An Coimisiún um
Rialáil Cumarsáide
Commission for
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Consultation on proposed 26 GHz Spectrum Award 2018

Consultation

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1 Introduction

1 In its most recent Spectrum strategy statement, the Commission for Communications Regulation (ComReg) stated that it intended to consult on the proposed assigning of new rights of use for radio frequency spectrum ("spectrum") in the "26 GHz band", by granting new National Block Licences before the current licences expire in 2018.

2 This consultation paper sets out ComReg's proposals on the process for granting new National Block Licences in the 26 GHz band. In forming its proposals, ComReg has had regard to its statutory remit including its functions and objectives in managing spectrum (see Annex 2) and to its most recent Spectrum Strategy Statement[1]

3 This consultation paper considers aspects of the 26 GHz band, the type of award mechanism that might be used, the proposed approach to setting fees for new National Block Licences in the 26 GHz band, and the appropriate conditions to attach to those new licences. This paper is structured as follows:

- **Chapter 2** sets out background information on the 26 GHz band;
- **Chapter 3** sets out a Regulatory Impact Assessment on options for assigning new rights of use in the 26 GHz band;
- **Chapter 4** details key aspects of the proposed award including band plans, technology and service neutrality, and licence duration;
- **Chapter 5** sets out the proposed award type and format;
- **Chapter 6** discusses conditions that would attach to new licences;
- **Chapter 7** details how to submit responses and next steps in this consultation;
- **Annex 1** contains a glossary and definitions; and
- **Annex 2** summarises ComReg's statutory functions, objectives and duties in managing the national spectrum resource.
- **Annex 3** shows the duration of radio fixed link spectrum licences in the 26 GHz band throughout Europe.

[1] ComReg Doc 16/50 – "Radio Spectrum Management Strategy 2016 to 2018

2 Background

4 The entire 26 GHz band constitutes a total of 3 300 MHz of spectrum spanning the frequency range 24.250GHz – 27.550 GHz. In 2008, ComReg allocated a portion of the band (2 × 504 MHz) in the frequency ranges 24.773 – 25.277 GHz paired with 25.781 – 26.285 GHz (together the "26 GHz band") for national block use. That portion of the band was divided into 18 blocks of 2 × 28 MHz and could be used for Point-to-Point ("P2P") or Point-to-Multipoint ("PMP") applications on a national basis.

5 ComReg did not designate specific frequencies in the portion of the 26 GHz band at issue for specific technologies or applications (e.g. P2P or PMP). Rather, ComReg decided that the award process alone should determine the appropriate split – i.e. how many of the 18 blocks were assigned to P2P and how many to PMP.

6 ComReg also decided to assign P2P blocks in the upper part of the 26 GHz band and PMP blocks in the lower part. If all 18 blocks were assigned then 2 additional blocks would be designated as guard bands, in order to protect adjacent wireless communications (P2P links at the upper end of the 26 GHz band and FWALA services at the lower end).

7 The 2008 award process was designed to consist of a possible Second Price Sealed Bid auction followed by an Assignment Stage[2]. The Sealed Bid stage would only be required if demand exceeded supply and that stage would also determine the number of blocks that would be assigned to P2P and PMP. The Assignment Stage would determine how individual blocks would be distributed amongst bidders. It transpired that demand for the 26 GHz band did not exceed supply and the award process proceeded directly to the Assignment Stage.

8 13 of the 18 available blocks were assigned, 10 for P2P and 3 for PMP - see Figure 1(a). Three Ireland declined to take up the P2P block that it was offered.

9 In 2009, Digiweb (now Viatel) returned its PMP block. In 2012, Three Ireland (then Telefonica O2) requested that its 2 PMP blocks be converted into P2P blocks. ComReg acceded to this request following consultation[3] and the licence was amended accordingly – see Figure 2 (b).

[2] ComReg 0793R " The award of National Point to Point and Point to Multipoint in the 26 GHz Band – Information Memorandum"

[3] ComReg Consultation on the 26 GHz change of use request 12/64; https://www.comreg.ie/publications/?date_from=&date_to=&orderby=date__desc&limit=10&query=12%2F64&start-month=01&start-year=1995&end-month=05&end-year=2017
ComReg Response to Consultation on the 26 GHZ change of use request 12/19; https://www.comreg.ie/publications/?date_from=&date_to=&orderby=date__desc&limit=10&query=12%2F89&start-month=01&start-year=1995&end-month=05&end-year=2017

10 All of the existing National Block Licences are of 10 years duration and they expire on June 5 2018.

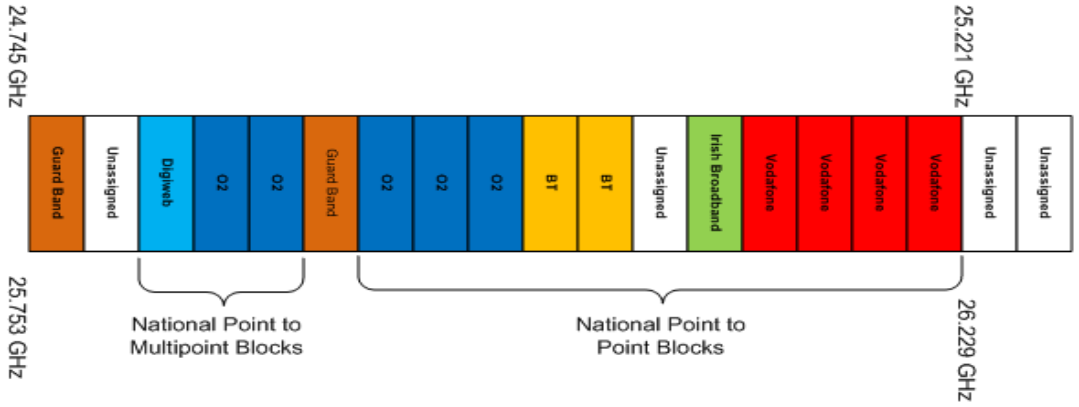

Figure 1 (a): 26 GHz National Block Assignments following the 2008 Award Process

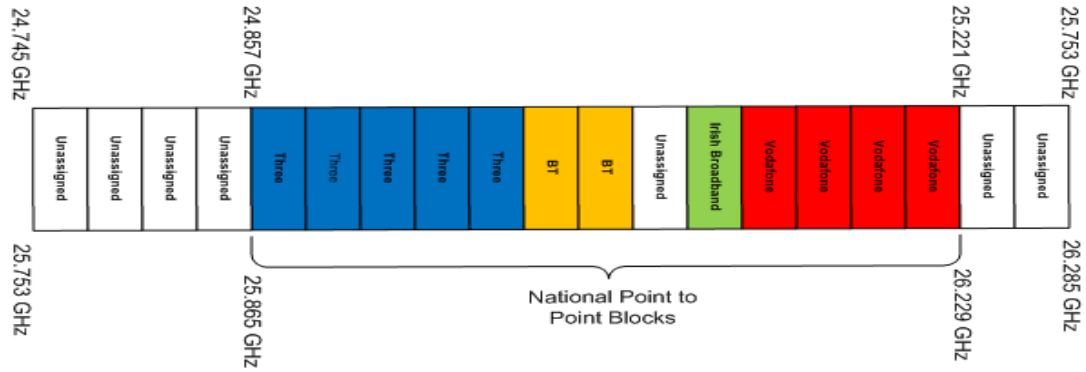

Figure 1 (b): Current 26 GHz National Block Assignments

Figure 1: 26 GHz National Block Assignment Channel Plan

2.1 26 GHz Band Plan

11 The entire 26GHz band spans the frequency range 24.25 GHz – 27.5 GHz. It is allocated in the EU for fixed and mobile use on a primary basis and in Ireland it is also allocated for short range devices ("Automotive Short Range Radar" and "Industrial Probing Radar") but on a secondary, licence exempt basis[4].

12 At present, this band is used to provide four types of wireless electronic

[4] See Radio Frequency Plan for Ireland https://www.comreg.ie/industry/radio-spectrum/radio-frequency-plan-for-ireland/

communications service, three on a primary basis and two a secondary basis (see Figure 2). The primary licensed uses are:

- Fixed Wireless Access Local Area (FWALA) (24.549 – 25.753 GHz)
- Fixed National P2P and PMP links (24.745 – 26.285 GHz)
- Fixed Individual P2P links (25.277 – 26.453 GHz)

The secondary licence-exempt uses are:

- Automotive Short Range Radar (21.65 – 26.65 GHz)
- Industrial Probing Radar (24.65 GHz – 25.5 GHz)

13 In addition, 1 863 MHz of spectrum in the band is currently unassigned and not being used – see Figure 2 below:

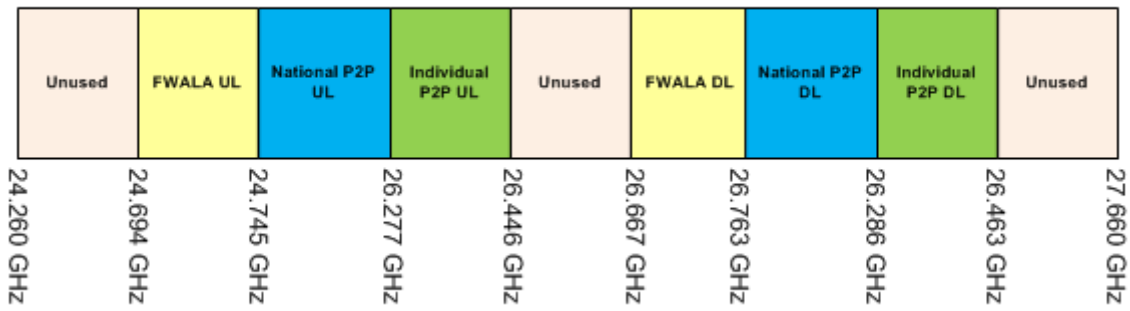

Figure 2: 26 GHz band plan overview

2.1.1 Automotive Short Range Radar and Industrial Probing

14 “Automotive Short Range Radar” and “Industrial Probing Radar” are short range devices that may be operated in parts of this band but on a secondary basis - i.e. they are prohibited from causing interference to any licensed apparatus in the 26 GHz band and are not protected from interference to them caused by such licensed apparatus. These short range devices are exempt from licensing under S.I 160/2006 and S.I. 405/f 2002. The operating frequencies and conditions of use for these devices are harmonised at EU level and are set out in ComReg Document 02/71R9 - Permitted Short Range Devices.

2.1.2 Fixed Wireless Access Local Area (FWALA) use

15 5 blocks of 2 × 28 MHz are allocated in the lower part of the band for FWALA use, in the ranges 24.594 – 24.745 GHz paired with 25.557 – 25.753 GHz. 3 of those 5 blocks have been assigned, one each to Imagine and Airspeed in Dublin and one to Titan in Limerick - see Figure 3 below.

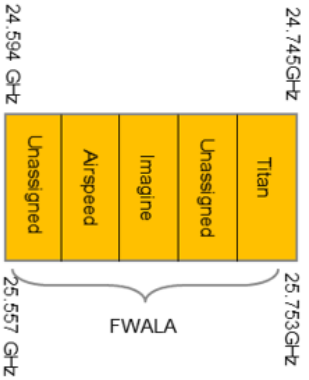

Figure 3: Details of 26 GHz FWALA assignments

2.1.3 Fixed Link Use

16 Fixed links form a major part of the infrastructure of electronic communications networks, being wireless devices or systems that connect two fixed locations. Fixed links are the main category of licensed “apparatus for wireless telegraphy” that utilise this band in the State. As detailed in Figure 2, ComReg currently licenses two types of fixed P2P links in the 26 GHz band:

- 6 blocks of 2 × 28 MHz channels for deployment of fixed Individual P2P links (25.277 – 26.453 GHz), and;
- Fixed National P2P and PMP Links (24.745 – 26.285 GHz).

17 Individual P2P links operate at the upper end of the band across six 2 × 28 MHz blocks labelled P1 – P6 (see Figure 4) and are licensed under the Wireless Telegraphy (Radio Link Licence) Regulations 2009.[5]

[5] S.I. 370/2009

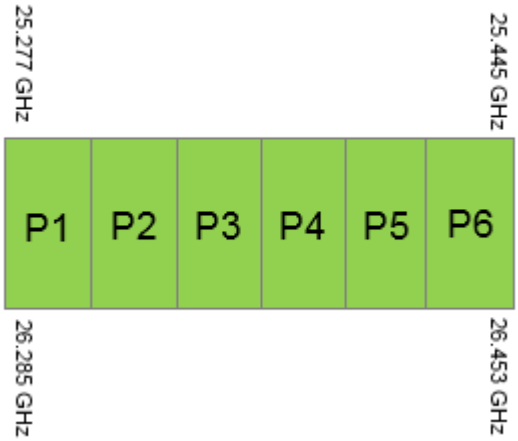

Figure 4: Individual P2P Channel Plan

18 As of the date of publication of this consultation paper, there are 384 Individual P2P links licences in the 26 GHz band, spread amongst 8 licensees. Meteor has 200 licences, Three has 127 (separate to its 5 National Block Licences), Vodafone has 39, Virgin Media has 8, Eir has 4, Airfibre has 3, ESB has 2, and Dundrum Credit Union has 1.

19 As stated above, four undertakings hold 12 National Block Licences in the 26 GHz band, granted under the Wireless Telegraphy (National Point-to-Point and Point-to-Multipoint Block Licences) Regulations 2007.[6] The frequency assignments are as follows (see also Figure 1):

- BT - 2 blocks: 24.997 – 25.053 GHz with 26.005 – 26.061 GHz
- Irish Broadband - 1 block: 25.081 – 25.109 GHz with 26.089 – 26.117 GHz
- Three - 5 blocks: 24.857 – 24.997 GHz with 25.865 – 26.005 GHz
- Vodafone - 4 blocks: 25.109 – 25.221 GHz with 26.117 – 26.229 GHz

20 ComReg intends to make 2 × 532 MHz available for new National Block Licences in a portion of the 26 GHz band. This will consist of 19 blocks of 2 × 28 MHz in the range 24.745 – 25.277 GHz paired with 25.753 GHz – 26.285 GHz.

[6] S.I. 762/2007

2.2 International Developments since 2008 Award

21 ComReg is following international developments to define standards and technologies for the next generation of mobile technology and to establish a regulatory framework to facilitate the roll-out of this technology, when appropriate to do so. Work in this area is ongoing within the International Telecommunications Union (ITU), the Conference of European Post and Telecommunications Administrations (CEPT), and in EU bodies including the Radio Spectrum Policy Group (RSPG) and the Radio Spectrum Committee (RSC).

22 The entire 26 GHz band is one of the candidate bands being considered by the ITU as it is seen as potentially suitable because it is currently internationally allocated to mobile services (amongst others) on a primary basis. If the work of the above bodies is completed in time and if international agreement is reached at WRC-19 (in late 2019) then the 26 GHz band or parts thereof may, by 2020, be designated internationally for next generation "International Mobile Telecommunication" (IMT) services.

23 While it is not certain that the 26 GHz band or parts thereof will be harmonised for IMT by 2019, the EU does nevertheless intend to reach regional agreement on the future of the 26 GHz band within the EU. The RSPG aims to "*facilitate the launch of 5G on a large scale by 2020, thereby ensuring that the benefits of 5G - based services are available to all European citizens*". In support of this roadmap, and as noted in a recent RSPG opinion[7], the 26 GHz band is one of a number of candidate bands[8] for the early deployment of what is now known as "5G" technology in Europe.

24 The current situation at the international level is thus uncertain in that ComReg does not have any certainty on which bands will eventually be designated for 5G. As against that, the current situation at the national level is certain in that ComReg knows that:

- The existing National Block Licences in the 26 GHz band will expire in June 2018;
- The existing National Block Licences occupy 1.064 GHz of the total 3.3 GHz of spectrum that makes up the 26 GHz band; and

[7] Radio Spectrum Policy Group – Strategic roadmap towards 5G for Europe – Opinion on spectrum related aspects for next generation wireless systems (5G) – RSPG16-032 – Published 09 November 2016

[8] The other bands being considered are; 3 400 – 3 800 MHz, 700 MHz, 24 GHz, 31.8 – 33.4 GHz and 40.5 – 43.5 GHz

- There is currently 1 863 GHz of spectrum in the 26 GHz band that is unassigned and this may be sufficient to meet any future mobile technology spectrum requirements.

25 ComReg, having considered what may happen internationally and what will happen nationally, is of the preliminary view that the best course of action at this time, with the portion of the 26 GHz band at issue, is to consult on conducting an award process for the granting of new National Block Licences in that portion of the 26 GHz band, and maintaining the existing FWALA and Individual P2P link licensing schemes in this band, on a primary basis.

3 Regulatory Impact Assessment

3.1 Introduction

26 All existing National Block Licences in the 26 GHz band will expire on 5 June 2018. This chapter sets out ComReg's draft Regulatory Impact Assessment (RIA) on how best to assign new spectrum rights of use in the 26 GHz band, by granting new National Block Licences (the "Assignment Process RIA"). This chapter concludes with ComReg assessing its preferred option arising from the RIA ("Preferred Option") against its statutory remit in managing spectrum,[9] including its relevant functions and objectives and the regulatory principles with which it must abide (see Annex 2).

3.2 RIA Framework

27 ComReg seeks to ensure that all of its regulatory measures are justified, proportionate, transparent, and non-discriminatory. A RIA is an analysis of the likely effect(s) of a proposed measure, including whether the measure is necessary at all. A RIA seeks to identify all possible measures and to then identify the most effective and least burdensome measure, in terms of achieving the desired objectives while minimising any regulatory burden.

28 There are five steps in a RIA and this chapter goes through all five:[10]

- Step 1: Describe the policy issues and identify the objectives;
- Step 2: Identify and describe the regulatory options;
- Step 3: Determine the impacts on stakeholders;
- Step 4: Determine the impacts on competition;
- Step 5: Assess the impacts and choose the best option.

Policy Issues and Objectives (RIA Step 1)

29 In the following sections, ComReg describes the specific policy issues to be addressed and the background to those issues, as well as the objectives to be achieved by assigning new 26 GHz National Block Licences.

[9] Set out in Annex 2.
[10] ComReg RIA Guidelines (2007) www.comreg.ie/media/dlm_uploads/2015/12/ComReg0756a.pdf

Policy Issues

30 As stated in its 2016-2018 Spectrum Strategy Statement,[11] ComReg does not favour any one process for awarding new rights of use for spectrum but prefers to decide upon the most appropriate process in each individual case. In this regard, there are various processes by which to award new rights of use in the 26 GHz band. For example, it could be done by administrative assignment following a comparative selection procedure or through a competitive market-based mechanism (i.e. an auction). Each process will typically have its particular advantages and disadvantages and one process may, on balance, be found to be the most suitable in light of the particular features of the spectrum to be assigned.

31 The primary policy issue herein is how to best assign new rights of use in the portion of the 26 GHz band at issue, by the granting of new National Block Licences.

Objectives

32 This RIA assesses the impact of the proposed measure(s) (see regulatory options below) on stakeholders, including consumers, and on competition. This should enable ComReg to identify and implement the most appropriate and effective means to assign the new rights of use , while also achieving the following objectives:

- To take appropriate measures in advance of the expiry of the current 26 GHz National Block Licences, in June 2018;
- To assign new rights of use in the 26 GHz band on the basis of justified, objective, transparent, and non-discriminatory selection criteria; and
- To promote the interests of end-users and the economic development of the State and the electronic communications sector.

33 ComReg aims to design and conduct the process for assigning new rights of use in the 26 GHz band in accordance with its statutory remit in managing spectrum which, in summary, is to encourage the efficient use and ensure the effective management of spectrum, to promote competition in the electronic communications sector, to contribute to the development of the internal market, and to promote the interests of users within the Community. See Annex 2 for a more detailed overview. ComReg's goal, ultimately, is to choose the regulatory measure(s) which are most likely to maximise the benefits for consumers, in terms of the price, choice, and quality of products and services.

34 The remainder of this chapter contains the "Assignment Process RIA" – this

[11] ComReg's Radio Spectrum Management Strategy Statement (2016-18) www.comreg.ie/publication/radio-spectrum-management-strategy-2016-2018/

addresses the primary policy issue and the statutory objectives outlined above.

