivered over Fixed Links can be categorised into (i) those that are provided directly to consumers and businesses in downstream markets and (ii) those that are used as inputs to provide downstream.

Downstream services

5.248 In relation to (i), ComReg notes that FWA and advanced FWA are the only two use cases that are provided directly to consumers and business in downstream markets. In that regard, ComReg is of the preliminary view that consumers would prefer Option 2 for the following reasons:

- Overall growth in bandwidth is largely driven by demand from FWA operators[216], and the more efficient use of spectrum by all licensees ensures that more spectrum is available for the delivery of end services (from consumers who increasingly require more bandwidth);
- FWA is the primary use case in rural areas and Option 2 better supports the development of rural ECS networks, noting that the decline in fees is greater in uncongested Fixed Links, which occur primarily in non-urban areas
- Investments in new use cases (e.g., advanced FWA) are more likely to arise under Option 2 because it promotes innovation and efficient investment; and
- Option 2 is less likely to restrict the development of advanced FWA by reducing the likelihood of congestion[217] and the incentives for spectrum hoarding in bands suited for the delivery of this service.

5.249 Alternatively, under Option 1, certain areas may be underserved or not at all in the future due to emerging congestion.

[216] Document 20/109A, p 126.

[217] Through the incentive mechanisms identified in Impact on Competition above (i.e. frequency gradient, bandwidth charges and congestion charges etc).

Inputs to downstream services

5.250 In relation to the remaining use cases (e.g., backhaul etc), it is useful to briefly set out why the efficient assignment of Fixed Links across a range of bands which are not directly used for downstream services is an important issue for consumers, as it will affect the choice, price, and quality of the electronic communications service that ultimately are made available to consumers.

5.251 Providers of wireless mobile services use a combination of inputs to provide those services. This includes radio frequency spectrum which is used to transmit signals between base stations and end users' devices and to operate key network infrastructure such as base stations and transmission towers. The backhaul element of a mobile network is essential to the provision of wireless mobile services as it routes voice and data traffic from base stations to the core network. Providers of wireless mobile services must have access to sufficient backhaul, in terms of sufficient capacity and speed, to avoid communications bottlenecks and a reduced quality of service for their consumers.

5.252 The need for improved backhaul infrastructure - in terms of higher capacity and faster speeds – has increased and will probably continue to increase in parallel with the roll-out of more advanced services (e.g., advanced FWA etc) and ever-increasing consumer demand for data intensive mobile services such as mobile video streaming. ComReg observes that a 'feedback loop' exists in that increased consumer demand leads to better services, which further increases consumer demand, which leads to even better services, which further increases consumer demand, and so on. All of this puts pressure on backhaul infrastructure. Even if operators were to use more fibre backhaul in future, alongside wireless backhaul, microwave links would still be essential for backhaul to the core network, especially in rural areas. Therefore, the way new Fixed Links are assigned for backhaul could have significant impacts on consumers and on downstream communications markets.

5.253 In In that regard, Option 2 would likely be preferred by consumers because, as noted previously, it best ensures that spectrum rights of use are available for the delivery of these services. In particular, the incentives provided by Option 2 are less likely to result in congestion in the future such that rights of use are more likely to be available in provision of same. This improves an operator's ability to use Fixed Links and deliver services where and when they need it. Option 2 would incentivise operators not to occupy and retain Fixed Links unnecessarily (e.g., Fixed Links in Dublin) and more generally to economise on their use of Fixed Links spectrum (e.g., bandwidth charge).

5.11 Preferred option

5.254 This RIA considers a number of regulatory measures available to ComReg within the context of the analytical framework set out in ComReg's RIA Guidelines (i.e., impact on industry stakeholders, impact on competition and impact on consumers). This section complements that analysis and provides an assessment of the extent to which any regulatory measure would, if implemented, be likely to achieve one or more of ComReg's statutory objectives in the exercise of its related statutory function or functions.

5.255 Considering the above, ComReg is of the preliminary view that Option 2, is the preferred option in terms of the impact on stakeholders, competition and consumers.

5.256 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 pricing methodologies and models.

5.257 The following section assesses the Overall Preferred Option against ComReg's other relevant functions, objectives and duties.

5.12 Assessment of the Preferred option against ComReg's other relevant statutory objective

5.258 This RIA identifies and considers the options potentially available to ComReg, within the context of the RIA analytical framework as set out in ComReg's RIA Guidelines (impact on industry stakeholders, the impact on competition and the impact on consumers). This RIA also analyses the extent to which those various options would facilitate ComReg to meet its statutory remit in managing the radio spectrum. This includes analysing the extent to which the various options would promote competition and ensure that there is no distortion or restriction of competition in the electronic communications sector, whilst also encouraging efficient investment in infrastructure, promoting innovation, and ensuring the efficient use and effective management of the Fixed Links Bands.

5.259 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 draft 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 draft RIA above.

5.260 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.

5.12.2 General Provisions on Competition

5.261 There is a natural overlap between the aims of the draft RIA and an assessment of ComReg's compliance with some of its statutory obligations and, in particular, one of its 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; and
- encouraging efficient use and ensuring effective management of radio frequencies.

5.262 In so far as the promotion of competition is concerned, Regulation 16(1)(b) of the

Framework Regulations further requires ComReg to ensure that:

- 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. [218]

5.263 Certain other provisions also relate to ComReg promoting and protecting competition in the electronic communications sector including:

- Regulation 16(2) of the Framework Regulations which requires ComReg inter alia 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; and
- General Policy Direction No. 1 on Competition (26 March 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).

5.264 Based on the assessment provided in the RIA above, ComReg's view is that the Preferred Option in the draft RIA would best safeguard and promote competition to the benefit of consumers.

5.12.3 Contributing to the development of the Internal Market

5.265 In achieving the objective of contributing to the development of the Internal Market, another of ComReg's statutory objectives under section 12 of the 2002 Act, ComReg considers that the following factors are of particular relevance in the context of setting fees for Fixed Links:

- 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, 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

[218] The final two statutory obligations were introduced by Regulation 16 of the Framework Regulations.

- 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.

Encouraging the establishment and development of trans-European networks and the interoperability of pan-European Services

5.266 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 pricing models which do not incentivise efficient use or encourage low value incumbent not to vacate) would not, in ComReg's view, satisfy the requirements of this objective.

5.267 In this regard, ComReg refers to the 'draft RIA and its preliminary finding that the Overall Preferred Option is likely to be preferred by future and potential Fixed Link licensees, which may be new entrants. This is because the Overall Preferred Option would best encourage the efficient use of Fixed Links and reduce the incentives for Existing Licensees to engage in spectrum hoarding strategies. Further, this option reduces the likelihood of asymmetric access scenarios arising which may benefit Existing Licensees simply by virtue of their incumbency. Such an approach would also be in line with service- and technology-neutrality requirements by not preferring existing services and technologies by virtue of incumbency.

Promoting the development of consistent regulatory practice and the consistent application of EU law

5.268 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.

5.269 For instance, ComReg has had clear regard to international developments in the context of:

- ComReg considered international trends in the use of Fixed Links in paragraph 75 of Document 20/109 and informed its consideration in

developing its preferred Option;

- ComReg issued a Request for Information ("RFI") and received 22 responses from members of the Independent Regulators Group ("IRG")[219] provided a response to the IRG RFI which ComReg issues in order to gather, among other things, the most up to date information on trends in the use of Fixed Links;
- ComReg and DotEcon held stakeholder meetings with international equipment manufacturers and vendors to inform its Preferred Option; and
- DotEcon had clear regard to fee methodologies (Annex 2) used in other countries in forming its recommendations giving an overview European price references (Table 5) and common practices (Table 6).

5.12.4 Promote the interest of users within the community

5.270 The impact of the Overall Preferred Option and other options on users and stakeholders 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 RIA and it is not proposed to consider this matter further here.

5.271 ComReg also observes that most measures set out in Section 12(2 (i) to (iv) 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.

5.12.5 Efficient use and effective management of spectrum

5.272 Under section 10(1) 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 in carrying out its functions, ComReg shall seek to ensure that measures taken by it are proportionate having regard to the objectives set out in section 12.

5.273 Regulation 9(11) of the Authorisation Regulations also provides that ComReg must

[219] The Independent Regulators Group ("IRG") a group of European National Telecommunications Regulatory Authorities (NRAs) that functions as a forum for exchange of best practices and discussions on regulatory challenges in communications between NRAs

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.

5.274 In relation to Policy Direction No. 11, the draft RIA set out above considers 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. ComReg is of the view that the Overall Preferred Option is one that would safeguard and promote those interests.

5.275 In addition, the preferred Option best facilitates efficient new entry and encourages an efficient use of spectrum by those successful in acquiring spectrum. This is because the formula-based approach under Option 2 would achieve the following:

- In relation to uncongested links, it best provides that licensees are incentivised to use assigned rights of use as efficiently as possible (i.e., the least amount of spectrum necessary to deliver a service at certain levels) and not rely on additional rights of use when a service could be delivered using less; and
- In relation to congested links, it best ensures that spectrum rights would be awarded to those users who value them the most and because of the incentives provided under this option, those users are also the most likely to use the spectrum efficiently.

5.276 In particular, ComReg refers to Section 5.6 'Spectrum management and efficiency above'.

5.277 ComReg is of the preliminary view that the Overall Preferred Option complies with the obligations contained in the above statutory provisions. ComReg is also of the preliminary view that Option 1 would fail to satisfy the above provisions to the same extent, if at all considering the increased requirement for bandwidth in the future.

5.12.6 Regulatory Principles

5.278 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:

- promoting regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods; and
- promoting efficient investment and innovation in ECS networks and infrastructure.

Regulatory Predictability

5.279 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.

5.280 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 accessing spectrum for Fixed Links; and
- promoting regulatory predictability in relation to ensuring that the process used to determine fees is predictable and not subject to significant change such that it would compromise efficient investments.

5.281 In relation to the first objective, ComReg's approach for congested links is consistent to its general treatment of a scarce resource such that rights of use should be assigned to those who value it the most. Further, in relation uncongested links, ComReg assigns rights of use in a way that encourages efficient use in line with its competition objectives.

5.282 In relation to the second objective, ComReg refers to its assessment under efficient investment below and its view that the conditions for promoting efficient investment and innovation in new and enhanced infrastructures investment involves ComReg taking its regulatory functions in an appropriate and predictable fashion as provided under Option 2.

5.283 Considering the above, ComReg is of the view that the Overall Preferred Option complies with the regulatory principle of promoting regulatory predictability.

5.12.7 Efficient Investment and Innovation in New and Enhanced Infrastructures

5.284 ComReg considers that the Overall Preferred Option is consistent with the aims of this regulatory principle for the reasons set out in Section 5.12. Further, ComReg notes that it:

- provides for a range of outcomes and differentiated services noting that this option has been designed with existing and potential use cases in mind and consulted in detail on same in Document 20/109 and associated documents. This potentially increases the choice for consumers while also allowing for mobile operators to complement their existing spectrum holdings or fixed connections, while improving existing and future services to consumers;

- supports entry and/or participation by new use cases or new entrants by removing any incumbency advantages Existing Licensees may have from holding certain rights of use;
- is the one likely to best promote competition in the assignment of Fixed Links; and
- produces an efficient outcome by assigning congested links to uses who would attach the highest value to it and, because of these financial incentives, thereby generate the greatest benefits to society from the use of the spectrum.

5.12.8 Relevant Policy Directions and Policy Statements

5.285 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 European Electronic Communications Code (which has repealed the Common Regulatory Framework) and, in turn, with those followed by ComReg in identifying the Overall Preferred Option.

5.286 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.

5.287 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

5.288 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.*"

5.289 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.

5.290 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 FWA services and fixed wireless more generally in relevant bands and it complements other schemes such as the National Broadband Plan 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

5.291 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".*

5.292 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 light of the business cycle at the time such decisions are taken.

5.293 ComReg observes that this policy direction concerns the sustainability of the industry as a whole rather than the position of individual players. In that regard, ComReg notes that total fees are broadly stable under Option 2 and may reduce depending on how licensees decide to deploy their networks in the future.

5.294 Notwithstanding, in its 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 the financial impact on these stakeholders in the Impact on Stakeholders section above. This shows that while Option 2 may result in some modest increases for certain stakeholders, this is highly unlikely to threaten industry sustainability. ComReg also refers to its considerations in the context of the principle of proportionality above.

Policy Direction No. 11 of 21 February 2003 on the Management of the Radio Frequency Spectrum

5.295 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".*

5.296 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 the respective interests of commercial and non-commercial user.

5.297 In carrying out the draft RIA, ComReg has considered the Preferred Option in light of the interests of various categories of industry stakeholders and consumers.

5.298 ComReg is of the view, therefore, that it has complied with this requirement in carrying out the 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.

5.12.9 General guiding principles (in terms of spectrum management, licence conditions and setting of licence fees)

5.299 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 under the European Electronic Communications Code (which has repealed the Common Regulatory Framework). In relation to the current process, ComReg considers that these principles are most relevant in terms of its functions concerning spectrum use and management, attaching conditions to rights of use and the setting of licence fees.

5.300 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 based on 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.

5.301 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.

5.302 ComReg is of the view, having regard to the applicable legislation and legal principles, its draft RIAs and other analyses, its expert advice and reports, and the material to which it has had regard, that the Overall Preferred Option is objectively justified, transparent, proportionate, and non-discriminatory. In particular, the preferred option:

- is objectively justified given the detailed assessment provided in this RIA, including that it would be unlikely to distort or restrict competition and it better encourages the efficient use of the radio spectrum;
- would not give rise to discrimination in the treatment of undertakings because:
    - any change in fees arising from Option 2 arise because the situation of some licensees is materially different from the other.
- whether fees increase, or decrease does not dependent on the stakeholder but rather on the bandwidth and bands operators locate their rights of use;
- is transparent because, among other things:
    - the detailed methodology is set out in Annex B and the DotEcon Report;
    - ComReg provides an assessment of the impact on stakeholders (including financial impact) in the RIA above; and
    - ComReg will provide each licensee with an Assessment Tool to estimate impacts at a licensee level.
- be proportionate because, among other things:
    - the preferred option would accord with ComReg's statutory objectives and regulatory principles as described above;
    - there do not appear to be less onerous means by which these objectives and principles could be achieved; and
    - the preferred option is being implemented over a 3-year period which allows licensees more time to plan and make the necessary changes to their use of Fixed Links and relevant networks, allowing greater flexibility in adjusting to the changes. ComReg considers that this will allow the operators to make better planned and more informed decisions and resulting improve efficiency of assignment.