3.3 Considerations relevant to the Assignment RIA

35 This section sets out relevant considerations in identifying and assessing an appropriate process for assigning rights of use for spectrum. Before setting out the specific options for assigning new rights of use in the relevant portion of the 26 GHz band, it is useful to present an overview of the two main processes by which rights of use for spectrum can be assigned:

1. **Administrative Assignment**: the regulator determines who obtains spectrum, how much they obtain, and the price paid; or

2. **Competitive market mechanism**: the process determines who wins the spectrum and the price paid, subject to objective and transparent rules set *ex ante* by the regulator (e.g. an auction).

36 ComReg considers that the above choices warrant an assessment on a case-by-case basis, having regard to the features of the band(s) at issue and the market circumstances. ComReg has previously expressed views on the assignment of spectrum by auction or administrative award, including in these documents:

- Chapter 3, Document 14/101[12]
- Chapter 3, Document 15/70[13]
- Chapter 3, Document 15/140[14]

37 Document 15/140, in particular, notes the outcomes that ComReg seeks to achieve in any spectrum award, irrespective of the particular process adopted (i.e. auction or administrative assignment). These outcomes include:

1. Determining which undertakings should be assigned spectrum rights of use;

2. Determining the quantum of spectrum to assign to each undertaking, and;

3. Determining the frequency ranges for the assigned spectrum rights of use.

38 As stated in Chapter 2, the new 26 GHz National Block Licensees will not be permitted to use their licences to provide mobile services or to own or operate PMP links; the new licences will be for P2P links only. For this reason, the possible fourth award outcome identified in Document 15/140 is not considered in this RIA because it relates to determining "*which electronic communications*

[12] ComReg (2014) 'Spectrum Award – 2.6GHz Band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz Band

[13] ComReg (2015) 'Consultation on Proposed 3.6 GHz Band Spectrum Award'

[14] ComReg (2015) 'Response to consultation and draft decision on proposed 3.6 GHz band spectrum award' (page 32)

networks/services using which technologies". The new 26 GHz National Block Licences will be restricted to P2P links.[15]

1. Determining optimum use of the spectrum

39 An administrative assignment can take many forms depending on what it is intended to achieve. Administrative assignments are likely to be most appropriate where there is relatively limited demand for a relatively large amount of spectrum, such that all applicants can obtain the amount of spectrum they require. In this situation, where supply exceeds demand, there is less risk of the regulator assigning the spectrum in a manner which will result in its inefficient use, since all competing requirements can be provided for.[16] However, ComReg is of the preliminary view that demand for the new rights of use in the 26 GHz band is likely to be greater than it was in 2008.

40 It is not clear which criteria ComReg should use in an administrative award, so as to determine which undertakings are assigned spectrum rights of use in a manner that should ensure its efficient use. For example, an administrative award could involve:

a) Granting spectrum rights of use to specific parties (such as incumbents);

b) Reserving spectrum rights of use for specific parties (such as new entrants);

c) Conducting a comparative award ("beauty contest") where there are particular objectives; and

d) Extending or renewing existing spectrum rights of use or assigning spectrum rights of use to particular undertakings for a particular period of time.

41 In relation to (a) - granting spectrum rights of use to specific parties such as incumbents - one could argue that an administrative award to 26 GHz incumbents, who were previously assigned such rights of use in 2008 on foot of an auction, may be appropriate if supply exceeded demand. However, such an administrative award would still run the risk of the assigned spectrum being used inefficiently, for the following reasons:

- The 2008 award represented an efficient outcome at that point in time but ComReg, at this point in time almost a decade later, must be open to the possibility of new entrants – i.e. there may be one or more undertakings who currently do not hold any 26 GHz rights of use but seek to obtain same and who may use those rights efficiently;

[15] To the extent that the technological scope for delivering fixed links exists and is likely to vary between operators, ComReg will considers these as part of the Final RIA.

[16] ComReg notes that even in scenarios where supply exceeds demand, it may apply certain obligations (e.g. fees) to ensure that assignment does not displace valuable future uses.

- Demand for new rights of use in the 26 GHz band - to support mobile, nomadic, and fixed wireless backhaul - is likely to be significantly higher in 2018 than in 2008 (see Section 3.4);
- There may be one or more undertakings who currently hold 26 GHz Individual Links Licences but who would rather obtain a National Block Licence containing a certain number of blocks (because a National Block Licence can be more cost effective than multiple Individual Links Licences, beyond a certain level of use) - see Annex A of the DotEcon Report (ComReg Doc. 17/85a);
- An administrative granting of new 26 GHz National Block Licences to incumbents could fragment the band, such that only one other block of four blocks would be available; and
- An administrative assignment of new 26 GHz National Block Licences would not provide criteria as to how the unassigned blocks from the 2008 award ought to be assigned.

42 In relation to (b) – reserving spectrum rights of use for specific parties such as new entrants - the 26 GHz band is not likely to be essential to the provision of backhaul though it may be a cost effective option depending on the network.

43 Annex A of the DotEcon Report shows that as the number of links increases, there is likely to come a point where National Block Licences become more cost effective, and thus more attractive, than Individual Links Licences. This depends on the fee for a National Block Licence compared to the fee for an Individual Links Licence. For example, at present a National Block Licence costs 33 to 39 times more than an Individual Link Licence. This means that someone who has 20 Individual Link Licences and is content is unlikely to want a National Block Licence, because the latter would be almost twice as expensive but would convey little or no competitive advantage. However someone with, say, 30 or more Individual Link Licences may have reached the point where a single National Block Licence is the more cost effective, and hence the preferable, option.

44 Any potential new entrant to the 26 GHz band has options other than being assigned rights of use in that band through an open competitive award process. For example, alternative options for backhaul include:

- using individual fixed P2P links in the upper part of the 26 GHz band; and/or

- using alternative spectrum bands17 of which there are 21 with the closest being the 23 GHz and 28 GHz bands[18].

45 Further, potential new entrants may include undertakings who are already active in the downstream retail market for the provision of mobile services to end users and an administrative assignment of 26 GHz spectrum rights of use to such undertakings could distort competition in that downstream market.

46 Given the likely use of the 26 GHz band, ComReg does not consider that the administrative assignment of new 26 GHz rights of use is likely to be sufficient, of itself, to result in new entry to the Irish communications market. In order for any new entrant to be viable, it would probably require rights of use in a number of spectrum bands – i.e. having rights of use in the 26 GHz band alone would be not be sufficient, particularly given that they would be restricted to P2P. Therefore, reserving some of the 26 GHz band for new entrants could result in one or more of the 19 available blocks going unassigned when they could otherwise have been assigned to, and efficiently used by, incumbents.

47 In relation to (c) - conducting a comparative award or "beauty contest" - ComReg would require all relevant information in order to assess how a given spectrum band, or part thereof, should be distributed amongst a number of undertakings with a view to determining which of those undertakings would generate the greatest value from that band. If there were competing demands for spectrum then it would be difficult for ComReg to determine, to any degree of accuracy, the exact combination of applicants and spectrum assignments, individually or collectively, which should result in the most efficient use of the spectrum, thereby ensuring that its economic and societal benefit is maximised. As described in Document 15/140, a number of factors limit the extent to which a regulator can hope to accurately identify the optimum licensees through a comparative award process:

- Applications are likely to be voluminous and the length of time required to review, analyse and compare applications is likely to be extensive;
- Considerable information asymmetries exist between the regulator and applicants such that it may be difficult for the regulator to make comparative evaluations that are sufficiently robust; and
- The risk of legal disputes arising over assignments made on foot of decisions which are, by their nature, somewhat subjective can result in uncertainty and

[17] The 21 other spectrum bands used for P2P links are: VHF-UHF, 1.3-1.4 GHz, 1.3-1.5 GHz, 2.0-2.3 GHz, L6, 6 GHz, U6, L7, 7 GHz, L8, U8, 11 GHz, 13 GHz, 15 GHz, 18 GHz, 20 GHz, 23 GHZ, 28 GHz, 38 GHz, 42 GHz, and 80 GHz.

[18] Note - national block licences are only available in the 26 GHz band; all of the other 21 bands use individual P2P licencing only. The top 5 bands with P2P links deployed (as at May 2017) are: 26 GHz (3,200); 38 GHz (2,200); 15 GHz (1,900); 23 GHz (1,800) and 13 GHz (1,500).

delay. This can be detrimental to undertakings seeking to obtain the spectrum rights of use and to end users in any affected downstream markets.

48 In relation to (d) - extending or renewing existing spectrum rights of use or assigning spectrum rights of use to particular undertakings for a particular period of time - it could be argued in this instance that ComReg ought to extend current rights of use in the 26 GHz band until such time as there is more certainty as to whether the band will be harmonised for future mobile technology. However, this RIA does not consider the extension of existing 26 GHz rights of use as being a valid regulatory option, for two reasons:

(a) There is still significant uncertainty as to whether the 26 GHz band will be harmonised for future mobile technologies and, even if this does eventually happen, there is still significant uncertainty as to *when* it will happen (i.e. if the WRC-19 window is missed then it would not happen until WRC-23 at the earliest). There is also likely to be considerable potential for co-existence of fixed links with these new mobile technologies.

(b) Current providers of electronic communications services in the State require considerable certainty as to their ability to continue to own and operate fixed links, and more certainty than could reasonably be provided by a relatively short-term extension.

(a) Uncertainty around harmonisation for future mobile technologies

49 All existing 26 GHz National Block Licences will expire before the earliest possible date by which the 26 GHz band could be harmonised for any future mobile technologies (end of 2019 or possibly end of 2023).[19] In addition to uncertainty as to *when* the 26 GHz band will be formally harmonised, there is also considerable uncertainty around the use of the 26 GHz band for what is being called 5G, including:

- the current absence of a 5G technical standard[20],
- the availability and cost of 5G-enabled equipment in the 26 GHz band;
- whether harmonisation will include some or all of the 26 GHz band; and
- the full range of bands that any future mobile technology standard would encapsulate.

50 There is also likely to be considerable potential for co-existence of fixed links with any new mobile technologies – i.e. for the 26 GHz band to be used for fixed links

[19] WRC-19 will decide on the allocation of the band - or parts of it - to the mobile service on a primary basis for the development of advanced IMT, which means that no final decision in terms of Radio Regulations will be taken before 22 November 2019.

[20] EC Radio Spectrum Committee issued a mandate to CEPT in Dec 2016 to develop 5G harmonised technical conditions by mid-2018.

and mobile services at the same time. [21] Given the current use of the 26 GHz band, undertakings are unlikely to know whether, or the extent to which, new mobile services may be rolled out using the 26 GHz band until studies on the co-existence of fixed links with advance IMT technologies have been completed.

51 It would not be appropriate to extend current 26 GHz National Block Licences absent all necessary information as to whether or when the 26 GHz band will be harmonised for mobile services and on the future evolution of mobile technology, once bands for same have been harmonised. To extend current licences in anticipation of the future harmonisation of the band for mobile services, but where considerable uncertainty still exists around the timing of such harmonisation and roll-out, would not promote regulatory predictability and could lead to inefficient use of the 26 GHz band.

52 Alternatively, if rights of use in the 26 GHz band were to be assigned by a competitive market process, similar to that used in 2008, then this would allow ComReg to consult, at a later point and if necessary, on whether to provide for early liberalisation[22] of the 26 GHz band or for any other appropriate measures.

(b) Need for fixed link regulatory certainty

53 The extension of current 26 GHz licences would not provide regulatory certainty for the provision of fixed links for which, unlike future mobile services, there is already a clearly established use. Licence extensions typically involve a short term extension and are unlikely to give incumbents the certainty they require if they are to invest in 26 GHz specific network infrastructure, because they would not know if they could hold their 26 GHz rights of use for a sufficient period of time as to recoup the costs of their investment. Further, licence extension only applies to incumbents and ComReg would still need to put in place measures to assign rights of use for remaining spectrum in the band.

54 Alternatively, the granting of new, 26 GHz National Block Licences should give all new licensees sufficient certainty. They would know that they would have 10 years in which to invest in 26 GHz fixed links infrastructure and to recoup their investments. They would also know that if certain events should unfold within the 10-year period and if the need arises then they may be given the option of early

[21] As noted by DotEcon, in line with the EC mandate, CEPT is currently conducting studies for the introduction of 5G in the 26 GHz band, taking into account the protection of all existing services in the band and in adjacent bands.

[22] "Although the definitive meaning of early liberalisation would be context specific, in the present context it would mean a process whereby a holder of spectrum rights could, in advance of the expiry of its existing licence, avail of a potential licence upgrade such as to enable new spectrum uses different to those when the licence was originally granted. As an example, ComReg permitted existing GSM licensees to liberalise GSM 900 MHz and 1800 MHz spectrum for alternative uses such as 4G.

liberalisation of their 26 GHz licences in order to provide new mobile services.

55 The extension of current 26 GHz licences could also delay any new entry as might otherwise occur, by any other undertaking seeking to deploy P2P links in the 26 GHz band under a National Block Licence. Licence extensions could also delay any planned re-assessment of existing rights of use by incumbents in the band, who may have a requirement to increase or decrease the quantity of their current spectrum holdings.

2. Determining how much of the 26 GHz band should be assigned to each undertaking

Administrative Assignment

56 The extent to which participants in the future award process will require specific quanta of spectrum in the 26 GHz band [23] is likely to vary between those participants and will depend on a number of factors including channel spacing, modulation, traffic optimisation, and commercial offering[24] (now and in future). These factors are likely to vary between participants and ComReg is not likely to have all necessary information by which to determine how to best apportion the available spectrum between applicants in order to achieve the most efficient assignment. It would be difficult for ComReg to assess what combination of applicants and quantum of spectrum (individually or collectively) would generate the greatest value.

57 Even where there are only a small number of possible outcomes, it would be difficult to accurately assess those outcomes and to determine the most efficient package and doing so would likely require extensive modelling.

Auction

58 A spectrum award process that utilises a market mechanism (i.e. an auction) means that ComReg is not required to make a determination (based on incomplete and imperfect information) on the complex question of how best to assign spectrum so as to ensure its efficient use. The auction itself determines the quantum of spectrum that is assigned to each participant and the cost of same (the licence fee). A well-designed auction that incentivises truthful bidding (according to valuation) can extract information about bidders' valuation structures that would otherwise not be available to the regulator. This can be used to ensure that the spectrum is awarded efficiently to those bidders that value it the most

[23] The throughput that can be delivered by a microwave point to point link is proportional to the spectrum bandwidth. For example, a microwave system using 28 MHz of bandwidth will deliver twice the throughput of a microwave system using 14 MHz, using the same technology.

[24] For example, does an operator offer large data packages. Operators also have to dimension their backhaul network in terms of peak throughput to ensure required speeds are achieved.

(where valuations can be reasonably expected to provide a proxy for the social welfare that could be generated by the bidder using the spectrum, and to establish prices based on the market value of the spectrum implied through the bids received.

3. Determination of which part of the 26 GHz band the spectrum rights should be located

Administrative Assignment

59 An administrative award of new rights of use in the 26 GHz band would also require ComReg to decide where in the band to place each winning applicant.

60 ComReg would expect 26 GHz incumbents to prefer to remain in their current locations, so as to avoid any costs of having to retune and/or change equipment (see section 5.4 of Chapter 5). However, to allow incumbents to remain in their current locations would create a bias in that it would favour those incumbents over potential new entrants, or indeed over any incumbents who wish to change their locations in the band. Further, it would not be possible for ComReg to accurately assess the value of specific locations in the band to specific applicants or to assess the impact of incumbents having to move from their current locations, as the impacts could vary significantly depending on the specifics of such moves.

61 In addition, any remaining blocks would not be contiguous and may not be sufficient for other applicants, exposing them to aggregation risk or creating the risk that spectrum that otherwise would have been assigned and used would not be assigned, contrary to the objective of ensuring the efficient use of spectrum. This would also create difficulties for any incumbents seeking to increase their holdings as they might not be able to fit their requirement into a contiguous block if other incumbents are fixed to a particular location in the band.

Auction

62 Unlike administrative (or comparative) assignments, auctions allow the market to determine the specific frequency assignments for each winning bidder. This promotes efficient assignment based on information about bidders' preferences that would otherwise not be available to the regulator.

63 The auction process described in Chapter 5 provides for a frequency generic or a frequency specific auction:

(i). A frequency generic auction has two stages. Bidders are assigned spectrum in the first stage and this is followed by a second 'assignment' stage in which bidders are given the opportunity to express their valuation for specific frequencies in the band.

(ii). A frequency specific auction allows bidders to express their value for

specific frequencies from the outset, thus allowing incumbents who value remaining in their current locations in the band to bid accordingly.

Both formats give bidders opportunity to express their value for specific frequencies within the band. An auction removes the problems with determining specific frequency assignments which are present in an administrative assignment process.

3.4 Identifying the options (RIA step 2)

64 In light of the above, ComReg considers that two options are available:

- **Option 1**: Assign new 26 GHz rights of use by administrative assignment; or
- **Option 2**: Assign new 26 GHz rights of use by auction.

65 The following sections consider the likely impacts of the above options on industry stakeholders, competition and consumers.

66 Prior to assessing these impacts, this RIA sets out ComReg's preliminary views on demand for 26 GHz rights of use, particularly in light of developments since the 2008 award.

Demand for 26 GHz rights of use

67 Since 2008, several market developments have changed the nature of backhaul significantly such that demand for 26 GHz rights of use is likely to have increased:

- Consumer demand has shifted from "voice and text" to mobile, nomadic and fixed wireless data (such as streaming of video content);
- Wireless data traffic has increased sharply and is forecast to increase further:
  - Mobile data usage increased by 500% between 2012 and 2016[25],
  - A 2015 report for ComReg by Frontier Economics conservatively estimated that there will be a 33-fold increase in user demand for mobile data between 2015 and 2035;[26]
- The faster data speeds enabled by 4G LTE networks[27], as compared with 2G and 3G networks, has put additional stress on backhaul infrastructure[28] - as data usage continues to increase and new technologies emerge, demand for ever more backhaul capacity can also be expected to increase;

[25] ComReg's 'Radio Spectrum Management Strategy Statement 2016-18' (page 2)
[26] ComReg document 15/62a 'Cost benefit analysis of the change of use of the 700 MHz radio frequency band in Ireland' (page 2)
[27] This will continue to increase in line with improvements in throughput and spectral efficiency for the current and future LTE releases.
[28] Capacity requirements of 4G backhaul networks are significantly higher than for 3G networks

- There has been a significant increase in the assignment of spectrum rights of use for the provision of electronic communications service - since 2008, an additional 500 MHz has been assigned for mobile, nomadic and fixed wireless broadband services and a further 390 MHz has potential to be assigned;[29]
- Irish MNOs have extended and continue to extend coverage into rural areas where existing fibre backhaul connections may not be available; and

68 In order to meet the ever increasing demand amongst consumers for faster and more ubiquitous mobile data services, operators are already investing in expanding their networks. This includes having to invest in backhaul infrastructure, including fixed P2P links. For example:

- P2P links in the 26 GHz band have increased from 1,300 National Block Links in 2011 to 2,800 National Block Links in 2017 (driven mainly by the two MNOs with National Block Licences, Vodafone and Three).
- An alternative to 26 GHz National Block Licences in this band are Individual Link Licences – located in the upper part of the 26 GHz band.[30] Meteor, the only MNO without a 26 GHz National Block Licence, has maintained a broadly steady deployment of individual P2P links using Individual Link Licences (Meteor had 235 individual P2P links in 2011 and currently has 200);
- Vodafone and Three, the two MNOs with 26 GHz National Block Licences, also utilise 26 GHz Individual Link Licences though their deployment of Individual Links has decreased over the past five years (perhaps because their use of 26 GHz National Blocks has increased); and,
- The total number of undertakings utilising 26 GHz Individual Link Licences increased from four in 2011 to eight[31] in 2017; in that same period, the total number of individual links decreased from 657 to 417.

69 Given the above, ComReg is of the preliminary view that demand for rights of use in the 26 GHz band is likely to be notably higher today than it was in 2008.

3.5 Impact on stakeholders (RIA step 3)

70 There are essentially two stakeholder groups who will be affected by the regulatory decisions made on foot of this consultation:

(i). Industry stakeholders who include incumbent[32] 26 GHz National Block

[29] See Section 5.2.2 of ComReg's Spectrum Strategy Statement, Document 16/50.
[30] Individual links licence spectrum 25.277–25.445 GHz duplexed with 26.285–26.453 GHz
[31] The eight licensees, in order of number of individual links deployed (as at June 2017) are: Meteor, Three, Vodafone, Eircom, Virgin Media, Airfibre Ltd, and Dundrum Credit Union.
[32] Incumbent licences in the 26 GHz band include: two MNOs (Three and Vodafone) with five and four blocks of spectrum respectively; and two other authorised operators (British Telecom and Irish Broadband) with two and one blocks of spectrum respectively.