Conclusion

5.303 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 6

6 Assessment Tool, Submitting Comments and Next Steps

6.1 Assessment Tool

6.1 As noted in the RIA, an Assessment Tool will be made available for existing Fixed Link licensees on request. Requests should be made as soon as possible following the publication of this document noting that the Assessment Tool itself will be made available no longer than 5 working days from January 4. This will consist of compiling the organisation's information and verification of the person's identity and their relationship with that organisation. ComReg may seek additional proof of employment or any other relevant documentation before providing the Assessment Tool.

6.2 Requests must be submitted in written form (email) to the following recipient, clearly marked – "***Assessment Tool for ComReg 21/134***":

Email: marketframeworkconsult@comreg.ie

6.3 ComReg would advise interested parties to request the Assessment Tool as soon as possible to ensure that all submissions are received within the consultation timeframe mentioned below.

6.2 Submitting Comments

6.4 Recognising that this consultation spans the Christmas period, and that the mobilisation of resources may be challenging during this time, ComReg has provided an additional two weeks over the four outlined in ComReg's Consultation Procedures.[220] The consultation period will run until 17:00 28 January 2022 during which time ComReg welcomes written comments on any of the issues raised in this paper.

6.5 It would make the task of analysing responses easier if comments were referenced to the relevant section / paragraph number in each chapter and annex in this document or the relevant accompanying consultant's report.

6.6 Please also set out your reasoning and all supporting information for any views

[220] ComReg Consultation Procedures – ComReg Document 11/34: ComReg Consultation Procedures | Commission for Communications Regulation

expressed.

6.7 Submissions must be provided in written form (e-mail) to marketframeworkconsult@comreg.ie, clearly marked – Submissions to ComReg Document 21/134.

6.8 Electronic submissions should be submitted in an unprotected format so that they may be readily included in the ComReg submissions document for electronic publication.

6.9 ComReg appreciates that respondents may wish to provide confidential information if their comments are to be meaningful. In order to promote openness and transparency, ComReg will publish all respondents' submissions to this notice, as well as all substantive correspondence on matters relating to this document, subject to the provisions of ComReg's guidelines on the treatment of confidential information (Document 05/24[221]).

6.10 In this regard, respondents should submit views in accordance with the instructions set out below. When submitting a response to this notification that contains confidential information, respondents must choose one of the following options:

A. Preferably, submit both a non-confidential version and a confidential version of the response. The confidential version must have all confidential information clearly marked and highlighted in accordance with the instruction set out below and include the reasons as to why they consider any particular material to be confidential. The separate non-confidential version must have actually redacted all items that were marked and highlighted in the confidential version.

OR

B. Submit only a confidential version including the reasons as to why they consider any particular material to be confidential and ComReg will perform the required redaction to create a non-confidential version for publication. With this option, respondents must ensure that confidential information has been marked and highlighted in accordance with the instructions set out below. Where confidential information have not been marked as per our instructions below, then ComReg will not create the non-confidential redacted version and the respondent will have to provide the redacted non-confidential version in accordance with option A above.

6.11 For ComReg to perform the redactions under Option B above, respondents must mark and highlight all confidential information in their submission as follows:

[221] Response to Consultation - Guidelines on the treatment of confidential information – ComReg Document 05/24: Response to Consultation – Guidelines on the treatment of confidential information | Commission for Communications Regulation (comreg.ie)

A. Confidential information contained within a paragraph must be highlighted with a chosen particular colour,

B. Square brackets must be included around the confidential text (one at the start and one at the end of the relevant highlighted confidential information),

C. A Scissors symbol (Symbol code: Wingdings 2:38) must be included after the first square bracket.

For example, **"Redtelecom has a market share of [✂25%]."**

6.3 Next Steps

6.12 When it has concluded its review of all submissions received and other relevant material, ComReg's intention would be to publish a response to consultation, follow by a draft decision and draft regulations as appropriate.

Annex 1: Potential new band plans for existing Fixed Links

A 1.1 The bands allocated for Fixed Links in Ireland, and the channel arrangements within those bands, are in keeping with harmonised CEPT/ITU recommendations. The number of spectrum bands allocated for Fixed Links in Ireland is similar to approaches taken in other European countries,[222] and is necessary to accommodate the wide range of use cases and link length/capacity requirements for those use cases. Below is a list of potential channels for the Fixed Links frequency bands that are currently unavailable in accordance with latest CEPT/ITU recommendations:

- Frequency Band: L6 GHz, Bandwidth: 59.3 MHz;
- Frequency Band: U6 GHz, Bandwidth: 80 MHz;
- Frequency Band: L7 GHz, Bandwidth: 56 MHz;
- Frequency Band: U7 GHz, Bandwidth: 56 MHz;
- Frequency Band: L8 GHz, Bandwidth: 59.3 MHz;
- Frequency Band: U8 GHz, Bandwidth: 28 MHz;
- Frequency Band: U8 GHz, Bandwidth: 56 MHz;
- Frequency Band: 11 GHz, Bandwidth: 80 MHz;
- Frequency Band: 15 GHz, Bandwidth: 112 MHz;
- Frequency Band: 18 GHz, Bandwidth: 220 MHz;
- Frequency Band: 23 GHz, Bandwidth: 224 MHz;
- Frequency Band: 28 GHz, Bandwidth: 224 MHz; and
- Frequency Band: 38 GHz, Bandwidth: 224 MHz.

[222] See ECC Report 173 - Fixed Service in Europe Current use and future trends post 2016: https://docdb.cept.org/download/6fd0de6b-f796/ECCRep173.PDF

The L6 GHz Frequency Band

A 1.2 59.3 MHz Channel Spacing

CEPT/ERC/REC 14-01, Annex 1 59.3 MHz Channel Spacing		
Channel	MHz	MHz
1	5960.025	6212.065
2	6019.325	6271.365
3	6078.625	6330.665
4	6137.925	6389.965

The U6 GHz Frequency Band

A 1.3 80 MHz Channel Spacing

CEPT/ERC/REC 14-02, Annex 1 80 MHz Channel Spacing		
Channel	MHz	MHz
1	6480	6820
2	6560	6900
3	6640	6980
4	6720	7060

The L7 GHz Frequency Band

A 1.4 56 MHz Channel Spacing

CEPT/ECC/REC (02)06 Annex 1 56 MHz Channel Spacing

Channel	MHz	MHz
1	7156	7310
2	7212	7366

The U7 GHz Frequency Band

A 1.5 56 MHz Channel Spacing

CEPT/ECC/REC 02-06 Annex 1 56 MHz Channel Spacing		
Channel	MHz	MHz
1	7456	7610
2	7512	7666

The L8 GHz Frequency Band

A 1.6 59.3 MHz Channel Spacing

ITU-R F. 386-9, Annex 6 59.3 MHz Channel Spacing		
Channel	MHz	MHz
1	7762.525	8073.845
2	7821.825	8133.145
3	7881.125	8192.445
4	7940.425	8251.745

The U8 GHz Frequency Band

A 1.7 28 MHz Channel Spacing

ITU-R F. 386-9, Annex 2 28 MHz Channel Spacing		
Channel	MHz	MHz
1	8293	8412
2	8321	8440
3	8349	8468

A 1.8 56 MHz Channel Spacing

ITU-R F. 386-9, Annex 2 56 MHz Channel Spacing		
Channel	MHz	MHz
1	8307	8426

The 11 GHz Frequency Band

A 1.9 80 MHz Channel Spacing

CEPT/ERC/REC 12-06 Annex 1 80 MHz Channel Spacing		
Channel	MHz	MHz
1	10755	11245
2	10835	11325
3	10915	11405
4	10995	11485

5	11075	11565
6	11155	11645

The 15 GHz Frequency Band

A 1.10 112 MHz Channel Spacing

ITU-R F. 636-5 112 MHz Channel Spacing		
Channel	MHz	MHz
1	14557	14977
2	14669	15089

The 18 GHz Frequency Band

A 1.11 220 MHz Channel Spacing

CEPT/ERC/REC 12-03, Annex 1 220 MHz Channel Spacing		
Channel	MHz	MHz
1	17865	18875
2	18085	19095
3	18305	19315
4	18525	19535

The 23 GHz Frequency Band

A 1.12 224 MHz Channel Spacing

CEPT Recommendation T/R 13-02 Annex 1 224 MHz Channel Spacing		
Channel	MHz	MHz
1	22134	23142
2	22358	23366

The 28 GHz Frequency Band

A 1.13 224 MHz Channel Spacing

CEPT Recommendation T/R 13-02 Annex 3 & 5 224 MHz Channel Spacing		
Channel	MHz	MHz
1	28108.5	29116.5
2	28332.5	29340.5

The 38 GHz Frequency Band

A 1.14 224 MHz Channel Spacing

CEPT Recommendation T/R 12-01, Annex 1 224 MHz Channel Spacing		
Channel	MHz	MHz
1	37170	38430
2	37394	38654
3	37618	38878
4	37842	39102
5	38066	39326

Annex 2: Relevant methodologies for setting fees for Fixed Links

A 2.1 This Annex identifies the methodologies that could be used to estimate fees for Fixed Links in the absence of a market mechanism. These methodologies may form one or more regulatory options in the draft RIA.

- Description of potential methodologies for setting fees for Fixed Links; and
- Assessment of potential methodologies and suitability for consideration in the RIA.

Methodologies for setting fees for Fixed Links

A 2.2 In Annex 1 of Document 21/134a, DotEcon provides an assessment of the various methodologies available to ComReg for setting fees for fixed links administratively (i.e. outside of a market mechanism). DotEcon assessed four general methodologies[223]:

I. Universal system performance pricing ("USPP");

II. Administrative Incentive Pricing ("AIP");

III. Benchmarking; and

IV. Administrative cost recovery.

A 2.3 ComReg provides a brief description of each methodology before assessing the appropriateness of each Option for inclusion in the RIA.

I. USPP

A 2.4 The USPP approach implements a price for spectrum based on a set of relevant usage factors that are selected in advance, such as bandwidth, the number of channels or links used, degree of congestion, geographical location etc. Therefore, the term 'USPP' refers to a broad approach to spectrum pricing, with a specific implementation involving choice of a pricing formula and factors to act as inputs into that formula. Those choices will reflect both the policymaker's objectives and the need for a workable pricing formula based on objectively

[223] DotEcon also briefly assessed other methodologies for setting spectrum fees that are not broadly used internationally, as they are not easily adapted to different circumstances. These are all inferior to the methodologies above and were not assessed further

verifiable data forming inputs to that formula.

A 2.5 A typical application of USPP would identify various factors related to the interference, or 'pollution area', imposed on others by a given licence, and to set spectrum fees by applying rating factors. In effect, this penalises a licensee in relation to the spectrum that it denies other users. Such rating factors encourage efficient use through incentivising operators to establish links in a more spectral efficient manner and penalises spectrum hoarding. This should be thought of as accounting for the opportunity cost of the specific licence (i.e., the foregone spectrum uses as a result of the individual characteristics of a licence.

Example

USPP fee = (Bandwidth factor x Use factor x Frequency factor).

II. Administrative Incentive Pricing or "AIP"

A 2.6 AIP attempts to set prices equal to opportunity cost, such that only the highest value users have an incentive to take up licences in the band and an efficient outcome is achieved. A fee is based on an estimate of the opportunity cost of the spectrum, typically the value per MHz. This should be thought of as accounting for the opportunity cost of the spectrum (i.e., the foregone use of this spectrum.) The fee is set administratively to incentivise efficient use, rather than being determined by a process such as an auction, which would reveal opportunity cost through a competitive process.

Example

Fee = Reference Fee × Bandwidth factor × Frequency band factor × Path length factor × Availability factor

A 2.7 An AIP fee formula usually contains multiple criteria such as bandwidth, number of channels or links used, degree of congestion, geographical location etc that seek to account for the specific characteristic of the licence being awarded. Therefore, in practice, there may be some overlap between USPP, in that it implements a formula-based pricing rule based on various factors. However, with AIP, it is necessary to consider not just how a licence is used by the licensee, but also factors related to the value that excluded users might have for that spectrum (for example, the availability factor in formula in the box above might indicate congestion for a particular licence type).

III. USPP as an AIP proxy

A 2.8 DotEcon advises that, if the factors with a USPP formula are the key determinants

of opportunity cost and with an appropriate formula, then USPP could (in principle) be used as a proxy for opportunity cost. However, the term USPP is typically used to describe formula-based pricing rules more widely, whether or not they are intended to act as a proxy for opportunity cost.

A 2.9 Due to the difficulties in estimating opportunity cost (in particular, the lack of information that the administrator is likely to have about the value of excluded potential users for spectrum), AIP may in practice be implemented through a simplified formula that only includes the most significant drivers of opportunity cost. Therefore, any practical AIP scheme will involve a degree of averaging of opportunity costs across different users, rather than each user paying an opportunity cost individualised to its own specific circumstances.

A 2.10 Therefore, a formula-based implementation of AIP could be very similar in structure to USPP. For this reason, we use the term "USPP as an AIP proxy" below to describe a situation in which a formula-based pricing approach is used, but the factors within the formula and its parameters are chosen to proxy opportunity cost (at least in terms of its broad features).

IV. Administrative cost-recovery

A 2.11 Cost based fees can take the form of simple charges that are set at a level sufficient to recover the costs of spectrum management. This is one of the simplest methodologies available and may be appropriate when there is no threat of spectrum scarcity.

A 2.12 A typical formula for such an approach would be to calculate fees based on the estimated cost of the licensing regime divided by the number of licences.

Example

Spectrum Fee = Spectrum Management Costs / Amount of total Spectrum Assigned to the User

V. Benchmarking

A 2.13 Benchmarking estimates the value of spectrum based on the prices paid by licensees in other countries for access to equivalent spectrum.

A 2.14 Regulators may also carry out benchmarking by drawing inferences from market prices for substitutable bands, in the same or similar jurisdictions. Where fees are set by benchmarks derived from (competitive) auction results, this implicitly uses opportunity cost pricing. Regulators could also benchmark the fees set administratively in other jurisdictions.

A 2.15 ComReg's award of the 2 GHz band to Mobile Satellite Services ("MSS") in 2017 (the "SSA")[224], used benchmarking to set fees administratively.

Assessment of methodologies for setting fees for Fixed Links

A 2.16 DotEcon assessed these methodologies against four criteria which are broadly aligned ComReg's statutory objectives;

I. promoting competition and **efficient** use of the radio spectrum, including ensuring that the most valuable users should be prioritised where spectrum is scarce.

II. **simplicity for users**, to ensure that users and potential users do not face undue burdens. In particular, new users are not discouraged from applying (which reinforces a dynamic efficiency objective).

III. charges should be **predictable**, so that users do not face future price shocks.

IV. **practicality** of implementation for ComReg. It is of little value if a methodology provides theoretically optimal fees but requires inputs which are impossible to measure or otherwise unavailable to ComReg.