Licensees (12 blocks of 2 × 28 MHz) and potential new entrants[33] from within or outside the State; and

(ii). Consumers who are assessed in Section 3.7.

71 In this RIA, the impact on industry stakeholders is first considered, followed by the impact on competition, followed by the impact on consumers. The order of this assessment does not imply any order of relative importance but is as a logical progression. For example, a measure which safeguards and promotes competition should in turn have a net benefit for consumers. In that regard, the assessment of the impact on consumers draws substantially on the assessment of the impact on competition.

72 Prior to its future consideration of all submissions made in response to this consultation, ComReg has, in the following analysis, taken what it considers to be a reasonable and pragmatic approach to considering the likely impact of each identified option on the various stakeholders. ComReg does not yet know the views on particular matters that have yet to be expressed by stakeholders but ComReg has been able to rely upon its considerable experience and developed expertise in managing the national spectrum resource and has had regard to the advice of its external consultants.

73 As noted above, industry stakeholders can be split between incumbents (current 26 GHz National Block Licensees) and potential new entrants**.**

Option 1 vs Option 2

74 26 GHz incumbents are likely to favour the administrative assignment of new 26 GHz rights of use (replacing those that will expire in 2018) because such a process would likely give them the greatest opportunity to retain their current rights of use and their locations within the 26 GHz band (noting that there could be additional costs in having to moving to new locations).

75 Administrative assignments would likely ensure that all incumbents remain in the 26 GHz band for 10 more years, if they so wish. However some incumbents may not prefer an administrative assignment if the terms of that assignment (i.e. the specific quantum of spectrum being offered and the location in the band) would not meet the incumbent's current or future needs. Significant costs could be incurred by some incumbents even under an administrative assignment, depending on how many links are currently deployed by an incumbent and how

[33] ComReg considers new entry from three perspectives: (i) pure new entry where entrant is currently not assigned any rights of use in the state; (ii) new entry to the 26 GHz band; and (iii) new entry to national block assignments.

many of those links must be retuned or replaced (see Chapter 5)[34].

76 Some incumbents may also prefer Option 2, an auction, because it would offer the greatest amount of contestable spectrum. Rather than merely being able to retain their current holdings in the 26 GHz band, incumbents would have an opportunity to *increase* their current holdings (subject to any competition caps that may be imposed).

77 ComReg's preferred award format at this point in time is a 'sealed bid combinatorial auction'. This format should take less time to complete than a multi-round auction format or an administrative award (likely to take significant time given the likely volume of applications that ComReg would have to assess).

78 Under Option 2, new entrants and incumbents could all compete openly with one another for any of the 19 National Blocks being auctioned. This should give more opportunity and greater flexibility to bid for more spectrum and to acquire larger contiguous blocks, compared to an administrative process designed largely with the objective of allowing incumbents to remain in their current locations. Option 2 should also provide new entrants with greater opportunity to win spectrum because an auction format exposes incumbents to the opportunity cost of retaining their existing spectrum holdings (i.e. if they want it then they have to pay opportunity cost). An administrative award is potentially less likely to reveal such information; it would be down to the judgment of the regulator as to how to best assign the spectrum and it could be a big call to take spectrum away from an incumbent who argued its case for retaining same (even if the spectrum was not being used efficiently, which in any case may be difficult to determine).

79 While potential new entrants would likely prefer Option 2 over Option 1, some may prefer a variant of Option 1 in which some of the 26 GHz band would be reserved for new entrants.

80 As previously noted, there is likely to be greater demand for 26 GHz rights of use in 2018 than in 2008, especially in certain frequency ranges which align with existing licensees. ComReg thus considers that some industry stakeholders (incumbents and new entrants) may, on balance, prefer Option 2 (auction) over Option 2 (administrative assignment) because Option 2 would give them the best opportunity to meet their requirements – i.e. to increase their holdings or retain their current holdings but move to more favourable locations in the band.

[34] However, this should be balanced against the extent to which P2P links are due for replacement or upgrade in any case, given that the normal investment cycle for such equipment is about 8 to 10 years.

3.6 Impact on competition (RIA step 4)

81 Each option's likely impact on competition is assessed at two interconnected levels:

1. Competition during the award process. This occurs where bidders compete with each other for blocks of spectrum and the final price paid reflects the relative value attached to each block; and

2. Downstream retail competition[35]. This refers to competition between winning bidders and other market participants active in affected downstream markets such as fixed and mobile telephone and fixed and mobile broadband services.

1. Competition within the award process

82 Any form of administrative assignment entails a limited range of possible outcomes. The more extensive the restriction in terms of the possible assignment outcomes it precludes, the greater the risk of precluding the true optimal assignment.

83 Ordinarily, assigned spectrum should be used efficiently if the assignees pay at least the opportunity cost of that spectrum.[36] Opportunity cost-based pricing creates incentives for bidders to reveal their willingness to pay for the spectrum, thus helping to ensure that the spectrum is awarded to those who value it most and thereby achieving an efficient assignment. Prices based on opportunity cost also have the advantage of ensuring that there are 'happy losers', - i.e. that there are no other bidders or groups of bidders who would have been willing to buy the spectrum assigned to a winning bidder at a higher price than the winner was required to pay.

Administrative Assignment

84 In the case of a direct administrative assignment of the 26 GHz band, of the type likely to be favoured by incumbents, ComReg has limited information about:

- The economic and social value of the services that each applicant could provide, and
- The bandwidth and frequency range that would need to be assigned to each applicant.

85 There is a risk that applicants could exaggerate their business cases in applying

[35] ComReg notes that 26 GHz band rights of use apply to fixed links only and any impact at network/infrastructure level could ultimately be felt in the downstream market.

[36] The opportunity cost is what an alternative operator would have been prepared to pay for the spectrum, e.g. the next highest bidder in an auction award.

for new 26 GHz rights of use through an administrative award. As a consequence, the level of competition between applicants for the available rights of use could be somewhat artificial. And as a consequence of that absence of real competition, the actual effects on the market may be different than ComReg, based on its assessment of the evidence before it, had envisaged.

86 The probability of undertakings being assigned 26 GHz rights of use below opportunity cost may be higher in an administrative award than in an auction. This is because ComReg would have less information about the value that alternative undertakings would place on those rights of use. In this sense, an administrative award could cause alternative undertakings to be artificially excluded from the award process, which would mean that their intended uses of the 26 GHz band would never manifest.

87 It is therefore difficult for ComReg to accurately determine the criteria for an administrative assignment and there is a risk that 26 GHz rights of use could be assigned in a manner which would result in the inefficient use of the 26 GHz band, both in terms of selecting the successful applicants and determining how much spectrum to award to each successful applicant.

Spectrum reservation

88 Similarly, to reserve some amount of the 26 GHz band for possible new entrants could result in inefficient entry if any new entrant(s) only won 26 GHz rights of use because demand had been artificially restricted - e.g. there may have been another incumbent bidder who placed a higher value on the spectrum. Reserving spectrum for possible new entrants could therefore disadvantage incumbents by reducing the amount of spectrum available to them.

89 Furthermore, even if an administrative award of the 26 GHz band did not entirely satisfy a reserved applicant/bidder's demand, it is likely that the reserved applicant/bidder would still hold an advantage over alternative applicants/bidders who wished to compete for the available residual spectrum. This is because the reserved applicant/bidder would effectively have a head start on its competitors because a portion of its demand had already been satisfied through an administrative award, rather than entirely through open competition.

Auction

90 In contrast, an open, competitive auction for new 26 GHz rights of use should reveal information about the value that different undertakings place on those rights of use. Such information would not be available to ComReg if it was to assign the rights of use administratively. Also, where 26 GHz rights of use are auctioned, blocks can be combined and bidders can express the value they place on different amounts and on aggregations of spectrum.

91 An auction can also include measures to promote competition and ensure an efficient outcome:

- Prices paid by winning bidders are based on the opportunity cost of winning bids – the "second price" rule. This encourages straightforward bidding behaviour and should result in prices that are determined by competition from other bidders;[37]
- The non-uniformity of prices supports competition by reducing incentives to artificially reduce demand to keep prices low.
- Minimum prices reduce incentives for bidders to engage in strategic behaviour during an auction, in an attempt to decrease the eventual price(s) paid[38]. This includes tacit collusion during an auction and arrangements entered into before an auction begins and which are aimed at reducing competition between bidders.[39] Other measures to reduce collusion include having a carefully designed information policy and imposing appropriate sanctions for collusive behaviour.

92 Where 26 GHz rights of use are assigned by an appropriately designed auction, final prices will be set by the auction and should reflect what winning bidders were willing to pay and what losing bidders were unwilling to pay. In this way, and taking account of the auction's design and rules, the new 26 GHz rights of use should be assigned in a manner that results in their efficient use.

93 For the reasons set out above, ComReg is of the preliminary view that Option 2 – to assign new 26 GHz rights of use by auction - would best promote competition within the award process, thereby best ensuring that the rights of use are assigned in a manner that should result in their efficient use.

Competition in the market

94 The previous section discusses the regulatory options in terms of their impact on competition within the auction. This section considers the impacts on downstream retail competition.

Administrative assignment

95 The administrative assignment of new 26 GHz rights of use to a particular applicant or category of applicants (i.e. incumbents or new entrants) would reduce the amount of the 26 GHz band that could be made available to other applicants.

[37] See Section 5.1.4 DotEcon Report 17/85a.
[38] Note also that minimum prices that are too high might have a negative impact on competition if smaller participant/new entrants are discouraged from participating, so there is a balance as discussed in Chapter 5 below.
[39] See Section 4.3 DotEcon Report 17/85a.

There would create the risk that certain applicants, such as those who require significant backhaul infrastructure in order to provide high-value services to end users, may obtain less spectrum than they require or indeed may not succeed in obtaining any spectrum. At the same time, other applicants might obtain the quantum of the 26 GHz band which they sought even though they will use it less efficiently than others would have (had they succeeded in acquiring it). An administrative assignment of 26 GHz rights of use, to undertakings who will use the spectrum inefficiently or less efficiently, could also result in a lower level of downstream competition than would have been the case if those same rights of use had been assigned by auction, which in turn could have a detrimental impact on end users in terms of the price, choice, and quality of services.

96 In addition, and as noted above, an *ex-ante* administrative assignment of new 26 GHz rights of use to certain applicants would reduce the amount of the band available to other applicants. This could be a barrier to entry if any of those other applicants, who were excluded from applying for some reserved segment of the 26 GHz band, perceived the Irish market as favouring certain pre-determined applicants. Also, reduced competition in the auction could reduce or distort competition in the retail market.

Spectrum Reservation

97 While attracting new entrants is normally desirable in terms of promoting competition, to reserve some of the 26 GHz band for new entrants (whether to the band or to electronic communications within the State generally) would favour new entrants over other applicants/bidders. Absent objective justification for such a measure, this could result in new entry but by a new entrant who would use its obtained spectrum inefficiently, or less efficiently than would be the case had another applicant/bidder obtained it. Further, new entrants are not entirely dependent on select treatment and may succeed in obtaining 26 GHz rights of use even if none of the band is reserved for new entrants. As noted above, a new entrant could be an undertaking already operating in the downstream market.

98 ComReg is of the preliminary view that there is no justification for reserving some of the 26 GHz band for new entrants. Doing so would likely reduce the competitiveness of the award process and could result in some of the 26 GHz band being used inefficiently, or less efficiently than would be the case had some alternative applicant/bidder obtained it.

Competitive Award - Auction

99 Spectrum auctions are designed to incentivise participating bidders to express their willingness to pay for spectrum, the key objective being to assign the spectrum to those who value it most. Bidders who place the highest value on the

spectrum, and who bid accordingly and thus succeed in obtaining the spectrum, may be expected to use the spectrum efficiently. This in turn should promote competition in any affected downstream retail market to the ultimate benefit of end users in terms of the price, choice, and quality of services.

100 Awarding spectrum by auction carries some risk that bidders may try to reduce or distort the competitiveness of the auction, in order to restrict the total number of winning bidders and so gain a competitive advantage (by preventing new entry or foreclosing access to spectrum required by incumbents to maintain or enhance existing services) and/or to reduce the amounts paid by winning bidders. This could restrict the number of undertakings capable of providing downstream retail services, which in turn could reduce competition in the provision of those services. As a result, consumers could have less choice and some services may be of relatively low quality, because the service providers lack sufficient spectrum for their backhaul infrastructure.

101 ComReg therefore proposes taking certain measures to ensure that the auction of 26 GHz rights of use is truly competitive. Such measures include having competition caps as described in Chapter 5. ComReg considers that competition caps are the best means to ensure that the auction is truly competitive, such that the assigned spectrum is assigned efficiently, which in turn should safeguard and promote downstream retail competition.

102 An award process that fails to deliver an efficient outcome is likely to have a negative impact on downstream competition. As noted above, ComReg is of the preliminary view that Option 2 – to assign new 26 GHz rights of use by auction - is more likely to produce an efficient outcome because it is the award process that is most likely to result in the spectrum being assigned to those who value it most, and who should therefore use it efficiently. ComReg is also of the preliminary view that an auction would be strengthened by certain additional measures, specifically competition-caps and certain conditions that would attach to the eventual 26 GHz National Block Licences for the purpose of protecting consumers and downstream competition.

3.7 Impact on Consumers

103 ComReg considers that consumers should prefer the option which has the greatest potential to promote competition, thereby maximising the long term benefits to consumers in terms of choice, price, and quality of electronic communications service. Consumers are also likely to prefer option which avoids or minimises any significant disruption to existing services.

104 Given that new 26 GHz National Block Licensees will only be permitted to use the band in accordance with its designated use (i.e. to own and operate P2P links) it is useful to briefly set out why the efficient assignment of 26 GHz rights of use for

fixed links 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.

105 Providers of wireless mobile services use a combination of inputs to provide those services. This includes radio frequency spectrum, a national resource which is the essential input without which all wireless electronic communications would be impossible. Spectrum 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. Spectrum is also a scarce resource and so it must be used efficiently.

106 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, in order to avoid communications bottlenecks and a reduced quality of service for their consumers.

107 Most backhaul infrastructure in the State consists of microwave links. The new 26 GHz National Block Licences would be used to deploy P2P links which provide backhaul services for mobile, nomadic and fixed wireless networks. 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 4G LTE services 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 will still be essential for backhaul to the core network, especially in rural areas. Therefore, the manner in which new 26 GHz rights of use are assigned could have significant impacts on consumers and on downstream communications markets.

108 ComReg considers that consumers are unlikely to prefer an administrative assignment of 26 GHz rights of use to incumbents, for the following reasons:

- Some incumbents may require more 26 GHz rights of use than they currently hold in order to improve their wireless mobile networks and/or services;
- Incumbents who currently do not use their 26 GHz rights of use efficiently, or who intend to reduce their utilisation of the 26 GHz band, could nevertheless be re-assigned their 26 GHz rights of use where those rights might have been more efficiently utilised by another undertaking;

- The assignment of new 26 GHz rights of use based on incumbents' current frequency ranges would risk fragmenting the band in that residual lots would not be contiguous with each other[40]. This could reduce the potential for new entry, as potential new entrants may require a minimum amount of contiguous bandwidth, and that in turn could increase the risk of some lots not being assigned and so left unused; and
- Customers of service providers who currently do not have 26 GHz National Block Licences could be denied the benefits that would be likely to accrue if those service providers obtained 26 GHz National Block Licences.

109 More generally, an administrative award of the 26 GHz band would increase the risk of some lots being assigned to undertakings who would use it inefficiently, as described above. This could impact on competition and potentially delay the introduction of more advanced mobile data services in the State. Any net negative effect resulting from the administrative assignment of 26 GHz rights of use would fall on consumers[41] and even a relatively small negative effect could result in a substantial aggregate loss over the 10-year term of any new 26 GHz National Block Licence.

110 Consumers are likely to generally be in favour of new entry but only where it is likely to result in (a) the optimal number of service providers in all markets; and (b) the replacement of less efficient incumbents.

111 For the reasons stated above, ComReg considers that reserving some segment of the 26 GHz band for potential new entrants would place other auctions bidders, including incumbents, at a competitive disadvantage. The information asymmetry described above is such that reserving some of the 26 GHz band for new entrants could not guarantee an efficient assignment of the spectrum.

112 ComReg thus considers that consumers are likely to prefer Option 2 – to assign new 26 GHz rights of use by auction - for the following reasons:

- All of the 26 GHz band would be offered to all bidders and non-incumbents would not be restricted from participating in the auction;
- Incumbents would have the opportunity to retain their existing 26 GHz rights of use and to obtain additional 26 GHz rights of use, up to the spectrum competition cap;

[40] Assignment based on current occupied frequencies would leave seven residual blocks for potential new entrants. Of these, four are contiguous at the lower end of the band, two are contiguous at the upper end, and one solitary block is located towards the middle of the band.

[41] Such effects could include higher prices and less choice than might otherwise have been available; and poorer quality services than might have been achieved with a more efficient spectrum assignment.

- An auction should have the most positive impact on downstream retail competition and should therefore promote the interests of consumers in terms of the choice, price, and quality of electronic communications services;
- An auction should ensure that 26 GHz 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).
- An auction is more likely to ensure that none of the bidders are dissatisfied with the outcome, as this could delay roll-out of new backhaul services and have a negative impact on the maintenance of current backhaul.
- An auction should create a better incentive for winning bidders to return, to ComReg, any of their 26 GHz spectrum holding that is unused. This is because the price paid for the spectrum (the annual licence fee) would have been set by the market and provided that price of spectrum is not insignificant then the holder has an incentive to return any spectrum that it does not need.

113 In light of the above benefits to consumers ComReg is of the preliminary view that consumers would likely prefer Option 2, an auction, over Option 1, an administrative assignment.

3.8 Preferred Option (RIA step 5)

114 The above preliminary assessment considers the likely impact of Options 1 and 2 from the perspective of industry stakeholders and the likely impact on competition and consumers. In summary, ComReg considers that incumbents would likely prefer a version of Option 1 in which some of the 26 GHz band is reserved for incumbents whilst new entrants would likely prefer a version of Option 1 in which some of the 26 GHz band is reserved for new entrants. ComReg considers that while both versions of Option 1 might be in the best interests of particular stakeholders, neither would be in the best interests of competition and consumers.

115 Furthermore, it seems likely that all stakeholders would prefer Option 2, a competitive award, over Option 1, an administrative assignment to specified stakeholders other than themselves. Option 2 also appears to be the best form of award by which to promote competition amongst bidders for the available 26 GHz rights of use, which in turn should promote competition in the downstream retail market, all to the ultimate benefit of consumers.

116 ComReg is therefore of the preliminary view that the new rights of use, in the portion of the 26 GHz band at issue should be assigned by auction – this is the "Preferred Option". Chapter 5 considers different auction formats and identifies a "sealed bid combinatorial auction" (SBCA) as preferable.

3.9 Assessment of preferred option against ComReg's statutory functions, objectives and duties

117 This draft RIA identifies and considers a number of options potentially available to ComReg within the context of the RIA analytical framework as set out in ComReg's RIA Guidelines (i.e. impact on industry stakeholders, impact on competition and impact on consumers). This draft RIA also analyses the extent to which those various options would facilitate ComReg to meet its statutory remit in managing the 26 GHz band. This includes, in particular, 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 26 GHz band. Acting in accordance with these objectives should best enable ComReg to ensure that users derive maximum benefit in terms of choice, price and quality.

118 In this section, ComReg assesses the Preferred Option against the statutory provisions relating to spectrum management (see Annex 2). Those provisions are not exhaustively set out herein. In summary, ComReg's statutory function is to manage the national radio spectrum resource and its objectives, in doing so, are to promote competition, to contribute to the development of the internal market, to promote the interests of users within the Community, and to ensure the efficient use and effective management of spectrum. ComReg is also required to take measures towards the achievement of its objectives but must also have regard to certain regulatory principles; specifically its measures must be justified, transparent, non-discrimination, and proportionate.

Promotion of Competition

119 One of ComReg's statutory objectives, set out in section 12 of the 2002 Act, is to promote competition by, amongst other things:

- ensuring that users derive maximum benefit in terms of choice, price and quality;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector;
- encouraging efficient use and ensuring effective management of radio frequencies;
- ensuring that elderly users and users with special social needs derive maximum benefit in terms of choice, price and quality; and

- ensuring that, in the transmission of content, there is no distortion or restriction of competition in the electronic communications sector.[42]

120 Other statutory provisions also require ComReg to promote and safeguard competition in the electronic communications sector:

- Regulation 16(2) of the Framework Regulations requires ComReg to apply objective, transparent, non-discriminatory and proportionate regulatory principles by safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure based competition;
- Regulation 9(11) of the Authorisation Regulations requires ComReg to ensure that competition is not distorted by any transfer or accumulation of rights of use for radio frequencies;
- Article 4 of Directive 2002/77/EC (Competition Directive) requires ComReg to refrain from granting exclusive or special rights of use of radio frequencies for the provision of electronic communications services; and
- The General Policy Direction on Competition (No. 1 of 2 April 2004) requires ComReg to focus on the promotion of competition as a key objective, including the promotion of new entry.

121 ComReg is of the preliminary view that the Preferred Option would best safeguard and promote competition. In particular, it should maximise competition during the assignment process and in downstream retail markets by facilitating the assignment of 26 GHz National Block Licences in line with the requirement for nationwide fixed P2P links. In identifying the Preferred Option, ComReg applied objective, transparent, non-discriminatory and proportionate criteria and principles. ComReg is also of the view that, in identifying the Preferred Option, it has complied with the obligations contained in the above statutory provisions and the General Policy Direction on Competition (No. 1 of 2 April 2004).

122 ComReg also considers that the alternative option – an administrative assignment of new 26 GHz rights of use - would not achieve its objectives concerning competition to the same extent as the Preferred Option. In particular, ComReg notes DotEcon's observations that an administrative assignment may fail to ensure an efficient outcome where there demand for the available spectrum exceeds supply.

Contributing to the development of the Internal Market

123 ComReg considers the following factors to be particularly relevant to its statutory objective of contributing to the development of the Internal Market, in the context

[42] The final two statutory obligations were introduced by Regulation 16 of the Framework Regulations.

of this award process:

- The Preferred Option should best promote harmonisation of the use of spectrum across the EU, consistent with the need to ensure its effective and efficient use and in pursuit of consumer benefits such as increased economies of scale and improved interoperability of services, having regard to all decisions and measures adopted by the European Commission in accordance with the Radio Spectrum Decision[43] (Regulation 17 of the Framework Regulations);
- The Preferred Option should best support the establishment and development of trans-European networks and the interoperability of pan-European services, in particular by facilitating, or at the very least by not distorting or restricting, entry into the Irish mobile market by undertakings from other EU Member States; and
- In selecting the Preferred Option, and in order to ensure the development of consistent regulatory practice and the consistent application of EU law, ComReg has had due regard to the views of the European Commission, BEREC and other EU Member States.

Promoting harmonised use of radio frequency spectrum across the EU

124 The 26 GHz band has not been harmonised at EU level[44] and therefore issues of promoting harmonisation do not currently arise. However the band may become harmonised in future (see DotEcon Report) and ComReg has considered that possibility and would have options if it should occur including possible early liberalisation of the band. That could enable harmonisation even during the 10-year lifetime of the new 26 GHz National Block Licences, during which use of the band would be restricted to possession and use of P2P apparatus. Therefore, when there is greater certainty about the future of the 26 GHz band, and when or if market demand for alternative uses of the 26 GHz band manifests, ComReg may consult on proposals to liberalise the 26 GHz band or apply other suitable measures to support harmonisation.

125 ComReg is thus of the preliminary view is that the Preferred Option is based on current known facts and makes suitable allowance for future events as may occur. The Preferred Option should provide for the effective management of the 26 GHz band, now and for the foreseeable future, by assigning new 26 GHz rights of use for the provision of P2P links while retaining discretion to liberalise the band during the lifetime of the 26 GHz National Block Licences, if the need arises.

[43] Decision No. 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the EU.

[44] The 26 GHz Band is, however, harmonized at a CEPT level for both fixed and mobile services

Encouraging the establishment and development of trans-European networks and the interoperability of pan-European Services

126 ComReg notes the overlap between this objective and the objective to promote competition. Encouraging the establishment and development of trans-European networks requires that operators from other Member States, who seek to develop such networks, are given a fair and reasonable opportunity to obtain and/or use all requisite spectrum. ComReg considers that any regulatory measure which failed to encourage (or which actively discouraged) the establishment and development of trans-European networks, or which would otherwise unfairly discriminated against potential new entrants, would not meet the objective at issue. ComReg in this regard considers that an administrative assignment of 26 GHz rights of use to incumbents could fail to encourage, or could actively discourage, the establishment and development of trans-European networks.

127 ComReg also refers to its above preliminary reasoning as to why the Preferred Option, an auction, is likely to be preferred by potential new entrants, as opposed to an administrative assignment that is more likely to favour incumbents simply by virtue of their incumbency. The Preferred Option should not act as a disincentive for potential participation by undertakings from other Member States.

Promoting the development of consistent regulatory practice and the consistent application of EU Law

128 ComReg continues to cooperate with other National Regulatory Authorities ('NRAs) and to closely monitor developments in other Member States, to ensure that its regulatory practice and implementation of the EC of the Common Regulatory Framework is generally consistent with comparable jurisdictions.

129 For example, ComReg has had regard to international developments in the following areas: promoting the provision of wireless broadband (WBB) services; harmonising equipment standards for the 26 GHz and other candidate bands; the duration of 26 GHz rights of use; and fees for 26 GHz rights of use.

130 ComReg will continue to note relevant international developments during this consultation. At present, ComReg considers that the Preferred Option is consistent with approaches taken in comparable jurisdictions

Promote the interest of the users within the Community

131 The likely impact of the Preferred Option and of the other identified option on users, generally and in the context of ComReg's objective to promote competition, has been considered earlier in this draft RIA and is not considered in any further detail in this section.

132 ComReg also observes that most of the measures set out in section 12(2)(c) of

the 2002 Act, aimed at promoting the interests of users, relate to consumer protection more than to spectrum management.

Efficient use and effective management of spectrum

133 Section 10 of the 2002 Act requires ComReg to manage spectrum in accordance with any Ministerial Policy Direction No. 11 of 21 February 2003, issued under section 13 of the 2002 Act. Policy Direction No.11 requires ComReg to ensure that, in managing spectrum, it takes account of the interests of all users of spectrum, to include commercial and non-commercial users. Also, in pursuing its objective to promote competition ComReg must take all reasonable measures to encourage efficient use and ensure effective management of spectrum. Section 12(3) of the 2002 Act also requires that all measures by ComReg, including any measure related to managing spectrum, must be proportionate.

134 Regulation 9(11) of the Authorisation Regulations also requires ComReg to ensure that spectrum is used efficiently and effectively having regard to section 12(2)(a) of the 2002 Act and regulations 16(1) and 17(1) of the Framework Regulations.

135 In relation to Policy Direction No.11, the draft RIA seeks to take into account the interests of all current and potential users of the 26 GHz spectrum, commercial and non-commercial. ComReg is of the preliminary view that the Preferred Option would safeguard and promote those interests.

136 Based on its draft RIA, ComReg is of the preliminary view that the Preferred Option would encourage the efficient use of the 26 GHz band. In particular, there is likely to be a continued reliance on the 26 GHz band for P2P links for the foreseeable future. Assignment of new 26 GHz rights of use for P2P links should provide certainty that the 26 GHz band would be available for this use for at least 10 more years, at which point demand for the band and its potential uses can be considered afresh. As also noted above, the Preferred Option should also remove any risks relating to uncertainty as to the possible future harmonisation of the 26 GHz band for advanced mobile services.

137 The Preferred Option also appears to be the best measure by which to facilitate new entry and encourage efficient use of the 26 GHz band. This is because an auction, subject to reasonable features in its design such as competition caps, should ensure that those who obtain new 26 GHz rights of use are those who most value those rights, and are therefore those most likely to use those rights efficiently.

138 ComReg is therefore of the preliminary view that the Preferred Option should enable it to act in accordance with its statutory objectives in managing the 26 GHz band. ComReg is also of the view that the identified alternative option, an administrative assignment, would fail to satisfy some or all of the relevant

objectives.

Regulatory principles

139 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;
- promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors and parties seeking access to diversify the risk of investment, whilst ensuring that competition in the market and the principle of non-discrimination are preserved; and
- taking due account of the variety of conditions relating to competition and consumers that exist in the various geographic areas within a Member State.

Regulatory Predictability

140 ComReg generally has regard to the requirement for predictability in managing spectrum though ComReg must also note that this requirement must always be weighed against all relevant factors, some of which may necessitate measures which are less predictable or which are not predictable. ComReg has had regard to requirement for predictability in its consideration of how best to reassign the 26 GHz band, as illustrated below.

141 ComReg considers that regulatory predictability in relation to spectrum is best promoted by having an open, transparent, and non-discriminatory process for assigning new spectrum rights of use. ComReg also considers that, to the extent possible, it is best to take an approach to assigning new 26 GHz rights of use that is similar to that taken in the 2012 MBSA (800, 900, and 1800 MHz bands) and in the 2017 auction of 3.6 GHz rights of use. Both of those auctions were successfully completed and to the general satisfaction of all participants.

142 In relation to the first objective, ComReg notes that the Preferred Option ensures that the future assignment of rights of use in the 26 GHz band is known as soon as possible. This would give the market the utmost transparency and predictability in terms of the availability of spectrum rights in this band. ComReg's approach is also consistent with assignment mechanisms for other relevant spectrum bands (previous 26 GHz award, MBSA, 3.6 GHz).

143 In relation to the second objective, ComReg considers that the alternative option would not promote regulatory predictability due to the inherent uncertainties attached to administratively determining key parameters such as spectrum assignments and fees, particularly in the context of competing demands from stakeholders, imperfect information and the duration of the spectrum rights at issue.

144 In that regard, network operators in Ireland (post MBSA) and further afield are becoming increasingly familiar with competitive auctions processes. The 26 GHz band also represents the first award of spectrum previously assigned using a market mechanism. Therefore, the use of such a mechanism should contribute to regulatory predictability.

145 In addition, ComReg considers that the Preferred Option would:

- incorporate appropriate competition caps in order to provide access to spectrum that can be used in the provision of fixed links while avoiding extreme outcomes, and would
- better minimise the risk of award participants failing to win their desired spectrum assignments for reasons other than competitive tension within the award.

146 In light of the above, ComReg is of the preliminary view that the Preferred Option complies with the regulatory principle of promoting regulatory predictability.

Promoting efficient investment and innovation in New and Enhanced Infrastructures

147 ComReg considers that the Preferred Option is consistent with the aims of this regulatory principle because it:

- has the capacity to facilitate a fully competitive release of the 26 GHz band for fixed links at the earliest possible opportunity ensuring that winners of rights of use are appropriately incentivised to invest in new technologies and infrastructures and plan ahead in relation to the provision of backhaul.
- provides clarity around how ComReg will proceed in relation to the possible future availability of the band for new mobile services, avoids the potential costs, and inefficiencies associated with uncertainty around the release of such rights; and
- provides participants with the scope to bid according to their own valuation of the spectrum rights, based on their own business plans and market and financial positions, and thus to invest efficiently in the provision of fixed links.

General guiding principles (in terms of spectrum management, licence conditions and setting of licence fees)

148 ComReg is required to comply with the guiding principles of objectivity, transparency, non-discrimination and proportionality in carrying out its functions under the Common Regulatory Framework. In relation to this consultation, these principles are most relevant in terms of ComReg's functions concerning the management and use spectrum, including attaching conditions to rights of use and setting licence fees.

149 In relation to spectrum management and use, ComReg notes that:

- Regulation 11(2) of the Authorisation Regulations requires ComReg to grants rights of use for radio frequencies on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate; and
- Regulation 16(2) of the Framework Regulations requires ComReg 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.

150 ComReg at all times seeks to take account of and act in accordance with the above guiding principles of Irish and EU law.

151 ComReg, having had regard to the applicable statutory provisions, its draft RIA and other analyses, its expert advice, and all other relevant material, is of the preliminary view that the Preferred Option would be an objectively justified, transparent, proportionate and non-discriminatory regulatory measure by which to assign new rights of use in the portion of the 26 GHz band at issue, of 10 years duration and for the purposes of deploying and operating P2P links.

4 Key aspects of the proposed Spectrum Award

4.1 Introduction

152 This chapter discusses key aspects of the new 26 GHz National Block Licences rights of use which ComReg proposes to assign, in particular:

- The current band plan and frequency arrangements within the portion of the 26 GHz band at issue and its current use;
- Duplex arrangements (Frequency Division Duplexing vs Time Division Duplexing);
- Current P2P vs PMP usage within the 26 GHz band;
- details on the current block sizes and equipment requirements within the 26 GHz band;
- Guard bands[45]; and
- The duration of the new 26 GHz National Block Licences.

4.2 The 26 GHz Band

153 In this consultation ComReg proposes to award new rights of use for a total of 2 × 532 MHz of spectrum[46] in the frequency ranges 24.745 – 25.277 GHz paired with 25.753 – 26.285 GHz, again in accordance with Annex B of CEPT/ERC/REC 13-02. The 2 × 532 MHz of spectrum will be divided into 19 lots (A1 to A19) of 2 × 28 MHz – see Figure 5 below. The new rights of use would also be awarded on a national basis.

[45] In radio spectrum a guard band is an unused part of the spectrum between radio bands for the purpose of preventing interference. It is a narrow frequency range used to separate two wider frequency ranges to ensure that both can transmit simultaneously without interfering with each other

[46] There is an additional 2 × 28 MHz Block available as part of this award process as a result of the removal of the guard band between the FWALA assignment and the National Block assignment.

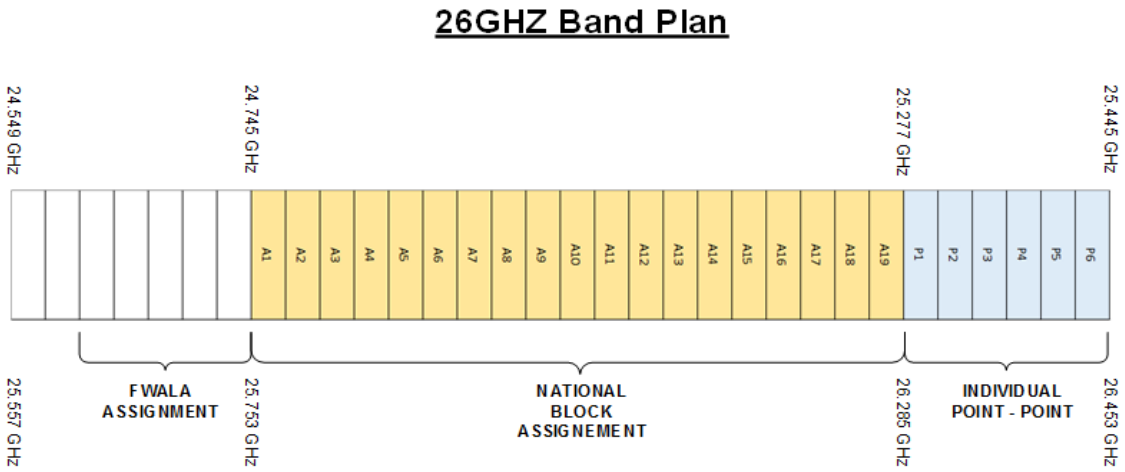

Figure 5: Band plan of spectrum for the proposed award.

4.3 Duplex arrangements

154 "Frequency division duplexing" (FDD) is a method for establishing a full-duplex communications link that uses two different radio frequencies for transmitter and receiver operation. The transmit direction and receive direction frequencies are separated by a defined frequency offset.

155 "Time division duplexing" (TDD) is a method for emulating full-duplex communication over a half-duplex communication link. The transmitter and receiver both use the same frequency but transmit and receive traffic is switched in time.

156 The National Block assignments in the 26 GHz Band are currently licensed for FDD use only. ComReg considers that, in this particular case, FDD has a number of advantages for P2P use including:

- Full data capacity is always available in each direction because the send and receive functions are both available simultaneously and continuously;
- It offers a very low latency since transmit and receive functions operate simultaneously and continuously; and,
- It is an efficient process to co-ordinate and protect FDD against interference.

157 To date, all P2P links in the 26 GHz band operate on FDD and there has been no evidence of demand for TDD for P2P links in the band. For this reason, as well as the advantages with using FDD described above, ComReg is of the preliminary

view that all new 26 GHz National Block Licences in the 26 GHz band should be for FDD use only, and not for TDD.

4.4 P2P vs PMP use

158 In the 2008 award ComReg did not designate specific frequencies within the 26 GHz band for particular technologies or applications (e.g. PMP or P2P). ComReg formed the view that the award alone would determine how the available blocks would be split into PMP and P2P

159 Three 10-year National Block Licences permitting PMP were assigned in 2008 – one to Digiweb Ltd (Digiweb)[47] and two to Telefónica Ireland. Digiweb surrendered its PMP licence in 2009 and Telefónica Ireland requested a change of use from PMP to P2P as detailed below. None of the existing 12 26 GHz National Block Licences permit PMP use. Consequently all 12 current licences permit P2P use only.

4.1.1 Telefónica Irelands change of PMP to P2P

160 In 2008, Telefónica (later acquired by Three (Ireland)) was awarded two PMP licences and three P2P 26 GHz National Block Licences. In 2011, as part of a formal request to ComReg that its two PMP channels be converted to P2P, Telefónica informed ComReg that in deploying 26 GHz links in its network it had found, in almost all cases, that it was more efficient to use P2P than PMP. Telefónica stated that it did not deploy any PMP links in its two PMP blocks, for the following reasons:

- It found that there were few cases where a sufficient number of base stations had line of sight from the central station and within a sector in order for PMP to be cost effective ;
- There was a reduced reach of PMP compared to P2P; and,
- At the time there was generally a much larger and more competitive P2P market resulting in faster ongoing technology development and price completion.

[47] Digiweb Ltd is part of the Digiweb Group which is made up of Digiweb Ltd, Digiweb Belgium, Digiweb UK and Viatel Ltd

161 Following a consultation arising from Telefónica's request,[48] ComReg decided to permit the change of use. In making that decision, ComReg noted that the change of use would have no effect on any future assignment of 26 GHz blocks, that it should result in more efficient use of the particular spectrum blocks (it being clear that PMP was no longer Telefónica's preferred option[49]), that it was in accord with the obligation to "*take the utmost account of the desirability of technological neutrality*", and that no other licensee would be affected by the change of use. Telefónica's two PMP licences were therefore changed to P2P licences and the Band Plan was rearranged accordingly – see figure 1(b) Chapter 2.

4.1.2 ComReg's Position on PMP

162 ComReg is of the preliminary view that there is very little demand amongst undertakings for 26 GHz National Block Licence rights of use for PMP and, as a consequence, that there is no need to provide for potential PMP use in the proposed award - i.e. that the new 26 GHz National Block Licences should be for P2P use only. In forming this preliminary decision, ComReg has had regard to relevant events and facts. These include Digiweb's decision to surrender its only PMP block in 2009, Telefónica's approved request to convert its PMP blocks to P2P blocks in 2012 (and the information provided by Telefónica in support of its request), and the fact that that, overall, there are few spectrum assignments for PMP across the fixed link bands.

163 For these reasons ComReg does not see any evidence which would justify adding complexity to the award by designing an award in such a manner as to provide for the possibility of new 26 GHz National Block Licences permitting the deployment of PMP links. ComReg instead proposes an award that would provide for new 26 GHz National Block Licences permitting the deployment of P2P links only.