A 2.17 A summary of DotEcon assessment across each of the four criteria is provide in Table 6.

	AIP	USPP as an AIP proxy	Benchmarking	Administrative cost
Efficiency	Potentially good but may be difficult to measure opportunity costs with accuracy due to lack of information.	Potentially good if opportunity costs are reasonably approximated by the pricing formula.	Likely very poor in this case, due to highly varied basis of setting fixed link charges used by other NRAs and different scarcity environment in other countries.	Very poor, as unlikely to reflect opportunity cost and encourage more efficient use.

[224] Mobile Satellite Services with Complementary Ground Component Authorisation Regime, 17/19.

Simplicity	May be complex if many drivers of opportunity cost included.	Reasonable and significantly simpler than full AIP, as only key drivers of opportunity cost.	Simple	Simple
Predictability	Moderate – opportunity cost estimates may be unstable over time.	Good, provided that the price formula anticipates future requirements.	Moderate-low.	Moderate-high.
Practicality	Challenging due to difficulty of measuring opportunity cost, so in practice likely to fall back to some proxy approach anyway.	Reasonable.	Reasonable, though question of which benchmarks to use where there is significant variation across NRAs.	Good.

Table 6: Links in each bandwidth category under Option 1

A 2.18 Based on Table 5 and the assessment provided in Annex 1 of Document 21/134a, DotEcon suggests that a proxy for opportunity cost prices based on a formula that sets fees for all bands (i.e. what we describe above as USPP as an AIP proxy) could be an appropriate way to set fees for Fixed Links. This is more likely to support efficient use of the spectrum than simpler methods but remains more predictable and practical than using modelled opportunity cost estimates directly as fees.

A 2.19 ComReg agrees with the assessment provided by DotEcon and sets out its view in relation to each of the methodologies below.

A 2.20 **In relation to benchmarking,** comparable market values could be used to estimate fees for the Fixed Link Bands and reduce the burden of directly calculating the opportunity costs of spectrum. However, such an approach

requires benchmarks that are sufficiently reflective of opportunity costs in the Fixed Link Bands. With that in mind, ComReg notes that:

- spectrum rights of use for fixed links are rarely awarded by auction and only a small number of auction benchmarks are therefore available [225];
- such auctions are made on a very infrequent basis (10 -15 years); and
- such auctions cover only a small number of the 20 Fixed Links Bands.

A 2.21 Similarly, benchmarking against fees set administratively in other jurisdictions is also inappropriate. These fees are typically not reflective of opportunity costs (as they are not based on the outcome of a competitive process) and do not provide any particularly meaningful basis for setting fees in Ireland.

A 2.22 Further, any fees framework needs to account for the various use cases identified in this consultation. Fees in other jurisdictions were set historically (decades ago in some instances) and therefore could not account for the use cases that were consulted on in Document 20/109 and discussed further in this consultation.

A 2.23 For these reasons, ComReg could not rely on benchmarking to set fees for each of the Fixed Links Bands[226]. Therefore, there is no benefit in including benchmarking for consideration in the draft RIA.

A 2.24 **In relation to AIP**, ComReg notes that such an approach is theoretically appealing because it directly sets prices based on estimates of the opportunity cost, which should promote efficient use. However, and as noted by DotEcon, it is difficult to implement in practice. In particular, even under some simplifying assumptions (i.e. that marginal excluded users are existing fixed links licensees, and looking only at a scenario where there is acute scarcity if spectrum) the determination of the opportunity cost of the spectrum requires ComReg to calculate the discounted cash-flow of potential users with and without access to the spectrum under assessment. ComReg notes several difficulties with such an approach.

[225] For example, ComReg's 2017 26 GHz award and Norway 2020 Multiband award (0 GHz, 13 GHz, 18 GHz, 23 GHz, 28 GHz, 32 GHz and 38 GHz).
[226] ComReg notes that DotEcon/Axon has considered the small number of potential comparable in for the small number of instances available (e.g., ComReg's 26 GHz award).

- First, there could be a substantial difference in the use case of licensees and associated cashflow estimates. (i.e., there is likely to be a high degree of usage asymmetry between licensees). There are a variety of services for which Fixed Link Bands might be used, all of which have different commercial and revenue structures. This makes it very difficult to adequately reflect the opportunity cost arising from its use. Readers will be aware that this phenomenon is particularly acute in Fixed Links where there are a wide variety of different users and up to seven different use cases, as identified in Document 20/109;

- Second, there is a large amount of uncertainty surrounding the results of the modelling process. If the model has insufficient data or makes incorrect technical or commercial assumptions about licensees, this could result in errors that misrepresents the value of spectrum across all of the fixed link bands. It is unrealistic to suggest that ComReg can accurately determine opportunity cost for each band/region combination without relying on assumptions, but the robustness of those assumptions seem unlikely to be adequate; and

- Third, due to the reasonable confidential and commercially sensitive nature of much of the required information, it would be difficult to achieve transparency in implementing this approach.

A 2.25 For these reasons[227] ComReg could not rely on AIP to estimate fees for each of the Fixed Links Bands[228]. Therefore, there is no benefit in considering whether AIP is a valid regulatory option in the draft RIA.

A 2.26 **In relation to administrative cost**, ComReg agrees with DotEcon that such an approach is straightforward and simple to implement. However, ComReg also agrees that it does not reflect opportunity cost in any way and would provide poor incentives for efficient use more generally. Notwithstanding, where there is no risk of spectrum scarcity over a sufficiently long period, there may be a sufficient basis for it to be used to set fees for spectrum rights of use.

A 2.27 Therefore, ComReg is of the preliminary view that there is merit considering whether an administrative cost recovery option is a valid regulatory option in the draft RIA. [229]

[227] There is also a risk that fees would be set too low where the opportunity cost is low or zero. Such scenarios are problematic where potential scarcity is an issue because such fees do not provide licensees with incentives to use spectrum efficiently and promote greater availability of spectrum in the future.
[228] ComReg notes that DotEcon/Axon has considered the small number of potential comparable in for the small number of instances available (e.g., ComReg's 26GHz award).
[229] This assessment is provided in Step 2 of the RIA framework. 'Identify and describe the regulatory options'

A 2.28 The **USPP (as an AIP proxy)** proposed by DotEcon[230] recognises that any attempt to estimate opportunity cost accurately for 20 Fixed Link Bands is subject to significant data and assumption limitations. This approach identifies important drivers of opportunity cost (e.g., channel size, frequency band) and includes these as part of a formula for setting fees. While this would not be as accurate as a fully modelled approach (assuming data was even available), it constitutes a more realistic approach to providing a coherent schedule of fees for the Fixed Link Bands.

A 2.29 This formula-based pricing should effectively encourage more efficient use of the spectrum as long as the fees (and parameters informing same) are set at a level that does not choke off efficient demand. Indeed, such fees may be above the administrative cost if there is information available regarding the willingness of licensees to pay for spectrum rights of use in the delivery of services. This is particularly helpful in guarding against the risk of setting fees too low which could encourage spectrum hoarding and ultimately impede the availability of spectrum for more efficient users in the future.

A 2.30 The formula-based approach used in this methodology also has the advantage that it may be possible to retain the formula but to update specific parameters within it if future circumstances change. Therefore, it provides a reasonable compromise with providing predictability and clarity for licenses, but still provide flexibility for ComReg to modify fees if circumstances change.

A 2.31 In particular, the formula can be extended to include areas that are congested and reflect estimates of opportunity cost under different scarcity conditions. As noted by DotEcon, "*Although opportunity cost modelling is still necessary, the assumptions become less critical (e.g. ComReg can calculate opportunity costs under the assumption that there is scarcity, and use this as one of a number of inputs to the fees, rather than relying on detailed congestion estimates, which are complex given the interference analysis required).*"[231] These are estimated by comparing the costs incurred by fixed links operators to those they would incur in a counterfactual scenario in which some fixed links bands were switched off.

A 2.32 Therefore, ComReg is of the view that there may be benefit in considering whether the **USPP (as an AIP proxy) methodology** proposed by DotEcon is a valid regulatory option in the draft RIA.

[230] See Document 21/134a
[231] See Document 21/134a

Annex 3: Parameter values in Option 2

A 3.1 This Annex provides a formal description of the formula used to calculate fees under Option 2. Further, it outlines the values for each parameter under that option and explains the motivation for each value. The remainder of this Annex is laid out as follows:

- Section A 3.1 provides a formal description of the formula used under Option 2; and
- Section A 3.2 provides the justification for the proposed parameter values in the formula.

Formal description of the formula

A 3.2 The fee for a link of bandwidth h in band i, and area s is given by the following formula:

$$\text{Fee} = \max\left[x \times r_i \times c_{is} \times b(i,h), \quad A\right]$$

A 3.3 Table 7 below provides a description of each of each of the variables and how each variable is mathematically represented.

Variable	Description and proposed values
The base price: x	A base price per MHz, x; **ComReg propose setting x = €1.30** (i.e., €1.30 per MHz)
The frequency gradient is determined by r_i,	r_i, is a schedule of band specific values that determine the relative minimum prices per MHz across bands; The level of the schedule parameter for each band (i.e. the value of each r_i) is defined by ComReg and is not a formal part of the proposed formula. ComReg proposes initially setting the values of r_i (for bands other than 80 GHz) based on the approximate ratio of estimated opportunity costs for the highest frequencies and the lowest frequencies. Specifically, with the bands numbered from 1 to N in ascending order of frequency, for band i: $$r_i = 1 + (R-1)\,\frac{F_i - F_N}{F_1 - F_N}$$ where F_i is the frequency midpoint of band i, and R represents the ratio of estimated opportunity costs for the highest band and the lowest band. **ComReg proposes setting the 'top to bottom' ratio: R = 30.**

	For 80 GHz, ComReg proposes setting $\mathbf{r_i = 0.25}$ instead of using the formula, given the greater availability of of spectrum in the band.
A 'typical bandwidth': $\widehat{h_\iota}$	For each band, a 'typical bandwidth', generally reflecting the most common channel size used within that band, $\widehat{h_\iota}$; Let $\widehat{h_\iota}$ be the typical bandwidth of band i. Then effective bandwidth is equal to bandwidth for links at or above typical size and the weighted average of bandwidth and typical bandwidth for smaller links, that is: $$b(i,h) = \begin{cases} h & \text{if } h \geq \widehat{h_\iota} \\ \widehat{h_\iota} + m(h - \widehat{h_\iota}) & \text{if } h < \widehat{h_\iota} \end{cases}$$ The values for the typical bandwidths for each band are set out in Table 3.
The small link gradient: $\boldsymbol{m}$	A 'small link gradient', m, that applies to links with a channel size smaller than the typical bandwidth for the band; **ComReg proposes setting $\boldsymbol{m = 0.5}$** (i.e., fees fall by half the rate below typical channel size)
The congestion intensity: $\boldsymbol{c}$	The levels that the congestion intensity, c, can take. **ComReg proposes setting $\boldsymbol{c = 3}$ for congested fixed links.**
An administrative cost floor: $\boldsymbol{A}$	An administrative cost floor, A, to ensure the recovery of the administrative cost of a Fixed Link licence. **ComReg proposes to set a price floor of €100 per fixed link.**

Table 7: The values for the proposed model parameters under Option 2

Parameter values

A 3.4 DotEcon has suggested a range of valuations for each parameter which it considers should provide the correct level of incentive to licensees to mitigate the risks it has identified and best provide for the efficient use of the radio spectrum.

A 3.5 The values chosen by ComReg are those used as the basis for the assessment of Option 2 in the R.I.A and in the DotEcon assessment of the impact of fees (see Section 4.3.8 of the DotEcon Report).

A 3.6 ComReg discusses the parameters for each component of the formula in order below:

- Top to Bottom Radio;
- Base price;

- Congestion;
- Administrative costs; and
- Bandwidth.

Top to bottom Ratio

A 3.7 DotEcon makes two recommendations[232] in respect of the top to bottom ratio.

- First, that r_i is based on a ratio of at least R = 30 (i.e., ratio of 1:30) across bands from 1.3/1.4 GHz up to 42 GHz, noting there are grounds for setting an even steeper gradient, up to around R = 40; and
- Second, that $r_i = 0.25$ for the 80 GHz Band in the initial set of band schedule parameters, rather than basing this on the ratio of opportunity costs.

A 3.8 In relation to the first recommendation[233], ComReg is of the preliminary view that the frequency gradient should be strengthened relative to the current fee schedule to encourage use of the higher bandwidths in order to preserve spectrum for Fixed Links in lower bands. ComReg provides its detailed views on the frequency gradient in Section 5.6.1 including its view that the existing gradient level (1:10) is unlikely to be at a level that sufficiently reflects value differences between the bands, given that the cost modelling[234] suggests that a more appropriate ratio is the range of 1:15 to 1:54.

A 3.9 Given same, DotEcon advises[235] that:

- 1:15 is unreasonably low (because it is based on high bandwidth links that are unavailable below 11 GHz); and
- all ratios likely underestimate the difference in opportunity cost across the full range of bands, because the bands were grouped for the opportunity cost calculations. [236]

A 3.10 ComReg agrees with DotEcon that a ratio set too low and closer to R = 15 is unlikely to provide a strong enough incentive to avoid the lower bands when higher frequency bands would be sufficient. That said, there is little to be gained in setting the gradient too high and closer to R = 54 because that is only representative of a

[232] Document 21/134a, p 44-46
[233] Document 21/134a, p 45
[234] See Table 9, 10 and 11 of Document 21/134a.
[235] Document 21/134a, p 45
[236] These are ratios of average opportunity cost in the 1.3 – 8 GHz band to average opportunity cost in the 23 – 38 GHz bands).

very specific bandwidth usage (20 - 40MHz) and only in urban areas.

A 3.11 Alternatively, a ratio in the R = 30/40 range is likely more reflective of the estimated opportunity costs across different bands given the bandwidth requirements users will have in both urban and rural areas (i.e opportunity costs differ across bands, but also between rural/urban in a given band). R = 30/40 provides the best fit across those characteristics).

A 3.12 ComReg proposes to set $R = 30$[237] [238] at the lower end of the DotEcon recommendation (for bands up to 42 GHz), noting that should this level of gradient prove ineffective in encouraging operators to organise themselves efficiently within the bands, ComReg could address the matter by adjusting the band schedule parameters in the future.

A 3.13 In relation to the second recommendation, DotEcon suggests setting $\mathrm{r_i} = 0.25$ for the 80 MHz Band instead of using the formula. The opportunity cost modelling suggests that opportunity cost for the 80 GHz band is higher than for bands in the 23 – 42 GHz range because the large bandwidths used mean that it is not possible to switch into alternative (lower frequency) bands, and opportunity costs are driven by the need to use dual polarisation. DotEcon advises that the 80 GHz fees need to be matched to (uncongested) 42 GHz fees to avoid inefficient migration between the two bands. In that regard, applying a 1:4 ratio for the 80 GHz band relative to the 42 GHz band would roughly reflect both relative channel sizes and relative supply in the bands, thereby leaving fees for 80 GHz broadly unchanged.