4.5 Guard bands

164 In the 2008 award ComReg decided not to set any external guard bands between adjacent 26 GHz National Block Licenses, for three reasons :

(i) Not having external guard bands would maximise the number of blocks

[48] ComReg 12/64 – 26 GHz Change of Use "*Request from Telefonica Ireland for change of use of its 26 GHz National Point to Multipoint block licences*"
[49] ComReg 16/50 – Radio Spectrum Management Strategy 2016 to 2018

that could be made available to bidders;

(ii) Inter-operator co-ordination and the deployment of Block Edge Masks was a more spectrally efficient method by which to minimise the risk of interference; and,

(iii) Successful bidders could make their own guard band arrangements, based on their choices of technology, and could bid for the number of blocks required in order to make those arrangements

165 The above approach appears to have been successful in that ComReg has never received any reports of interference between adjacent licensees during the c. 9 years in which the current National Block Licences have been in effect. Also, it has never been suggested that P2P licensees were limited in their ability to deploy P2P links due to the absence of external guard bands between them. Given the success of this approach to date, ComReg proposes to adopt this same approach for the proposed future auction - i.e. to not set any external guard bands between the new 26 GHz National Block Licensees. This means that bidders would again need to identify any guard band requirements that their choice of technology may require, and then bid for a sufficient number of blocks to meet those requirements.

166 ComReg, in the 2008 award, did set external guard bands between P2P and PMP licensees in the 26 GHz band. This decision was based on a review of sharing studies carried out by CEPT and other bodies, at that time the intent of which was to limit the potential for interference between the two different access techniques and topologies. ComReg also set a guard band between FWALA and 26 GHz National Block assignments resulting from the 2008 award, again to prevent any harmful interference that might otherwise occur. However, given that ComReg proposes that the future award of the 26 GHz band would not provide for assignments for PMP links, means the question of whether to have external guard bands between P2P and PMP licensees does not arise.

167 ComReg does not propose to set a 2 × 28 MHz guard band between FWALA and P2P licensees in the 26 GHz band. ComReg notes that there are relatively few FWALA assignments, all in the lower part of the 26 GHz band, and it should be possible for parties to directly address any potential interference issues.

4.6 Licence Duration

168 ComReg has addressed the issue of licence duration in a number of publications, most recently in its response to the Radio Spectrum Management Strategy

Statement 2016 – 2018 (Documents 15/131 and 16/49). This paper does not repeat the detailed analysis contained in those documents and any interested party is referred to same

169 ComReg favours granting rights of use for spectrum of fixed duration, and that then expire, for reasons which may be summarised as below. Fixed-term licences should:

- promote competition between undertakings and the efficient use of spectrum and it should contribute to development of the internal market;
- be wholly compatible with the Common Regulatory Framework;
- allow licensees sufficient time to make a return on their investments, in line with the expected life-cycles of any technologies deployed;
- provide enough flexibility to deal with any international harmonisation of a spectrum band, for example at EU-level, as may occur after fixed-term licences in that band have been granted;
- ensure that there are no long-term barriers to a co-ordinated approach to the bands (particularly important where a co-ordinated approach is necessary to introduce new services); and
- ensure that there can be a co-ordinated approach to bringing about the desired change but without creating perverse incentives for incumbents to hold out in order to gain more rents.

170 In determining what duration for rights of use is suitable in the 26 GHz band, ComReg notes that:

(a) rights of use under the proposed award process are expected to commence in June 2018 or shortly thereafter and expire on the same date following the number of years specified in the licence; and

(b) rights of use for other bands used for fixed links (i.e. 42 GHz etc) expire annually.

171 In that regard, all bands that are used for fixed links and that could potentially be considered a substitute or complement in the future expire on an annual basis. Therefore the exact licence duration of the 26 GHz band is not relevant in providing for co-termination with such bands in the future.

172 ComReg is of the preliminary view that a ten year licence period is appropriate for the following reasons.

- It is consistent with the licence duration provided on the same basis and type of use as in 2008, and ComReg is not aware of any material facts justifying a change in approach;
- It is consistent with the range of expiries for similar bands internationally[50]. For example, the majority of relevant Member States assessed have durations of between 1 and 10 years[51]; and
- In its Mobile Termination Rate consultations[52], ComReg noted that an asset life of 8 years is used for the vast majority of the mobile elements. ComReg observes that this asset life is applicable to future fixed links in the band. In that regard, ten years provides a sufficient period of time to obtain a return on network investments[53]; and
- On-going developments in the 26 GHz band could, over time, change the attractiveness of this band to certain services and the demand for spectrum in this band. This may mean that the primary spectrum outcomes derived from this award process may not be the most optimal outcomes in the future. In particular, as discussed previously, these frequencies may become harmonised for new mobile services in the future. As noted by DotEcon "*making P2P national block licences longer increases the exposure of licensees to such risks*"[54]. In that regard, DotEcon recommend maintaining a ten year duration.

[50] See Annex 3: Cullen International.
[51] Only two Member States assessed by Cullen potentially have durations longer than 10 years. In Slovenia the 28 GHz band has a 15 year licence duration. Italy has a 20 year licence duration, however this refers to licences issued in 2002 and any fixed links licences since 2002 have a duration consistent with an expiry in December 2022.
[52] See ComReg 15/19a
[53] ComReg additionally notes that fixed links in 21 other spectrum bands are renewed on an annual basis.
[54] Section 4.1 DotEcon Report 17/85a.

5 Award type and design

5.1 Introduction

173 On the basis of the draft RIA set out in chapter 3, ComReg is currently of the preliminary view that an auction is the most appropriate mechanism with which to reassign rights of use in the proposed award process.

174 There are a number of different auction formats and various design elements that can be applied. It is therefore appropriate to evaluate what considerations would apply to this award process and determine what auction characteristics, in this specific case, would best meet with ComReg's statutory objectives (See Annex 2).

175 In that regard this chapter is structured as follows:

- considerations for this award process;
- the preferred auction format;
- frequency generic or frequency specific lots;
- packaging of available spectrum;
- competition caps;
- unsold lots; and
- fees

5.2 Considerations for this Award process

176 The DotEcon Report identified and examined a number of suitable auction formats for awarding rights of use in the 26 GHz band, These auction formats include:

- Simultaneous Multiple-Round Ascending (SMRA) auction;
- Simple Clock Auction (SCA);
- Combinatorial Clock Auction (CCA);
- Sealed Bid Combinatorial Auction (SBCA); and
- Combinatorial Multi-Round Auction (CMRA).

177 It is not proposed to fully repeat DotEcon's discussion and analysis of these formats. Stakeholders are encouraged to review the mechanics of each auction format as set out in the DotEcon report which accompanies this consultation.

178 In order to assess which design and format is best suited to this award process, it is necessary to assess whether any risks are likely to arise, and determine which format and/or design considerations best mitigates those risks while ensuring spectrum is awarded to those users who value it the most. The DotEcon report outlines a number of issues or risks that concern the award format for this award process. These are:

- aggregation risks;
- inefficiently unsold lots;
- gaming opportunities; and
- complexity

179 The other main concern associated with this award is the assignment of specific frequencies, which is assessed separately in Section 5.5. In Section 5.2.5 ComReg sets out certain risks not likely to arise in this award and do not need to be considered in determining the preferred award format.

5.2.1 Aggregation Risks

180 Aggregation risk refers to the risk that bidders with a minimum spectrum requirement may be exposed to winning an unwanted subset of its demand, such as winning some lots, but fewer than the minimum number of lots it requires, in a band.

181 DotEcon is of the view that there are likely to be strong synergies[55] between lots as some bidders are likely to want to aggregate multiple contiguous blocks to allow for higher capacity P2P links.If a bidder receives fewer blocks than it expects, and/or non-contiguous blocks[56], the bidder would be restricted in the bandwidth of links it could deploy over a national block licence.[57] Unless protective measures are put in place, aggregation risk is therefore likely to be significant, and DotEcon is of the view that addressing aggregation risks is a primary consideration for the proposed award process.

182 SMRA auctions are not suitable where aggregation risks are likely to be significant. In a standard SMRA process, bidders bidding on a combination of lots may be exposed to the risk of ending up being the standing high bidder for some, but not all, of the lots on which they wished to win and paying a total price in excess of their valuation for the lots won. The SMRA provides no guarantee that the

[55] Where spectrum is divided into frequency blocks that need to be aggregated, then the value of each lot depends on whether a bidder wins one or more additional lots during the auction. Synergies, complementarities, scale effects can result in increasing marginal valuations.

[56] The importance of contiguous assignment was noted in the 2008 Information Memorandum award (ComReg 07/93R) where it stated that "*bidders buying multiple lots for the same use are likely to place a strong premium on winning contiguous spectrum*

[57] Whilst it would remain open to a bidder to deploy links in any of the six blocks under the individual link licensing regime, this may be less cost effective than deploying links in the national blocks.

minimum amount of spectrum required by a bidder will be achieved, as a bidder might eventually win fewer lots than is required to meet its own minimum objective. Furthermore, an SMRA cannot guarantee that each bidder wins contiguous spectrum, exposing a bidder to the risk of winning a fragmented assignment of spectrum.

183 DotEcon concludes that while these problems could be somewhat mitigated by providing rules for limited withdrawals of standing high bids, they cannot be eliminated and create significant additional complexity in the award process. Therefore, the SMRA with frequency-specific lots is not likely to be a viable auction format for this award.

184 In that regard, DotEcon recommends the use of an auction format that involves package bidding, so that bidders do not face aggregation risks arising from the possibility of winning some, but not all, of their target lots. In that regard, the issue of aggregation risk does not arise in combinatorial auctions such as the SBCA, SCA, CCA or CMRA as bidders can only ever win packages they bid on, or nothing at all. A combinatorial format allows bidders to make mutually exclusive package bids for spectrum and bidders can express valuations for various combinations of lots.

5.2.2 Inefficiently unsold lots

185 Unsold lots do not necessarily represent an inefficient outcome from an auction. However, if bidders have increasing returns for additional lots and such lots remain unsold, this would represent an inefficient outcome.

186 A SCA has an inherent risk of leaving lots inefficiently unsold. As noted by DotEcon, the main problem with a clock auction is that it could result in inefficiently unsold lots when some bidders have strong synergies, as is the case in this award. This arises because the clock auction imposes a uniform price per lot for all winners, regardless of the number of lots that each winner might receive. In particular, if bidders have a minimum requirement of multiple lots, or at least some bidders have increasing returns for additional lots, then there is a risk of inefficiently unsold lots. For example, there may be some bidders that have already reduced their demand or exited the auction (due to prices rising beyond their valuations) that would have been prepared to buy the unsold lots, albeit at a lower price per lot. It is also possible that a winner might be prepared to expand its demand, but not at the closing clock price.

187 While the risk of unsold lots is lower with a SMRA auction - where a standing high bidder for each lot is determined at the end of each round - there are circumstances where this risk may arise in particular when withdrawal of standing high bids is allowed. For example, suppose a bidder with synergistic valuations across multiple lots withdraws one or more of its standing high bids because the

other lots it needs have become too expensive. If no further bids are received for the lots with withdrawn standing high bids, those lots might go unsold even if other bidders would have wanted to acquire them at a lower price (but can no longer do so because the price is too high or they do not have spare eligibility to bid for those lots etc.) While the risk of inefficiently unsold lots in a SMRA is low, it is higher relative to alternative formats such as the CCA, SBCA or CMRA.

188 DotEcon advise that this problem is avoided through the use of the combinatorial auctions that do not impose linear pricing, such as the CMRA, CCA and SBCA. These formats allow bidders to submit multiple bids that reveal the structure of their demand for spectrum at different prices. Winners (and prices) are established taking into account the whole range of bids submitted, with the consequence that (if bidders reflect their full demand profiles in their bids) lots will only remain unsold if there is no additional value that can be achieved by assigning them.

189 Therefore, these formats do not suffer from the risk of inefficiently unsold lots.

5.2.3 Gaming Opportunities

190 Gaming opportunities refer to all opportunities for bidder behaviour aimed at: acquiring spectrum at a price below what would have been paid had the auction been run in a competitive manner; acquiring more spectrum than they would have acquired in fair competition; or compromising downstream competition.

191 While there is little reason to expect there to be a strong anti-competitive motive for a bidder to acquire spectrum to limit the number of winners of 26 GHz National P2P blocks, bidders may nonetheless aim to secure spectrum at a price below than what would have been paid had the auction been run in a competitive manner. Where bidders have an interest in specific lots, this can facilitate a collusive outcome where these bidders do not bid on one another's currently held lots and vice versa. This may arise where incumbents have strong preferences to remain in their current positions in the band.

192 The SMRA provides a range of gaming opportunities, including the potential to formulate gaming strategies aimed at reducing competition and trying to establish tacitly collusive arrangements. The possibilities for bidders to indicate potential collusive outcomes are often greater under the SMRA than other auction formats due to the ability to send signals through the bids submitted e.g. by bidding on particular combinations of lots. This could be a particular concern in this award if the cost of moving from incumbent positions is large. The SCA provides incentives for strategic demand reduction, whereby bidders might reduce demand early in order to keep prices lower than they might be under the competitive outcome. The fact that bidders in a clock auction only need to honour their final round bids may well facilitate strategic bidding with the intention of driving up prices for other bidders. As long as there is excess demand in one of the lot categories, a bidder

can bid for lots that he does not actually want, without necessarily having to honour these bids.

193 Collusive incentives are usually weaker in the CCA where prices are mostly determined by the bids submitted by competitors (second price rule), and where bidders may deviate from the collusive behaviour in the supplementary bids round without the possibility of retaliation. Furthermore, in a CCA the bids that bidders can submit are constrained based on bidding behaviour in earlier auction rounds; this means that there is a risk of not being able to fully express demand associated with bidding in a non-straightforward manner with the intention of affecting the auction outcome.

194 Similarly, collusive behaviour in the CMRA is difficult because bidders are unaware of which packages they will ultimately win from the mutually exclusive bids submitted plus the option for submitting additional bids (similar to the supplementary bids in a CCA) allows for deviation from the collusive outcome with limited scope for retaliation. Activity rules also help to make strategic bidding strategies risky, while the pricing mechanism in the CMRA means there is no opportunity for bidders to influence the prices of rivals by placing bids on packages that they have no preference for.

195 The SBCA offers the greatest level of protection against the gaming opportunities outlined above. A single sealed bid process ensures bidders cannot signal to each other or react in any way to information about competitors' bidding behaviour. This format is the least vulnerable to strategic behaviour, especially tacit collusion, as bidders cannot observe each other's behaviour over multiple rounds. Further, concerns about predatory bidding are also eased because entrants know that strong bidders do not have the opportunity to revise their bid strategy during the auction in order to out-bid them. This may be particularly relevant to this award where new entrants to the band are possible. It is possible that some bidders might try to submit bids that are not in line with valuations in an attempt to push up prices for others. However, with very limited information about the structure of demand from others bidders, this would be a dangerous strategy with a risk of winning a less preferred package, possibly at a price above valuation.

5.2.4 Complexity

196 Auction complexity is an important consideration because it can lead to inefficient outcomes whereby the bidder who places the highest value on the spectrum fails to acquire that spectrum because of a failure to adequately understand the assignment mechanism and the interaction of bids between it and other bidders.

197 The design of the proposed award should, to the extent possible, seek to minimise all forms of complexity for bidders. However, ComReg notes that this should not act to the detriment of the proposed award process and should be appropriately

balanced against the risks identified in this Chapter. Readers are referred to Annex 8 of Document 15/140 for a detailed discussion of the different forms of complexity[58] arising from an auction.

198 Certain awards are more computationally complex than others. However, it should be noted that for any of the award mechanisms assessed, the burden of computational complexity falls entirely on the auctioneer who typically uses algorithms or other methods to determine which of the bids will be winning bids and to determine what the winning bidders pay. Therefore, computational complexity is primarily a concern for the auctioneer regardless of the award type.

199 Like all combinatorial auction formats, the CMRA has a higher degree of associated complexity. Even though a large part of the complexity rests with the auctioneer, bidders have to assess when they would like to bid for additional packages, and possibly manage a portfolio of package bids in a given round. The CMRA is also a new award format and unlike other combinatorial awards, such as the CCA, its mechanics are relatively unknown.

200 Similarly, the CCA is often considered to have a relatively complicated structure, and the process of pricing and winner determination is relatively complex for bidders to understand. However, once the format is understood and bidders have generated their valuations for different packages of lots, the process of bidding to reflect these valuations (and importantly, relative preferences between different packages) bidding can be relatively straightforward. In particular, there is no need to adopt a complex bid strategy to bid successfully in a CCA. To date, CCA has been used twice for spectrum awards in Ireland and the mechanical complexity can be overcome through the use of bidder training, which has proved successful in both the MBSA in 2012 and the recent 3.6 GHz award.

201 The clock auction is a relatively simple format, both in terms of implementation and with regard to transparency for bidders. A SMRA may be easily understood because each bid for a specific lot is treated independently and competition for a lot takes no account of competition that might be taking place for other lots in the auction. However, bidding in a SMRA is strategically complex in that a bidder's optimal bid strategy is typically reliant on its expectations of competitors' behaviour and end prices in particular where there are synergies across lots that require careful management of aggregation and fragmentation risk.

202 The SBCA is a relatively straightforward process as it requires just one round of bidding (or two for frequency generic) to determine the winning bidders. This is a relatively simple bidding process, making it easier to understand and reduces the costs of participation for bidders. Therefore, ComReg is of the preliminary view that the SBCA is the least complex for award participants in terms of the

[58] Mechanical complexity, bidding complexity and computational complexity.

mechanics of the bidding process.

5.2.5 Other risks not likely to arise in this award

203 In the preceding section ComReg set out the main risks likely to arise in this award. For completeness, ComReg briefly considers certain risks that are unlikely to arise in this award and therefore do not need to be considered in determining a preferred award format. In particular, substitution risk and common value uncertainty is likely to be low in this award.

204 Common value uncertainty is particularly relevant where bidders are facing common risks from uncertain demand for new services or from uncertain costs from deploying new technology. However, in this award there is not an entirely new technology, nor an entirely new market. In particular, as noted in Chapter 2, ComReg has made clear that rights of use conditions are set to allow technologically-neutral use for P2P links, but not broader PMP or mobile use.

205 As noted by DotEcon, common value uncertainty is likely to be modest given that winners may deploy 26 GHz National Block Licences in very different ways depending on the structure of their respective networks. Bidders should continue to use 26 GHz National Blocks for point-to-point licences and their experience of using the spectrum over the past ten years means the extent of value uncertainty associated with the rights of use are likely to be limited. Bidders are likely to use the radio spectrum in different ways depending on the organisation of their networks, creating idiosyncratic variations in value of spectrum across bidders that will tend to mask any sources of common value uncertainty[59]. Therefore, common value uncertainty is not likely to be a particular feature of this award.

206 Similarly, substitution risks[60] are likely to be limited in this award where rights of use are for one band on a national basis. In an open auction, the bidder might switch back and forth between lots depending on relative price. The CCA, CMRA and SBCA remove substitution risk as they allow bidders to make multiple, mutually exclusive, package bids. The SMRA and to a lesser extent the SCA might expose bidders to substitution risk in the case of frequency specific lots, where bidders may want to switch between different combinations of lots across the band as prices evolve but are unable due to eligibility constraints or being stranded as standing highest bidder on some lots.

[59] For example, operators may need to deploy P2P links in different geographical areas or to service different end consumer groups, such as urban or rural, retail or business. Also, operators may rely on a combination of different spectrum bands to build their networks.

[60] By substitution risks, we mean the risk that a bidder may win one lot (or group of lots) when, at the prevailing prices, it would have preferred to win another lot (or group of lots) instead.

5.3 Auction Format

5.3.1 Preferred auction format

207 In selecting a suitable auction format, and taking account of the discussion above, the preferred auction format should be the one that, on balance, best achieves the following objectives, namely that the auction format should:

- Minimise the risk of inefficient outcomes for bidders and allow all bidders to express their demand without creating excessive complexity;
- Be flexible enough that bidders are able to construct their preferred packages of lots without running the risk of winning unwanted subsets of their demand;
- Encourage participation in the process and avoid outcomes where spectrum goes unsold despite demand existing for that spectrum;
- Create incentives for bidders to engage in a manner expected of normal competition, and not to engage in strategic or collusive behaviour; and
- Allow rights of use to be assigned in as timely a manner as possible while satisfying ComReg's objectives.

208 The SMRA is easy for bidders to understand and provides price discovery and allows bidders reasonable certainty on the value of lots awarded. However, the SMRA is susceptible to gaming opportunities and exposes bidders to aggregation risk. This is likely to be a particular concern in this award given the strong synergies across lots that are likely to exist for some bidders. In such cases bidders may be stranded on a subset of the lots they want and facing prices that are above its valuation of the lots won.

209 The SCA is a relatively simple procedure in terms of implementation and there is no risk of bidders winning subsets of lots that they do not want. Notwithstanding, SCA provides strong incentives for strategic demand reduction and there is a risk that frequencies which are of value to bidders remain inefficiently unsold.

210 In that regard, DotEcon "conclude that whatever format is used – open or sealed bid – should ideally allow for package bidding and not impose linear prices (i.e. uniform per lot prices for all bidders) if efficient outcomes are to be achieved."[61]Therefore, in light of the discussion above and the views of DotEcon, ComReg is of the view that the SMRA auction and the SCA are not suitable for this award process.

[61] DotEcon report 17/85a, p47.

5.3.2 Remaining Combinatorial Awards

211 Each of the remaining combinatorial awards (CCA, CMRA, and SBCA) supports flexible package bids thereby eliminating aggregation risks. The CCA and CMRA are open round combinatorial awards while the SBCA is a single round combinatorial award (or two rounds if assignment stage is used).

212 The SBCA is in effect, a CCA without the primary bid rounds (i.e. a supplementary bids round only). In that regard, the SBCA does not provide for price discovery. Instead, bidders have only one opportunity to submit their bids for the lots auctioned, and the winning bids and bidders are determined on the basis of just one round of bidding. Bidders can place mutually exclusive bids on all preferred combinations of packages[62] and these bids are collected in a single round with no bidder having visibility of the other bids made.

213 An open auction (CCA or CMRA) provides a mechanism for price discovery and reduces the impact of common value uncertainty on the efficiency of outcomes. However, in this case common value uncertainty is not a central concern as stated above. DotEcon observes that "*there is little need for an open auction as it is unlikely that there will be strong common value uncertainty amongst bidders*[63]*.*" ComReg agrees with the views of DotEcon and is of the view that common value uncertainty is not a substantial risk in this award and open rounds do not appear required in order to promote price discovery.

214 While a CCA or CMRA would likely result in the efficient assignment of the radio spectrum and would be a suitable format in that regard, both these formats are more complex and would require more time to complete than a SBCA. The SBCA format offers sufficient flexibility to deal with the concerns outlined by DotEcon without compromising the efficiency of the award process and has a number of additional advantages for this award over the CCA and CMRA, including:

- It is very quick to implement and requires only one round to determine the winning bidders.[64]
- The bidding process is simplified (e.g. by electronic data files), and is unlikely to require any detailed bidder training thus reducing the costs to bidders for implementation and preparing for an award; and
- This format is the least vulnerable to strategic behaviour, especially tacit collusion as bidders cannot observe and react to each other's behaviour over multiple rounds.

[62] These bids are constrained only by underlying spectrum caps and a minimum of the relevant reserve prices.
[63] DotEcon report 17/85a, p59.
[64] Potentially a further round to determine assignment of specific lots if specific frequencies are assigned in a follow-up assignment stage. This is discussed in section 5.3 below.

215 In light of the foregoing and having considered the DotEcon report and its statutory functions, objectives and duties, ComReg is of the view that a SBCA is the auction format best suited to deal with the considerations outlined in the DotEcon Report.

5.3.3 Pricing mechanism

216 Given ComReg's preferred auction format as outlined above, ComReg notes that the previous 2008 award used a second price rule which requires that each individual winning bidder pays at least its opportunity cost and also that every possible subset of winning bidders pays its joint opportunity cost (i.e. the value denied to other bidders from the lots assigned to that group of winners). The second price rule provides good incentives for bidders to bid truthfully and straightforwardly in line with their valuations. This approach was also used in the 2012 MBSA and the recent 3.6 GHz award process.

217 DotEcon advises that in the context of a SBCA where bidders may be submitting multiple bids for different packages, incentives for reasonably straightforward bidding are attractive properties of the second price approach (See Section 5.1.4 of DotEcon Report). In that regard, ComReg agrees with the views of DotEcon that a second price rule as used in the 2008 award is an appropriate pricing mechanism for this award process.

5.4 Frequency Generic vs Frequency Specific Lots

218 Regardless of whether an open round or a SBCA process is used, it is necessary to determine the feasible frequency assignments for winning bidders on the basis that those winning multiple lots will be assigned contiguous spectrum. Spectrum rights of use can be offered on a frequency-generic or frequency-specific basis

219 In a frequency generic auction, bidders bid on lots independent of the position of those lots within the band. Where lots are assigned in this fashion, the auction requires an assignment stage for determining the specific frequencies assigned to each winner of the frequency generic lots. Winners in the assignment stage and prices to be paid are determined in a similar manner to the main stage. A frequency generic auction has two stages:

1. **Primary Stage** - where bidders bid on a specific number of lots, without reference to the frequency location of the lots. This stage determines the number of lots that a successful bidder has won.

2. **Assignment Stage** - allows winning bidders to place a value on the location of its winning lots within the band, and determines the specific frequencies to be assigned to each winning bidder.

220 Under a frequency generic approach, it is important that lots are of similar value

to bidders. If the lots within a generic lot category have different values for a bidder (i.e. not all lots have the same value to a bidder), it may be difficult for the bidder to decide how much to bid for a given number of generic lots when it does not know the value of the spectrum it will ultimately receive. In the primary stage, such bidders would need to balance the risk of bidding closer to the high value lots but then winning lower value frequencies in the assignment stage, against the risk of bidding at the lower end of its valuations and winning fewer lots than it might have done in the efficient outcome.

221 In this award, an important source of consideration is that the value of the radio spectrum to certain bidders may depend on retaining their current position in the band. As noted by DotEcon, "*if frequency adjustment costs are significant relative to the likely value of these licences, then it might not be appropriate to expect bidders to make bids on a frequency-generic basis, first allocating frequency-generic lots and afterwards determining frequency assignments given the number of generic lots assigned*."[65]

222 A frequency-generic approach could face bidders with the problem of deciding how much generic lots would be worth to them without knowing what re-tuning might be required when specific frequencies were subsequently assigned. This could risk inefficient outcomes due to distorted bidding incentives in the primary stage. For example, if a certain bidders' value was based primarily on the position in the band, it may submit relatively low bids in the primary stage to guard against the risk of being assigned spectrum outside its preferred frequency range and incur significant retuning costs. As a result, it may not bid enough in the primary stage and subsequently not be assigned any spectrum when the efficient outcome (based on valuations) would have involved that bidder winning something.

223 Alternatively, a bidder may bid higher in the primary stage (closer to the value of its preferred frequencies) in order to avoid the risk of losing out on spectrum, but then be assigned spectrum outside its preferred frequency range at a price above the bidder's valuation for the frequencies it is awarded.

224 Therefore, it is worth considering whether a frequency-generic approach exposes bidders to risks if incumbents face significant costs of moving frequency assignments. Second, if such costs are significant, what, if any, auction design measures can mitigate against these risks without compromising the efficiency of the award process.

225 In a frequency-specific auction, bidders bid on lots where each lot is assigned a specific frequency within the band. As noted by DotEcon, bidders' valuations could then reflect the different re-tuning costs of different options, which would avoid facing bidders with unnecessary risk and ensure that the auction prices were

[65] DotEcon Report 17/85a, p 50.

reflective of retuning costs. The use of frequency-specific lots ensures that all bidders (incumbents and new entrants) would be able to express their preferences and compete both over the number of blocks they receive and the frequency assignment for those blocks. DotEcon also advises that this approach would not show undue preference to incumbents. In particular, no additional rights would be granted to incumbents beyond the life of existing licences by this approach.

226 However, DotEcon outline that such an approach raises two main risks which could compromise the efficiency of the award:

1. Bidders might fail to make a sufficient number of bids, only bidding for a limited number of frequency options leading to an inefficient outcome.

2. It enhances the possibilities for exclusionary bidding by certain bidders deliberately limiting its set of frequency-specific bids with a view to creating fragmentation of the band that excludes a rival bidder.

227 In relation to 1, DotEcon observe that this problem can be largely resolved by putting bidders on notice of this risk and explaining the importance of bidding for all frequency options of potential interest, not just preferred options. Furthermore, bid forms or bid software could be designed in such a way that bidders would be required to enter certain default bids unless they explicitly *opt out* of submitting those bids.

228 In relation to 2, a bidder is deliberately limiting its set of frequency-specific bids with a view to creating fragmentation of the band that excludes a rival. This type of behaviour requires particular assumptions and in many practical situations the ability of a bidder to use frequency-specific bidding to exclude rivals is likely to be much more limited. DotEcon note that with 19 lots and a cap on demand of 5 lots, it appears very difficult to use frequency-specific bids in this manner to fragment the band with a view to excluding other bidders. ComReg is of the view that this risk requires further consideration particularly as certain bidders (incumbents) frequency preferences are likely to be known by all bidders.

229 Overall, DotEcon note that these risks are not sufficiently serious to rule out the use of the frequency-specific lot approach at this stage. However, equally because of these potential issues it is important that frequency-specific lots are only used in preference to the simpler frequency-generic approach if there is a clear need.

230 ComReg agrees with DotEcon's assessment and in particular that the use of a frequency-specific approach should only be used where a clear need has been demonstrated. In that regard, and in light of the potential risks associated with a frequency-specific award, to proceed further with this option ComReg requires sufficient evidence as to the extent to which certain bidders may incur costs associated with being assigned rights of use in a position other than their existing positions within the band.

231 Interested parties should describe whether the costs of retuning are a relevant consideration in this award. In particular, where respondents are of the view that such costs would necessitate the use of a frequency-specific approach, appropriate evidence should be provided, including:

- Technical specifications of the link equipment currently in use by incumbents;
- The extent to which existing equipment is re-tuneable for other parts of the 26 GHz band and the span of that retuning (i.e. does the radio base station equipment currently being supplied have the capability to span this bandwidth in a single RBS);
- Where costs associated with retuning are alleged to arise, respondents should provide the following;
    - The number of sites/links where such costs (whether retuning or replacement) would arise;
    - The various elements of equipment which would require upgrades or replacement; and
    - An estimate of the man-hours, and the cost thereof, required to either upgrade or replace an existing piece of equipment.
- Respondents should provide detailed and verifiable evidence for data provided, including where relevant:
    - Similar costs previously incurred as a result of retuning or replacing equipment;
    - an assessment of costs, or part thereof, provided by third parties such as equipment vendors or independent contractors;
    - an assessment of the technical capabilities of the transmitter equipment provided by third parties such as equipment vendors or independent contractors.

232 ComReg will make a final determination on whether to use a frequency-generic or frequency-specific award following an assessment of all information provided by respondents and any other advice it may receive.

5.5 Packaging of lots

233 The 2008 award consisted of 18 blocks of 2 × 28 MHz. ComReg below considers whether it is necessary to maintain a 2 × 28 MHz lot size or to have larger or smaller lot sizes for the purpose of this award.

Larger Lot Sizes

234 In relation to the use of larger lot sizes such as 2 × 56 MHz, ComReg is of the preliminary view that services could potentially be deployed using just one lot of

2 × 28MHz on a national basis. For example, in the previous 2008 award, Digiweb limited were assigned 1 national point-to-multipoint channel[66] and Irish Broadband were assigned 1 national point-to-point channel.

235 Using larger lot sizes could have significant potential downsides. It could limit the flexibility that bidders have in expressing demand for precise quantities above any minimum requirement and therefore could lead to an inefficient outcome. Furthermore, the use of larger blocks sizes could potentially exclude those bidders who only have a requirement for one block (as in 2008). The risk of unsold spectrum also increases when bidders can only express demand in relatively large 'steps'. This potentially leads to an inefficient assignment of spectrum, along with an increase in the associated costs of acquiring such spectrum rights of use.

236 The SBCA described above allows for the aggregation of lots by bidders into packages of spectrum that would constitute larger blocks and therefore allows bidders to express their preferences up to the level of the competition cap (See Section 5.6 below).

Smaller Lot Sizes

237 In relation to smaller block sizes of 2 × 14 MHz or 2 × 7 MHz, ComReg is of the preliminary view that the use of smaller block sizes would add additional complexity to the award process[67] where such uses can already be accommodated in individual links. Data requirements are projected to increase over the coming years[68] therefore it is also unlikely that any individual user would have a requirement for a lot size of less than 2 × 28 MHz on a national basis, particularly where alternative spectrum is available.

238 Therefore, ComReg is of the preliminary view that 2 × 28 MHz remains an appropriate minimum lot size to accommodate technologically-neutral use for P2P links on a national basis.

5.6 Competition Caps

239 The main purpose of a competition cap is to guard against the risks of an extreme asymmetric outcome that has the potential to harm downstream competition. However, the competition cap should be set at a level that still allows for the distribution of spectrum to be determined by competition amongst the bidders, rather than unduly restricting the potential outcomes to a symmetrical split of the frequencies. DotEcon is of the view that there are no strong reasons to expect there to be a strong anticompetitive motive for a bidder to acquire spectrum to limit

[66] Digiweb Limited, subsequently surrendered its PMP block in 2009.
[67] For example, the use of 2 × 14 MHz lot size would double the number of available lots to 38 and the use of 2 × 7 MHz would increases the number of lots to 76.
[68] ComReg 16/50 – Radio Spectrum Management Strategy 2016 to 2018.

the number of winners of national P2P blocks.

240 In particular, bidders have alternative options in order to provide backhaul to the network. For example, DotEcon notes:

- The option of using individual licences would remain open;
- there are options to use other spectrum bands for P2P links; and,
- it is possible to make greater use of fibre backhaul.

241 Notwithstanding, DotEcon notes that as the number of links an undertaking is using grows, 26 GHz National Blocks are likely to become more cost effective at some point depending on the price of those 26 GHz National Blocks (See Annex C of DotEcon Report). In addition, the absence of a competition cap, or the imposition of a large competition cap could have impacts on competition in the future if a bidder accumulated significant spectrum rights of use and liberalised early or prevented others from doing so in the future. ComReg agrees with the views of DotEcon and is of the preliminary view that a spectrum competition cap is required for this award.

242 For the avoidance of doubt, ComReg notes that any proposed competition cap would only apply for the duration of the proposed auction and licensees would, subject to the licences granted on award, be free to trade, lease and combine rights of use of spectrum following the auction to the extent that such rights of use of spectrum are designated as being tradable or leasable and in line with competition law and the legal framework for electronic communications in Ireland.

5.6.1 Proposed competition cap for 26 GHz award process

243 In the 2008 award, there was a cap of six 2×28 MHz blocks. This cap provided for at least three winners with at least six blocks (given sufficient demand). The largest amount of spectrum won by any bidder was five blocks (Three). Therefore, the maximum option of six blocks was not reached, and four blocks went unsold. In addition, DotEcon does not see a strong need for setting a tight auction cap (i.e. less than four blocks) to allow for many winners.

244 ComReg agrees with the views of DotEcon and is of the preliminary view that a competition cap of between four and six blocks would be appropriate. In particular, noting that the largest bandwidth on a single link that is useable with currently available equipment is 2 × 112 MHz (i.e. four blocks) and the previous award had a spectrum competition cap of six blocks. These are assessed in order below.

Potential spectrum competition cap of 6 blocks

245 A competition cap of six blocks would represent the same competition cap used in the 2008 award. Data on the use of individually licensed P2P blocks suggest that there is only limited use of higher bandwidth links deploying multiple adjacent

blocks. Therefore, it would appear that, at least to date, there has not been any demand for six adjacent blocks, despite the competition cap being set at this level in 2008. While this cap was above the maximum demand expressed in the previous award, as noted in the draft RIA[69], there is likely to be increased demand for spectrum in this award. Therefore, bidders may have preference for a block of six.

246 However in the present case, ComReg notes that two additional blocks of spectrum are available for release, allowing for a greater range of potential competition caps to be considered. [70] If the cap only guarantees the possibility of three winners as in 2008, then highly asymmetric outcomes are possible in this award, the most extreme one being that in which three winner obtains up to the cap and the fourth winner only the minimum guaranteed (i.e. one block).

247 Therefore ComReg notes that a competition cap of six blocks is likely to be inappropriate for this award as it:

- would allow three winners to win 6 blocks leaving a single block that may not be desirable for most bidders; and
- may not ensure the efficient use of spectrum because that residual lot may be left unused; and
- the views of DotEcon that it would appear feasible to reduce the six block cap used in 2008 to four or five blocks without significantly constraining bidders[71].

Potential spectrum competition cap of 4 blocks

248 A spectrum competition cap of four blocks would provide for a minimum of five winners with at least three blocks for each bidder given sufficient demand. Such a cap would be appropriate where there were specific concerns about the impact of the assignment on downstream competition.

249 However, as noted above, the assignment of rights of use in this band are unlikely to create significant distortions to downstream competition. As a result, a cap of four blocks is unlikely to be suitable as it would restrict the range of demand that can be expressed (given that Three already has five blocks from the 2008 award) and such a restriction is not likely to be proportionate to the risk of competitive distortions.

[69] See Chapter 3.
[70] A guard block left between the national block and FWALA assignments, and the national blocks and the individual assignments in the 2008 award are being made available as a national block in this award.
[71] For example, as noted above, there are options to use other spectrum bands for P2P links and to make greater use of fibre links.

Potential spectrum competition cap of 5 blocks

250 A spectrum competition cap of five blocks would provide for a minimum of four winners with at least four blocks for each bidder given sufficient demand.

251 Such a cap is possible in this award as two extra blocks are available compared to 2008.[72] In that regard, DotEcon recommends a five-block cap which has the attraction of providing the opportunity for at least four winners each to gain at least four blocks, which would be sufficient to meet the very large majority of current usage patterns on fixed links.

252 ComReg agrees with the views of DotEcon and is of the preliminary view that a competition cap of five blocks would be a more proportionate and balanced response having regard to ComReg's functions, objectives and duties, and to the circumstances pertaining in this award, because:

- It would better allow bidders to obtain sufficiently large contiguous blocks of spectrum to meet likely future requirements and would not unduly restrict the range of demand that could be expressed in the proposed auction;
- it would allow for a minimum of four winners who win at least four lots[73] (which is useable with commodity equipment);
- it would better ensure the efficient use of spectrum by minimising the potential for lots to be stranded and therefore unused; and
- DotEcon considers that setting the competition cap at five blocks would not appear unduly restrictive.

253 Therefore for the reasons stated above, ComReg's preliminary view is that a competition cap of five blocks is appropriate for this award process.

5.7 Unsold Lots

254 The particular approach for dealing with unsold spectrum rights of use will depend on the amount and type of spectrum that is unsold. ComReg is of the view that discretion is required on how to proceed if the issue of unsold spectrum rights of use becomes a reality. This is to avoid providing a negative incentive to bidders to strategically withhold demand during the auction in the hope of being assigned this spectrum on the same or more preferable terms as those offered in the auction in a follow-up process.

255 Therefore, for the purpose of this award process, ComReg is of the view that it should retain its discretion regarding how it might treat any unsold spectrum lots

[72] For example, had the additional block been available in 2008, a cap of five would have allowed a greater range of outcomes all of which would have subsequently been facilitated.
[73] Assuming the use of a frequency-generic approach.

depending on the factual circumstances arising from the award process, save that it intends that unsold lots will not be assigned for a reasonable period after the process has ended.

5.8 Fees

256 This section considers matters in relation to fees that would potentially apply to rights of use assigned under the proposed award process. In this section ComReg:

- Provides an overview of the approach to fees used in the 2008 assignment of 26 GHz rights of use;
- Considers the relevance of minimum prices and the proposed approach in setting a minimum price for this award process;
- Considers the DotEcon Report and associated recommendations; and
- Sets out the proposed upfront SAF and ongoing SUFs that will be applicable to rights of use assigned under the proposed award process.

257 For ease of reference, ComReg sets out below definitions for the main technical terms used in this section:

- **Reserve Price/Minimum SAF**– This is the minimum bid for a lot for such a lot to be assigned. The reserve price in an auction is an established price floor below which a lot will not be sold.
- **Spectrum Access Fee ("SAF")** – This is the upfront fee which is payable by a winning bidder for a licence at the end of the auction.
- **Spectrum Usage Fee ("SUF")** – This is the annual fee which a successful bidder must pay throughout the duration of the licence and is additional to the amount that would be payable upfront at the conclusion of the auction.
- **Minimum Price** – This price is the combination of the Reserve Price and SUF and is therefore the total price per lot set at the beginning of the auction. For ComReg, the minimum price represents the lowest overall price subject to which it will grant rights of use for the licence period in relation to the spectrum concerned. For bidders, the effective minimum price is the sum of the upfront reserve price and the discounted stream of annual SUFs.