A 3.14 Setting the position of the 80 GHz band in the set of round schedule parameters on the basis of relative opportunity cost would result in a higher r_i for 80 GHz compared to 42 GHz Band which would not be reflective of the level of substitutability between these bands. This would create potential distortions with licensees potentially applying for 42 GHz spectrum when they would have preferred spectrum in the 80 GHz band. This would run counter to ComReg's view that the frequency gradient should encourage use of the higher bandwidths to preserve spectrum for Fixed Links needing the propagation of the lower bands.

A 3.15 Therefore, ComReg agrees that setting $\mathrm{r_i} = 0.25$ is a practical approach to ensuring the 80 GHz Band and other substitutable bands are used more efficiently in the future.

A 3.16 The $\mathrm{r_i}$ for each band and the associated calculations are set out in tab 'Details of

[237] ComReg considers that this incentive does not disadvantage users with preferred bandwidths relative to the status quo, given that in fact that average fees for Fixed Links across all bands besides U6, 13, 18, 32 and 80 GHz are decreasing.
[238] Specifically, the r^i formula with R=30 for bands from 42GHz or below, and ri=0.25 for 80 GHz.

Bands' in the Assessment Tool.

The Base Price

A 3.17 DotEcon recommends that ComReg set the formula parameters in a way that restructures the fees rather than leading to a fundamental change in the fee levels. DotEcon advises that a reasonable approach might be to set x such that the standard fees for typical bandwidths in the most commonly used bands, 11 – 23 GHz, remains similar to those under the current regime. With that in mind, DotEcon recommends setting $x = 1.3$ which would keep the general level of charges for uncongested links at typical bandwidth broadly similar for the 11 - 23 GHz bands (given $R = 30$).

A 3.18 ComReg agrees with DotEcon that the proposed approach should restructure the fees (i.e., according to frequency gradient, bandwidth requirements, congestion etc) rather than concern itself with the overall fee levels[239]. Note that this view is informed by the clear evidence that existing fees levels have not appeared to have choked off efficient demand. Obviously, if ComReg was approaching this issue absent this information, it may initially set a different base price and review at a later time. However, the existing fees paid by licensees provide highly relevant information about the extent to which the rollout of services are impacted by a particular fee level.[240] In this case, the existing fee levels are highly unlikely to choke off efficient demand.

A 3.19 Setting $x = 1.3$ would broadly preserve overall fee levels on a static basis (i.e., if licensees make no changes to their existing deployment overall fees would not change). However, this approach would also provide incentives for Existing Licensees to deploy these links more efficiently over a period of time and reduce the fees paid by individual licensees. Reducing the base price would likely reduce the incentives for Existing Licensees to deploy links more efficiently because the savings from such a deployment would be reduced. Existing Licensees are more likely to choose a more efficient deployment where the savings from doing so are higher.

A 3.20 Separately, the fees for any new links, whether with existing or new licensees, would be those that are most cost effective from the outset. The extent to which overall fees would change in the future would be irrelevant and would simply be a by-product of the decisions made by licensees in the deployment of Fixed Links.

[239] ComReg does not have a revenue raising objective. Consequently, revenue generating issues are not relevant in determining an appropriate fees framework. The overall fees collected would be a by-product of an efficient fees framework.

[240] This reduces concerns that ComReg might normally have about fees being set too high.

A 3.21 Therefore, ComReg agrees that $x = 1.3$ is an appropriate base price.

Congestion

A 3.22 DotEcon estimate that the current opportunity cost for the congested 13, 15 and 18 GHz bands for a 56 MHz bandwidth is over €10k per annum. To implement congestion charging to reflect opportunity costs of that scale would require setting $c \approx 6$ for congested cases, rather than the current $c = 1.2$. DotEcon recommends that a first step might be to set c in the region of 2 - 4 for congested bands/areas[241]. An initial sharp increase above 4 is unnecessary because, among other things, the relative scarcity in particular bands may in any case be reduced by the proposed pricing formula.

A 3.23 ComReg is of the preliminary view that a value at the lower end of the 2 – 6 range is appropriate. ComReg proposes to set $c = 3$ in Dublin for congested bands only and $c = 1$ in all other cases. ComReg notes that as $c = 3$ is at the lower end of the 2 – 6 range, there is scope for c to be readjusted following future analysis in the proposed 3 – 5-year review. This may arise due to further or persistent congestion in the congested bands and areas of emerging congestion in bands or areas not currently designated as congested.

A 3.24 This represents a larger difference between the fees for Fixed Links in congested bands/areas and uncongested areas/bands compare with the current fee structure[242]. ComReg considers the increase in fees for congested Fixed Links to be appropriate given that congestion charges do not appear to have had the desired impact by failing to reduce congestion to date in the congested bands.

Typical Bandwidths

A 3.25 Typical bandwidths are (mostly) set as the modal bandwidth (i.e., the bandwidth that occurs most often) for each Fixed Link Band as of November 2021.

A 3.26 However, DotEcon advises that where there is a strong trend towards wider channels (at least above 11 GHz), it may be more appropriate to use 56 MHz as the typical bandwidth wherever this is feasible within the respective channel plan for the band (and the modal channel size is not larger). This would suggest setting the typical bandwidth at 56 MHz for the 38 GHz band, even though the modal channel size is currently (as of 2021) 28 MHz.

A 3.27 ComReg agrees that choosing the modal bandwidth is the logical approach for setting the typical bandwidth for each Fixed Link Band in most cases. Further,

[241] See Document 21/134a

[242] As DotEcon note, the existing regime has an implicit congestion factor of 1.2 in Dublin for congested bands.

ComReg also agrees with setting the typical bandwidth at 56 MHz for the 38 GHz band given the trend towards wider channels in that and other bands. Such an approach would allow for larger channels now which are likely to be required for that band in the future.

A 3.28 The typical bandwidth for each band and the associated calculations are set out in tab 'Details of Bands' in the Assessment Tool, which is available on request.

A 3.29 In relation to the small link gradient m, DotEcon notes that it needs to be sufficiently small to incentivise use of larger channels (rather than multiple smaller channels). DotEcon advises that a range of 0.4 – 0.6 would seem appropriate[243], noting that ComReg may adjust this in the future if it considers doing so would be beneficial.

A 3.30 ComReg agrees with DotEcon that a range of 0.4 – 0.6 is appropriate. In particular, m above that range would raise the question of whether it is even needed as part of the formula at all given the impact would be relatively small. Conversely, setting m below 0.4 means there would be less benefit to operators acquiring licences for channel sizes under the typical bandwidth which would increase possibilities for licensees holding larger channel sizes they do not need.

A 3.31 Therefore, ComReg is of the preliminary view that setting $m = 0.5$, at the middle of the range, is appropriate, noting that it will monitor this impact and amend if needed in the 3 – 5 year review.

Administrative Cost Floor

A 3.32 DotEcon considers that €100 is a reasonable level at which to set the administrative cost floor[244], based on the analysis of administrative costs by Axon.

A 3.33 This is estimated by DotEcon/Axon as follows:

A 3.34 First, ComReg's costs fall into three categories:

- one-off (e.g., equipment used to assess interference complaints);
- recurring (e.g., support and maintenance fees for the interference modelling software); and
- staff costs (e.g., salaries).