5.6.2 Approach to fees in the 2008 award

258 ComReg used a benchmarking approach to determine the level of minimum prices in the 2008 award.

259 The minimum price amounted to a total of €350k (on an undiscounted basis[74]) per 2 × 28 MHz block of spectrum, split into:

- A reserve price of €70k per 2 × 28 MHz lot, payable up-front via SAF, and
- A total SUF of €280k (paid in annual instalments of €20k for years 2-5 and €40k for years 6-10) adjusted for consumer price inflation.

5.6.3 Relevance of minimum prices

260 The purpose of this section is to explain the rationale for applying a minimum price and consider whether a minimum price is necessary for the proposed award process. The number of potential users of spectrum may be limited by a number of factors, such as the number of undertakings that may be able to coexist in downstream markets. As a result, low participation scenarios are likely in spectrum awards. This may lead to low competition, especially if bidders have incentives to bid conservatively to keep prices low. As a result, minimum prices may be necessary to:

- Set a floor below which rights of use will not be assigned for a spectrum block;
- Mitigate the risk that rights of use will be sold to low-value inefficient users due to low participation (in the event that a higher value use may emerge in the near future);
- Reduce the potential gains associated with gaming behaviour aimed at restricting competition in the award (such as tacit collusion); and
- Encouraging bidders to compete thus promoting an efficient outcome; and;
- Prevent frivolous/speculative bidding occurring during the award.

261 Therefore, a minimum price needs to be set in order to prevent bidders obtaining access to valuable spectrum at a price below the level that would be determined by competition between bidders. A low or no minimum price could lead to less intense competition if bidders have incentives to bid strategically to keep prices artificially low.

262 DotEcon strongly recommends the use of minimum prices for the proposed award on the basis that they:

[74] Using a discount rate of 9%, the present value of the fees for a 2 × 28 MHz national block was about €245k in 2008 terms.

- Reduce incentives for strategic behaviour within an auction aimed at decreasing the price paid for spectrum rights of use below the true market value; and
- Discourage frivolous bidding by ensuring that only bids over a certain non-trivial level will be considered eligible by ComReg.

263 ComReg agrees with the views of DotEcon and is of the preliminary view that a minimum price is necessary in this award. In respect of the level at which the minimum price should be set, a number of factors which should inform that decision and that are relevant to the proposed award process, include that:

a) The minimum price should not be set so high as to choke off demand of serious bidders;

b) Assigning spectrum below a price that would be determined by competition would fail to meet ComReg's statutory objectives;

c) The minimum price should be set high enough to discourage participation by frivolous bidders;

d) A low minimum price could lead to excessive take up simply because the price is low resulting in the premature award of spectrum inefficiently displacing valuable future uses; and

e) The minimum prices should not facilitate collusive behaviour (whether tacit or explicit) or otherwise fixing of demand.

264 The minimum price should find an appropriate balance between (a) where a high minimum price could choke off demand and the remaining factors (b) to (e) which could result in an inefficient assignment of spectrum because the minimum price was set too low. In relation to (a) because of the uncertainty when estimating market value, minimum prices are typically set conservatively to mitigate the risk of setting excessively high prices that could choke off demand. More conservative prices will be used when there is more uncertainty about the value of lots.

5.9 ComReg's approach to minimum prices in this award

265 Section 5.8.1 above describes the approach and level of minimum prices set in the 2008 award. ComReg notes that the 2008 award used a benchmarking approach in order to determine the level of minimum fees. ComReg notes that other approaches are available for setting the minimum price.[75].However, ComReg firstly considers it appropriate to assess whether the level of the minimum fee in 2008 is appropriate for use in the proposed award process.

[75] Business modelling, low but non-trivial, and administrative costs.

266 Not all blocks of spectrum were assigned in the 2008 award. However, DotEcon is of the view that this is not a good reason to use a different approach or reduce the level of the minimum price. In particular:

- Demand for spectrum for P2P links at 26 GHz is likely to have grown since 2008, in line with general growth in data use and demand for connectivity bandwidth;
- There is a low risk of licences going inefficiently unsold with a minimum price set at 2008 levels; and
- Setting a lower minimum price by lowering SUFs could result in high auction prices as bidders would anticipate these lower annual fees when determining how much licences are worth to them.

267 ComReg agrees with the views of DotEcon, and for the reasons set out in Chapter 3 (the draft RIA), is of the preliminary view that demand for 26 GHz rights of use has increased in the intervening period.

268 Separately, in order to provide greater certainty that the minimum price is set at the correct level, DotEcon have conducted an updated benchmarking assessment.

5.9.1 DotEcon Benchmarking Approach

269 The auctions included in the benchmarking process arise in different jurisdictions and are invariably structured differently in terms of price and licence term. In addition, various macroeconomic factors such as inflation and exchange rates limit the extent to which final prices in a spectrum award are comparable across different jurisdictions. Therefore, it is necessary to make adjustments to ensure any benchmarked valuations are adjusted to a common basis.

270 DotEcon uses the following approach to ensure that licence prices across different jurisdictions are adjusted to a common basis:

1. Prices are expressed in MHz per head of population to correct for population and quantum of spectrum assigned in an auction.[76]
2. The present value (PV) of the stream of ongoing payments associated with the licence (e.g. Spectrum Usage Fees) calculated[77].
3. Differences in licence terms are accounted for by normalising to a 10 year licence term.[78]

[76] Auction prices are weighted with respect to MHz assigned and population covered by the licence.
[77] DotEcon uses a discount rate of 9% for all PV calculation which is outlined on p18 of the DotEcon report 17/85a.
[78] Assumes a constant annual value of spectrum.

4. Prices are expressed in 2017 Euros. This is necessary because the benchmarks includes a wide range of countries beyond the Euro area.[79]

271 Furthermore, in order to take account of differences in market conditions in considering these bands and the recommended estimate, DotEcon places greater weight on:

- European benchmarks where greater uniformity across market conditions is expected;
- Awards that have occurred in the last decade; and
- Competitive benchmarks which are defined as auctions where the licence price for at least one lot exceeded the reserve price for that lot category[80].

272 Separately, DotEcon uses an objective and transparent rule to identify outliers using standard definitions of outliers[81] rather than excluding data points in an ad-hoc manner. In that regard, DotEcon excluded observations that:

- Lie more than three standard deviations away from the sample mean; or
- Lie more than three times the interquartile range away from the 75th percentile

273 ComReg agrees with the overall approach used by DotEcon for the following reasons:

- It uses available 26 GHz award prices and data from the award of bands that are technically and commercially comparable to the 26 GHz frequencies.
- The approach is consistent with previous benchmarking approaches designed to set conservative minimum prices, i.e. 3.6 GHz award.
- It takes account of the differences between jurisdictions and makes appropriate adjustments;
- It gives a range of estimates that allows ComReg to establish a conservative estimate of value; and
- It uses an objective and transparent rule to identify outliers.

[79] Individual minimum prices were adjusted for currency differences using Purchasing Power Parity (PPP) exchange rates to account for price differences across countries and converted into a common currency (US Dollar). Prices in US Dollars in the year of the award are then adjusted for US inflation. This established comparable prices in real US dollars which is ultimately expressed in Euro.

[80] The more competitive the auction, the more likely final auction prices are likely to reflect opportunity cost of the spectrum concerned. DotEcon defines a competitive auction to be one where the license price for at least one lot exceeded the reserve price for that lot.

[81] Outliers are observations that are far removed from the rest of the sample and are unlikely to be comparable to Ireland.

5.9.2 Level of minimum price

274 DotEcon benchmarked 16 spectrum awards (9 competitive[82]) and produced a range of estimates for the possible value of 26 GHz rights of use[83]. However, as noted by DotEcon these bands have been used in a variety of different ways, including both for P2P applications and also PMP and FWA. Therefore, there is a significant degree of uncertainty about what the value of 26 GHz is specifically for P2P links. In that regard, the benchmarking estimates produced a European benchmark of €0.00133 /MHz/Pop, which implies a price of around €330k (discounted) for a 2 × 28 MHz national block. This is above the minimum price of €245k (discounted) set in the 2008 award. However, in light of the potential uncertainties, DotEcon recommends a minimum price of €245,000 per block (on a discounted basis including all SUFs at a 9% discount rate) as used in the 2008 award.

275 ComReg agrees with DotEcon's assessment and is of the view that fees set at this level are unlikely to choke off demand given that:

a) It is below DotEcon's European benchmark of about €330k per block;

b) It is below the average of the competitive awards assessed by DotEcon (See Table 4 in the DotEcon Report); and

c) Certain potential new entrants to the band using individual links are paying above €330k for what amounts to a similar or lower amount of spectrum used for a comparable purpose.[84]

276 Further at this level the minimum price is likely to be sufficiently high so as to limit the extent to which the factors raised in para 5.90 arise in practice. In that regard, a minimum price of €245k achieves an appropriate balance between the factors set out in para 5.90 above. ComReg is therefore of the preliminary view that the minimum price for the proposed award should be €245k per 2 × 28 MHz block.

5.9.3 Minimum price structure

277 The minimum price is made up of a minimum upfront SAF which is payable as part of the award process and the sum of annual spectrum usage fees (SUFs) which are paid periodically over the licence duration. The rationale for having some portion of the minimum price in the form of a usage fee is to create sufficient incentives for licensees to make efficient use of spectrum and to hand back part or all of any spectrum holdings for which they no longer have any use.

278 In that regard, DotEcon notes that a minimum price typically requires a balance of

[82] At least one lot sold above reserve.
[83] The benchmark includes 32 GHz and 40 GHz spectrum in the sample as these bands are technically similar to 26 GHz and used for commercially similar purposes.
[84] In particular, Meteor had 219 individual links deployed as at May 2017 at around €1,000 per link per year.

considerations, including that:

- A reasonable part of the overall price of spectrum determined by the auction is recovered through a payment made soon after the auction, as this discourages speculative bids that might not be appropriately financed; and
- On-going usage fees face licensees with an actual cost (as opposed to just an opportunity cost) that encourages return of unused spectrum to ComReg.

279 ComReg agrees with DotEcon and is of the preliminary view that a fee structure composed of both a minimum upfront SAF and ongoing stream of indexed SUFs should be applied for the following reasons:

- Paying SUFs on an ongoing basis during the licence period would encourage licence holders to consider the opportunity cost of holding rights of use throughout the period of the licence;
- A real financial outflow (i.e. the SUF) will provide a stronger incentive than an opportunity cost alone (i.e. the revenue forgone from not trading) to use spectrum efficiently;
- A minimum upfront SAF reduces the risk that spectrum is assigned to speculative bidders who may use the spectrum inefficiently.

280 DotEcon consider that a reasonable balance would be to set a reserve price of €70k per 2 × 28 MHz block, with ten annual SUF payments over the licence term of €25k per block. This would result in an overall minimum price of about €245k (i.e. discounted sum of reserve price and SUFs), which is very similar to the 2008 award. Roughly 30% of the minimum price would be recovered through the auction reserve price, and about 70% through SUFs.

281 ComReg agrees with DotEcon that a SAF/SUF proportion similar to 2008 is appropriate. In particular, experience since the 2008 award has not provided any reason to move the fee proportions set in that award. A higher SAF proportion (as used in MBSA/3.6 GHz) may be necessary where bidders have incentives to acquire more spectrum than appropriate for an efficient use and if the benefits from retaining such spectrum fell below the cost of annual SUFs (e.g. for hoarding purposes as the bidder could hold onto excess spectrum to deny it to competitors for a period but return it once it had consolidated its market position). However, the risk that bidders may acquire excess spectrum is lower in this award compared to the assignment of harmonised ECS spectrum where the potential impacts on downstream competition are likely to be larger. Therefore, ComReg is of the preliminary view that the minimum price per block should consist of an upfront minimum SAF[85] of €70k per 2 × 28MHz block and an annual SUF of €25k per

[85] The SAF is calculated on the basis of the bids received and is at least the sum of reserve prices of all lots included in the award.

block subject to annual indexation by CPI.

282 The proposed minimum fee structure is on the basis that SUFs are paid prior to the first grant of a Licence and then over its duration. This is in line with ComReg's current approach to SUFs.[86] In that regard, there will be ten SUF payments of €25k that begin in year one.

283 SUFs are indexed-linked to the overall Consumer Price Index ("CPI") as published by the Central Statistics Office of Ireland or its successor. As the CPI may vary over time, the SUF per Lot may increase or decrease over the duration of the 3.6 GHz Licence based upon the increases or decreases in the CPI for the relevant time period.

5.9.4 Implementation of reserve price

284 In the 2008 award, the implementation of the reserve price in terms of how bids were made, and how prices were determined, was different to the approach taken in the Multi-Band Spectrum Award (MBSA) and the 3.6 GHz Award. Both bids made and base prices[87] for generic lots were subject to reserve prices, in that:

- Each bid made on application had to be for an amount no less than the reserve price applied to the relevant number of lots (i.e. the reserve price for a package of lots had to be no less than the sum of reserve prices for those lots); and
- The winning prices derived were subject to a floor equal to the reserve price applied to the relevant number of lots (i.e. the winning price for a package of lots had to be no less than the sum of reserve prices for those individual lots).

285 As noted by DotEcon, under this approach, it was possible to yield a price below the reserve price, as the opportunity costs might be set by the incremental value that a bidder placed on additional lots. In this way, the incremental value of releasing additional lots could be less than the reserve price. Whilst each individual bid would need to exceed the relevant reserve price, it was possible that the difference between two bids for packages of different sizes could express an incremental value for additional lots less than the reserve price.

286 Therefore, DotEcon recommend that the implementation of the reserve price using a second price approach should be implemented as follows:

- Bids are subject to a reserve price floor;
- When determining the winning bids, any unassigned lots are valued at reserve price;

[86] 2012 MBSA and 2016 3.6 GHz award.
[87] The base price was the price to be paid by a bidder for the package of lots that became the winning bid.

- When calculating opportunity costs for applying the MRC pricing method, each individual and joint opportunity cost is subject to a floor of reserve price

287 ComReg agrees with this revised method of applying reserve prices. In particular:

- It is consistent with the approach used in the recent spectrum awards (i.e. MBSA and 3.6 GHz);
- It ensures that lots are only awarded when the incremental value of releasing additional lots exceeds the reserve price. The previous approach would allow certain lots to be assigned at a price below reserve.

288 Therefore, ComReg is of the preliminary view that the revised method of applying minimum prices is suitable and necessary for this proposed award process.

6 Indicative Licence Conditions

6.1 Introduction

289 This section sets out the indicative licence conditions that ComReg proposes to attach to the new 26 GHz National Block Licences. ComReg document 06/37cR ("Guidelines for National Point-to-Point and Point-to-Multipoint Block Licences in the 26 GHz Band") has been used to inform these licence conditions with ComReg proposing a number of changes to certain conditions to update the licence to current market needs.

6.2 Channel Bandwidths

290 On foot of the 2008 award process, licensees can use bandwidths of 3.5 MHz, 7 MHz, 14 MHz and 28 MHz within each of their blocks. Bandwidths of 56 MHz can be used if a licensee held two or more blocks (2 × 28 MHz blocks). However currently this is the maximum bandwidth permitted in the band.

291 For the proposed award process, existing bandwidths detailed above would continue to be applicable in the current award process. ComReg also proposes to increase the maximum available bandwidth from 56 MHz to 112 MHz provided a licensee has four or more contiguous lots.

292 Due to the increase in data usage over the last ten years and the continued increase of data required, ComReg believes that increasing the bandwidth to 112 MHz will meet this data need. Equipment currently available on the market is limited to a maximum bandwidth of 112 MHz, ComReg is of the view that providing a maximum bandwidth of 112 MHz would be adequate to meet current and future requirements.

6.3 EiRP, ATPC & ACM

293 As part of the 2008 award process licensees were required to ensure that any links operating in the band to use the minimum EiRP (Equivalent Isotropic Radiated Power) necessary to obtain the level of service and availability. As part of the proposed award process ComReg intends to maintain this requirement of using the minimum EiRP necessary to obtain the desired service and availability

294 ComReg mandated the use of Automatic Transmitter Power Control (ATPC) for all P2P radio links in this band[88] in the 2008 award process. ComReg proposes to continue to mandate the use of ATPC as part of the proposed award process based on the advantages that it provides to P2P links.

295 ComReg currently allows equipment utilising Adaptive Coding and Modulation (ACM) to be deployed in all fixed link bands. The use of ACM provides benefits for example:

- It provides a means of increasing data throughput and capacity over a microwave radio link, without increasing power or occupied bandwidth, thus making more efficient use of the spectrum; and,
- There are cost and environmental benefits, as the increase in data capacity avoids the need to deploy additional radio transmitters and receivers, thus minimising power consumption.

296 For these reasons ComReg also proposes to mandate the use of ACM as part of the proposed award process.

6.4 Site Registration

297 Currently specific transmission sites, and the immediate surrounding area[89], may be designated as “transmit high” or “transmit low”. The purpose of this is to ensure that the transmit frequencies in use on the site are sufficiently separated in

[88] ATPC is a feature of P2P 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 (rainfall) are over, 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 expected lifetime

[89] When planning a radio link specific sites and the immediate surrounding area are designated “transmit high” and “transmit low” in specific frequency bands, depending on the sub-band in which existing links on that site are transmitting. There is a search radius of between 100m – 500m for the various frequency bands, in the case of 26 GHz this search radius is 100m.

frequency from the receive frequencies to avoid harmful interference.

298 Licensees currently register the co-ordinates of their P2P sites with ComReg as a condition of using equipment within their 26 GHz National Block Licences. Any P2P equipment at sites which have not been registered with ComReg are deemed to be unlicensed.

299 For P2P Links a web based tool for the registration of transmit high and transmit low sites for the 26 GHz band is currently available. This tool accesses information on transmit high and transmit low sites from ComReg's database. Both sites of a P2P link need to be registered with ComReg.

300 ComReg proposes to keep the above conditions for 26 GHz site registrations and have the same online system for registering sites either transmit high or transmit low.

6.5 Submission of Site information

301 In addition to the above requirement to register sites as transmit high or transmit low and in order to help fulfil ComReg's mandate to ensure the efficient use of the spectrum, licensees are obliged to submit to ComReg information detailing all the apparatus for wireless telegraphy deployed by the licensee in their 26 GHz spectrum bands in aggregate form on years three, five, seven and nine of the years the licence is in force. The last tranche of site deployment information was received in May 2017.

302 In the event that spectrum obtained as part of the 2008 award process was not being used after three years of the issue of the licence and on the fifth, seventh and ninth anniversaries of the licence issue, ComReg reserved the right to amend or revoke the licence accordingly. The requirement on a licensee to demonstrate that their spectrum was being used applied to each contiguous block of spectrum assigned (including guard bands) to the licensee rather than to individual blocks.

303 ComReg intends to retain the obligation on licensees to submit information detailing the apparatus for wireless telegraphy that is deployed by the licensee at each site. However ComReg is of the view that in order to ensure that it has the most up to date and accurate information of all apparatus deployed that this information should be proved on an annual basis in line with similar requirements for other licence types. ComReg proposes that the following information should be provided as part of this process;

- Site Name
- Site co-ordinates (easting/northing)
- Transmit Frequency
- Receive Frequency
- Channel Number
- Channel Bandwidth
- Hi/Lo Designation

6.6 International Equipment Standards

304 On 16 April 2014, the European Union adopted a new set of rules for placing radio equipment on the European market, and putting them into service. This new directive is called the Radio Equipment ("RE") Directive (2014/53/EU, published on 22 May 2014) and all radio equipment must comply with this[90]. Manufacturers who were compliant with the existing R&TTE Directive had until 13 June 2017 to comply with the new RE Directive. During this transition period, radio equipment was permitted to be declared compliant under either Directive.

305 All antennas for Point-to-Point systems are required to be of at least 'class 3' standard as defined by ETSI EN302 217-2: Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 2: Digital systems operating in frequency bands from 1 GHz to 86 GHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

[90] The RED has been transposed into Irish law as S.I No. 248/2017 – European Union (Radio Equipment) Regulations 2017

7 Submitting Comments

7.1 Submitting Comments

306 All input and comments are welcome. However, 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.

307 Please also set out your reasoning and all supporting information for any views expressed.

308 The four week period for comment will run until 17:00 on 16th November 2017, during which time ComReg welcomes written comments on any of the issues raised in this paper.