A 3.35 Second, for each item in these categories, the annual expenses is multiplied by the estimated proportion of the expense attributable to fixed links, and sum these

[243] See Document 21/134a

[244] Document 21/134a, Section **Error! Reference source not found.**.

to give an estimate of ComReg's total annual fixed links administrative cost. This comes to approximately EUR 835,000 per year. Dividing this by the total number of links in operation (as of 2021) gives an average cost estimate of €67 per link, which DotEcon recommends rounding up to €100 per link.

A 3.36 ComReg considers this approach to be appropriate noting that it is based on data confidentially provided by ComReg on its administrative costs for spectrum licencing[245]. ComReg considers the proposed weighting of the "*administrative price floor"* ($A = €100$) to be appropriate noting that this estimate only serves as a floor on fees and only becomes the actual fee for the 1.3 to 1.5 GHz bands (representing a €900 decrease per link.)

[245] For further information on the calculation of administrative cost for Fixed Links licences, see Annex B Document 21/134a

Annex 4: Relevant Legal Framework and Statutory Objectives

A 4.1 The Communications Regulation Act 2002 (as amended by the Communications Regulation (Amendment) Act 2007) (the "2002 Act"), the European Electronic Communications Code (which has repealed the EU Common Regulatory Framework, namely the Framework and Authorisation Directives);[246] the corresponding Framework and Authorisation Regulations[247](which must be read in light of the EECC), and the Wireless Telegraphy Acts 1926 to 2009[248] set out, amongst other things, ComReg's functions and objectives that are relevant to the management of the radio frequency spectrum in Ireland and to this consultation document and Response to Consultation.

A 4.2 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 relevant provisions of the European Electronic Communications Code. 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 4.3 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 functions, objectives powers, and duties 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. All references in this annex to enactments are to the enactment as amended at the date hereof, unless the context otherwise requires. All references in this annex to

[246] 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").

[247] 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.

[248] The Wireless Telegraphy Acts 1926 to 1988 and Sections 181 (1) to (7) and (9) and Section 182 of the Broadcasting Act 2009

enactments are to the enactment as amended at the date hereof, unless the context otherwise requires.

New European Electronic Communications Code

A 4.4 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 4.5 **It is important to note that further to Article 125 ("Repeal") of the EECC, with effect from 21 December 2020, the EECC replaced the EU Common Regulatory Framework adopted in 2002 (and amended in 2009) under which ComReg has regulated electronic communications since 2003[249].**

A 4.6 With some limited exceptions (see Article 124 of the EECC), Member States had until 21 December 2020 to transpose the EECC into national law[1]. The DECC is responsible for the transposition of the EECC[2] and ComReg has assisted the DECC in that regard as appropriate.

A 4.7 ComReg understands that the EECC is unlikely to be transposed into national law until early 2022. **However, for the avoidance of doubt, electronic communications providers must continue to comply with their obligations, and ComReg will continue to regulate the electronic communications sector under its existing powers, and redress mechanisms for customers will continue unchanged until new legislation is introduced.**

A 4.8 Notwithstanding, and for the avoidance of doubt, ComReg is satisfied that, to the best of its knowledge, the proposals contained in this document will not conflict with the objectives of the EECC or the obligations likely to be imposed on ComReg under national legislation implementing same.

A 4.9 All references in this annex to enactments are to the enactment as amended at the date hereof unless the context otherwise requires.

Primary Functions and Objectives and Regulatory Principles under the 2002 Act and Common Regulatory Framework

A4.10 ComReg's relevant functions pursuant to Section 10 of the Communications Regulation Act 2002 as amended include, the management of the radio frequency

[249] For the correlation table between relevant articles of the repealed Directives and the EECC, please see Annex XIII of the EECC available here- EUR-Lex - 02018L1972-20181217 - EN - EUR-Lex (europa.eu)
[1] With the exception of Articles 53(2), (3) and (4), and Article 54 (See Article 124).
[2] See, for example, https://assets.gov.ie/162712/1d774c6b-55d4-4b04-9253-8be6f24fb3ba.pdf

spectrum and the national numbering resource. It's primary objectives in carrying out its statutory functions in the context of electronic communications are to:

- ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under section 13 of the 2002 Act.
- Promote competition[250];
- Contribute to the development of the internal market[251];
- Promote the interests of users within the Community[252]; 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 Regulations[253] in particular those designed to ensure effective competition.[254]

Efficient management and use of the radio frequency spectrum

Framework Regulations

A4.11 Regulation 17 of the Framework Regulations governs the management of radio frequencies of 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[255], 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

[250] Section 12 (1)(a)(i) of the 2002 Act.
[251] Section 12 (1)(a)(ii) of the 2002 Act.
[252] Section 12(1)(a)(iii) of the 2002 Act.
[253] 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).
[254] Regulation 16(1)(a) of the Framework Regulations.
[255] Broadly equivalent to Article 4 of the EECC.

- 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 EU.

A4.12 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.

A4.13 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 A4.14 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.

A4.15 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”).

A4.16 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.

A4.17 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.

A4.18 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.

A4.19 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.

A4.20 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.

A4.21 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.

Authorisation Regulations

Decision to limit rights of use for radio frequencies

A4.22 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;
- 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.

A4.23 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.

A4.24 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

A4.25 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

A4.26 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

A4.27 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.

A4.28 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[256] 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[257].

[256] Note that the Framework Directive has now been replaced by the EECC.
[257] Note that the Framework Directive has now been replaced by the EECC.

- 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.

A4.29 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

A4.30 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.

A4.31 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."

A4.32 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

A4.33 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.

A4.34 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

A4.35 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).

Other Relevant Legislation and Policy Instruments

Wireless Telegraphy Act, 1926 (the "1926 Act")

A4.36 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.

A4.37 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.

A4.38 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.

A4.39 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.

A4.40 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.

A4.41 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")

A4.42 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)

A4.43 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

A4.44 On 15 February 2012, the European Parliament adopted the five-year Radio Spectrum Policy Programme ("RSPP") which establishes a multi-annual radio spectrum policy programme for the strategic planning and harmonisation of the use of spectrum. The objective 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 audiovisual policies.

A4.45 Among other things, Article 5 of the RSPP, entitled "Competition", provides:

"*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.

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."

Policy Directions[258]

A4.46 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.

A4.47 The Policy Directions which are most relevant in this regard include the following:

[258] 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

Policy Direction No.3 on Broadband Electronic Communication Networks

A4.48 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

A4.49 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

Policy Direction No.5 on Regulation only where necessary

A4.50 Where ComReg has discretion as to whether to impose regulatory obligations, it 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

A4.51 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

A4.52 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

A4.53 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)

A4.54 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.

Promotion of Competition

A4.55 Section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:

- encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector; and
- ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality.

A4.56 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.

A4.57 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. 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.

Contributing to the Development of the Internal Market

A4.58 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.

A4.59 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.

Promotion of Interests of Users

A4.60 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.

A4.61 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.

Technological Neutrality

A4.62 As noted, 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 Regulations in particular those designed to ensure effective competition.

Regulatory Principles

A4.63 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.

BEREC

A4.64 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.

Other Obligations under the 2002 Act

A4.65 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;[259]

- have regard to international developments with regard to the radio frequency spectrum[260]; 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.[261]

[259] Section 12(3) of the 2002 Act.
[260] Section 12(5) of the 2002 Act.
[261] Section 12(6) of the 2002 Act.

Questions

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