309 Reponses must be submitted in written form (post or email) to the following recipient, clearly marked —Submissions to ComReg 17/85:

Jack O'Dwyer
Commission for Communications Regulation
One Dockland Central
Guild Street
Freepost
Dublin 1
D01 E4X0
Ireland

Email: jack.odwyer@comreg.ie

Annex: 1 Glossary

A 1.1 The definitions in this glossary shall apply to this document as a whole

A 1.2 Where a term in this glossary is defined by reference to a definition in a section or paragraph and an explanation of that term is provided in this glossary, the latter explanation is for convenience only and reference should be made to the appropriate part of the document for the definitive meaning of that term in its appropriate context.

A 1.3 Any reference to any provision of any legislation shall include any modification re-enactment or extension thereof.

A 1.4 Terms defined in this consultation paper shall, unless the context otherwise requires or admits, have the meaning set out below:

The 26 GHz Band	The frequency range 24.549 – 26.453 GHz
CPI	Consumer Price Index published by the Central Statistics Office
NRA	National Regulatory Authority
RIA	Regulatory Impact Assessment, an analysis of the likely effect of, and necessity of, a proposed new regulation or regulatory change. Such assessments are carried out in accordance with Document 07/56a - Guidelines on ComReg's approach to Regulatory Impact Assessment - August 2007.
Spectrum Right of Use	Authorisation to use certain radio frequencies subject to such conditions and restrictions as may be prescribed in a licence or by any Regulations made by ComReg under Section 6 of the Act of 1926.

A 1.1 European and Governmental Bodies, Regulatory and Standardisation Organisations

3GPP	The 3rd Generation Partnership Project
ComReg	Commission for Communications Regulation
CEPT	Conférence européenne des Administration des postes et des télécommunications. In English, European Conference of Postal and Telecommunications Administrations
DCCAE	Department of Communications, Climate Action and Environment
EC	European Commission
ECC	Electronic Communications Committee
ECO	Electronic Communications Office
EU	European Union
ITU	International Telecommunications Union
RSPG	Radio Spectrum Policy Group

Annex: 2 Legal Framework and Statutory Objectives

A 2.1 The Communications Regulation Acts 2002-2011[91] (the "2002 Act"), the Common Regulatory Framework (including the Framework and Authorisation Directives[92] as transposed into Irish law by the corresponding Framework and Authorisation Regulations[93]), and the Wireless Telegraphy Acts 1926 to 2009[94] set out, amongst other things, powers, functions, duties and objectives of ComReg that are relevant to the management of the radio frequency spectrum in Ireland and to this preliminary consultation.

A 2.2 Apart from licencing and making regulations in relation to licences, ComReg's functions include the management of Ireland's radio frequency spectrum in accordance with ministerial Policy Directions under Section 13 of the 2002 Act, having regard to its objectives under Section 12 of the 2002 Act, Regulation 16 of the Framework Regulations and the provisions of Article 8a of the Framework Directive. ComReg is to carry out its functions effectively, and in a manner serving to ensure that the allocation and assignment of radio frequencies is based on objective, transparent, non-discriminatory and proportionate criteria.

A 2.3 This annex is intended as a general guide as to ComReg's role in this area, and not as a definitive or exhaustive legal exposition of that role. Further, this annex restricts itself to consideration of those powers, functions, duties and objectives of ComReg that appear most relevant to the matters at hand and generally excludes those not considered relevant (for example, in relation to postal services, premium rate services or market analysis). For the avoidance of doubt, however, the inclusion of particular material in this Annex does not necessarily mean that ComReg considers same to be of specific relevance to the matters at hand.

[91] The Communications Regulation Act 2002, the Communications Regulation (Amendment) Act 2007, the Communications Regulation (Premium Rate Services and Electronic Communications Infrastructure) Act 2010 and the Communications Regulation (Postal Services) Act 2011.

[92] 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")

[93] 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.

[94] The Wireless Telegraphy Acts 1926 to 1988 and Sections 181 (1) to (7) and (9) and Section 182 of the Broadcasting Act 2009.

A 2.4 All references in this annex to enactments are to the enactment as amended at the date hereof, unless the context otherwise requires.

Primary Objectives and Regulatory Principles under the 2002 Act and Common Regulatory Framework

A 2.5 ComReg's primary objective in carrying out its statutory functions in the context of electronic communications are to:

- Promote competition[95]
- contribute to the development of the internal market[96]
- promote the interests of users within the Community[97];
- 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;[98] 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[99] in particular those designed to ensure effective competition[100]

Promotion of Competition

A 2.6 Section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:

- Ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality;

[95] Section 12 (1)(a)(i) of the 2002 Act.
[96] Section 12 (1)(a)(ii) of the 2002 Act.
[97] Section 12(1)(a)(iii) of the 2002 Act.
[98] Section 12(1)(b) of the 2002 Act. Whilst this objective would appear to be a separate and distinct objective in the 2002 Act, it is noted that, for the purposes of ComReg's activities in relation to electronic communications networks and services ("ECN" and "ECS"), Article 8 of the Framework Directive identifies "*encouraging efficient use and ensuring the effective management of radio frequencies (and numbering resources*)" as a sub-objective of the broader objective of the promotion of competition.
[99] 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).
[100] Regulation 16(1)(a) of the Framework Regulations.

- ensuring that there is no distortion or restriction of competition in the electronic communications sector; and
- encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources.

A 2.7 In so far as the promotion of competition is concerned, Regulation 16(1)(b) of the Framework Regulations also requires ComReg to:

- Ensure that elderly users and users with special social needs derive maximum benefit in terms of choice, price and quality, and

- ensure that, in the transmission of content, there is no distortion or restriction of competition in the electronic communications sector.

A 2.8 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

A 2.9 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 electronic communications networks, electronic communications services and associated facilities at Community level;

- encouraging the establishment and development of trans-European networks and the interoperability of transnational services and end-to-end connectivity; and
- co-operating with electronic communications national regulatory authorities in other Member States of the Community and with the Commission of the Community in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of Community law in this field.

A 2.10 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

A 2.11 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 electronic communications services
- encouraging access to the internet at reasonable cost to users;
- addressing the needs of specific social groups, in particular disabled users; and
- ensuring that the integrity and security of public communications networks are maintained.

A 2.12 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 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.

Regulatory Principles

A 2.13 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 electronic communications networks and services;
- 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

A 2.14 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

A 2.15 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[101];

- have regard to international developments with regard to electronic communications networks and electronic communications services, associated facilities, postal services, the radio frequency spectrum and numbering[102]; 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.[103]

Policy Directions

A 2.16 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.

Policy Direction No.4 on Industry Sustainability

A 2.17 ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.

Policy Direction No.5 on Regulation where necessary

[101] Section 12(3) of the 2002 Act.
[102] Section 12(5) of the 2002 Act.
[103] Section 12(6) of the 2002 Act.

A 2.18 Where ComReg has 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

A 2.19 ComReg, before deciding to impose regulatory obligations on undertakings in the market for electronic communications or for the purposes of the management and use of the radio frequency spectrum or for the purposes of the regulation of the postal sector, shall conduct a Regulatory Impact Assessment in accordance with European and International best practice and otherwise in accordance with measures that may be adopted under the Government's Better Regulation programme.

Policy Direction No.7 on Consistency with other Member States

A 2.20 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 Management of the Radio Frequency Spectrum

A 2.21 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

A 2.22 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;
- the potential of alternative technology delivery platforms to support competition.

Other relevant obligations under the Framework and Authorisation Regulations

Framework Regulations

A 2.23 Regulation 17 of the Framework Regulations governs the management of radio frequencies for electronic communications services. Regulation 17(1) requires that ComReg, subject to any directions issued by the Minister pursuant to Section 13 of the 2002 Act and having regard to its objectives under Section 12 of the 2002 Act and Regulation 16 of the Framework Regulations and the provisions of Article 8a of the Framework Directive, ensure:

- The effective management of radio frequencies for electronic communications services;
- that spectrum allocation used for electronic communications services and issuing of general authorisations or individual rights of use for such radio frequencies are based on objective, transparent, non-discriminatory and proportionate criteria; and
- ensure that harmonisation of the use of radio frequency spectrum across the EU is promoted, consistent with the need to ensure its effective and efficient use and in pursuit of benefits for the consumer such as economies of scale and interoperability of services, having regard to all decisions and measures adopted by the European Commission in accordance with Decision No. 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the EU.

A 2.24 Regulation 17(2) provides that, unless otherwise provided in Regulation 17(3), ComReg must ensure that all types of technology used for electronic communications services may be used in the radio frequency bands that are declared available for electronic communications services in the Radio Frequency Plan published under Section 35 of the 2002 Act in accordance with EU law.

A 2.25 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 accordance with Regulation 17(6).

A 2.26 Regulation 17(4) requires that, unless otherwise provided in Regulation 17(5), ComReg must ensure that all types of electronic communications services may be provided in the radio frequency bands, declared available for electronic communications services in the Radio Frequency Plan published under Section 35 of the Act of 2002 in accordance with EU law.

A 2.27 Regulation 17(5) provides that, notwithstanding Regulation 17(4), ComReg may provide for proportionate and non-discriminatory restrictions to the types of electronic communications services to be provided, including where necessary, to fulfil a requirement under the International Telecommunication Union Radio Regulations (“ITU-RR”).

A 2.28 Regulation 17(6) requires that measures that require an electronic communications service to be provided in a specific band available for electronic communications services must be justified in order to ensure the fulfilment of a general interest objective as defined by or on behalf of the Government or a Minister of the Government in conformity with EU law such as, but not limited to:

- Safety of life
- the promotion of social, regional or territorial cohesion,
- the avoidance of inefficient use of radio frequencies, or

- the promotion of cultural and linguistic diversity and media pluralism, for example, by the provision of radio and television broadcasting services.

A 2.29 Regulation 17(7) provides that ComReg may only prohibit the provision of any other electronic communications service in a specific radio spectrum frequency band where such a prohibition is justified by the need to protect safety of life services. ComReg may, on an exceptional basis, extend such a measure in order to fulfil other general interest objectives as defined by or on behalf of the Government or a Minister of the Government.

A 2.30 Regulation 17(8) provides that ComReg must, in accordance with Regulation 18, regularly review the necessity of the restrictions referred to in Regulations 17(3) and 17(5) and must make the results of such reviews publicly available.

A 2.31 Regulation 17(9) provides that Regulations 17(2) to (7) only apply to spectrum allocated to be used for electronic communications services, general authorisations issued and individual rights of use for radio frequencies granted after the 1 July 2011. Spectrum allocations, general authorisations and individual rights of use which already existed on the 1 July 2011 Framework Regulations are subject to Regulation 18.

A 2.32 Regulation 17(10) provides that ComReg may, having regard to its objectives under Section 12 of the 2002 Act and Regulation 16 and its functions under the Specific Regulations, lay down rules in order to prevent spectrum hoarding, in particular by setting out strict deadlines for the effective exploitation of the rights of use by the holder of rights and by withdrawing the rights of use in cases of non-compliance with the deadlines. Any rules laid down under this Regulation must be applied in a proportionate, non-discriminatory and transparent manner.

A 2.33 Regulation 17(11) requires ComReg to, in the fulfilment of its obligations under that Regulation, respect relevant international agreements, including the ITU Radio Regulations and any public policy considerations brought to its attention by the Minister.

Authorisation Regulations

Decision to limit rights of use for radio frequencies

A 2.34 Regulation 9(2) of the Authorisation Regulations provides that ComReg may grant individual rights of use for radio frequencies by way of a licence where it considers that one or more of the following criteria are applicable:

- it is necessary to avoid harmful interference,

- it is necessary to ensure technical quality of service,

- it is necessary to safeguard the efficient use of spectrum, or

- it is necessary to fulfil other objectives of general interest as defined by or on behalf of the Government or a Minister of the Government in conformity with EU law.

A 2.35 Regulation 9(10) of the Authorisation Regulations provides that ComReg must not limit the number of rights of use for radio frequencies to be granted except where this is necessary to ensure the efficient use of radio frequencies in accordance with Regulation 11.

A 2.36 Regulation 9(7) also provides that:

- Where individual rights of use for radio frequencies are granted for a period of 10 years or more and such rights may not be transferred or leased between undertakings in accordance with Regulation 19 of the Framework Regulations, ComReg must ensure that criteria set out in Regulation 9(2) apply for the duration of the rights of use, in particular upon a justified request from the holder of the right.

- Where ComReg determines that the criteria referred to in Regulation 9(2) are no longer applicable to a right of use for radio frequencies, ComReg must, after a reasonable period and having notified the holder of the individual rights of use, change the individual rights of use into a general authorisation or must ensure that the individual rights of use are made transferable or leasable between undertakings in accordance with Regulation 19 of the Framework Regulations.

Publication of procedures

A 2.37 Regulation 9(4)(a) of the Authorisation Regulations requires that ComReg, having regard to the provisions of Regulation 17 of the Framework Regulations, establish open, objective, transparent, non-discriminatory and proportionate procedures for the granting of rights of use for radio frequencies and cause any such procedures to be made publicly available.

Duration of rights of use for radio frequencies

A 2.38 Regulation 9(6) of the Authorisation Regulations provides that rights of use for radio frequencies must be in force for such period as ComReg considers appropriate having regard to the network or service concerned in view of the objective pursued taking due account of the need to allow for an appropriate period for investment amortisation.

Conditions attached to rights of use for radio frequencies

A 2.39 Regulation 9(5) of the Authorisation Regulations provides that, when granting rights of use for radio frequencies, ComReg must, having regard to the provisions of Regulations 17 and 19 of the Framework Regulations, specify whether such rights may be transferred by the holder of the rights and under what conditions such a transfer may take place.

A 2.40 Regulation 10(1) of the Authorisation Regulations provides that, notwithstanding Section 5 of the Wireless Telegraphy Act,1926, but subject to any regulations under Section 6 of that Act, ComReg may only attach those conditions listed in Part B of the Schedule to the Authorisation Regulations. Part B lists the following conditions which may be attached to rights of use:

- Obligation to provide a service or to use a type of technology for which the rights of use for the frequency has been granted including, where appropriate, coverage and quality requirements.
- Effective and efficient use of frequencies in conformity with the Framework Directive and Framework Regulations.
- Technical and operational conditions necessary for the avoidance of harmful interference and for the limitation of exposure of the general public to electromagnetic fields, where such conditions are different from those included in the general authorisation.
- Maximum duration in conformity with Regulation 9, subject to any changes in the national frequency plan.
- Transfer of rights at the initiative of the rights holder and conditions of such transfer in conformity with the Framework Directive.
- Usage fees in accordance with Regulation 19
- Any commitments which the undertaking obtaining the usage right has made in the course of a competitive or comparative selection procedure.
- Obligations under relevant international agreements relating to the use of frequencies.

- Obligations specific to an experimental use of radio frequencies.

A 2.41 Regulation 10(02) also requires that any attachment of conditions under Regulation 10(1) to rights of use for radio frequencies must be non-discriminatory, proportionate and transparent and in accordance with Regulation 17 of the Framework Regulations.

Procedures for limiting the number of rights of use to be granted for radio frequencies

A 2.42 Regulation 11(1) of the Authorisation Regulations provides that, where ComReg considers that the number of rights of use to be granted for radio frequencies should be limited it must, without prejudice to Sections 13 and 37 of the 2002 Act:

- Give due weight to the need to maximise benefits for users and to facilitate the development of competition, and

- Give all interested parties, including users and consumers, the opportunity to express their views in accordance with Regulation 12 of the Framework Regulations.

A 2.43 Regulation 11(2) of the Authorisation Regulations requires that, when granting the limited number of rights of use for radio frequencies it has decided upon, ComReg does so "…on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate and which give due weight to the achievement of the objectives set out in Section 12 of the 2002 Act and Regulations 16 and 17 of the Framework Regulations."

A 2.44 Regulation 11(4) provides that where it decides to use competitive or comparative selection procedures, ComReg must, inter alia, ensure that such procedures are fair, reasonable, open and transparent to all interested parties.

Fees for spectrum rights of use

A 2.45 Regulation 19 of the Authorisation Regulations permits ComReg to impose fees for rights of use which reflect the need to ensure the optimal use of the radio frequency spectrum.

A 2.46 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.

Amendments of rights and obligations

A 2.47 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 Provisions

Wireless Telegraphy Act, 1926 (the "1926 Act")

A 2.48 Under Section 5(1) of the 1926 Act, ComReg may, subject to that Act, and on payment of the prescribed fees (if any), grant to any person a licence to keep and have possession of apparatus for wireless telegraphy in any specified place in the State.

A 2.49 Section 5(2) provides that, such a licence shall be in such form, continue in force for such period and be subject to such conditions and restrictions (including conditions as to suspension and revocation) as may be prescribed in regard to it by regulations made by ComReg under Section 6.

A 2.50 Section 5(3) also provides that, where it appears appropriate to ComReg, it may, in the interests of the efficient and orderly use of wireless telegraphy, limit the number of licences for any particular class or classes of apparatus for wireless telegraphy granted under Section 5.

A 2.51 Section 6 provides that ComReg may make regulations prescribing in relation to all licences granted by it under Section 5, or any particular class or classes of such licences, all or any of the following matters:

- The form of such licences
- The period during which such licences continue in force,
- The manner in which, the terms on which, and the period or periods for which such licences may be renewed,
- The circumstances in which or the terms under which such licences are granted,

- The circumstances and manner in which such licences may be suspended or revoked by ComReg,
- The terms and conditions to be observed by the holders of such licences and subject to which such licences are deemed to be granted,
- The fees to be paid on the application, grant or renewal of such licences or classes of such licences, subject to such exceptions as ComReg may prescribe, and the time and manner at and in which such fees are to be paid, and
- Matters which such licences do not entitle or authorise the holder to do.

A 2.52 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.

Article 4 of Directive 2002/77/EC (Competition Directive)

A 2.53 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."

Annex: 3 Cullen International

Table 1 - Duration of radio fixed link licences

Last update: October 2017

The table below shows the duration of radio fixed link spectrum licences in the 26 GHz band.

- If the duration of licences varies considerably from one operator (or one link) to another, this is shown in the table as "varies"
- If the duration of the licence is set for a specific period (typically one year) but is in practice automatically renewable (the operator only has to complete a form or pay the applicable fee), then the table below shows the duration and this information, e.g. "one year – automatically renewable"

Information about the duration of radio fixed link licences in other bands is also included, where available.

Country	Duration of radio fixed link spectrum licence	Duration of radio fixed link spectrum licences in other bands
AT	Up to 10 years The annex to the application form for all fixed links above 1 GHz allows applicants to either ask for a duration of 10 years (the maximum duration set by law) or to specify a shorter duration.	Up to 10 years The application procedure is the same for all bands above 1 GHz.
BE	Varies Licences per link	Other bands: 1.4, 6, 7, 8, 11, 13, 15, 18, 23, 28 and 38 GHz Varies Licences per link
DK	Licences in the 26 GHz band are issued per individual link. Duration: 15 years – set out in Executive order on licences to use radio frequencies.	Other bands used for fixed radio links: 7, 12, 15, 18, 23, 32 and 38 GHz Licences are issued per link. Duration 15 years – set out in Executive order on licences to use radio frequencies.
FI	Ten years or shorter if requested. Automatically renewable. Licence per link (FICORA website, in EN; art. 40 of the Information Society Code 917/2014, in EN)	Other bands: 1.4, 6.2, 6.8, 7.3, 7.6, 8, 10, 10.5, 13, 17, 18, 23, 28, 32, 38, 42, 57.2-58.2 GHz Ten years or shorter if requested. Automatically renewable. Licence per link

Country	Duration of radio fixed link spectrum licence	Duration of radio fixed link spectrum licences in other bands
FR	Licences per link 5 years. Unless shorter period requested. ARCEP decision 14-0386 on the conditions of use of the 24.5-26.5 GHz band does not define a standard duration for the licences granted.	Other bands: 1.4, 6, 8, 11, 13, 18, 23, 26, 32, 38, 70-80 GHz. Licences per link. 10 years. Unless shorter period requested. ARCEP summary on technical conditions of use and management rules for radio fixed links
DE	10 years Individual authorisations for point-to-point or point-to-multipoint radio links are regulated by secondary legislation of BNetzA. Licences are generally issued for 10 years. The 26 GHz band can be used for point-to-point or point-to-multipoint.	Other bands: 4, 6, 7, 13, 15, 18, 23, 28, 32, 38, 42, 52, 71-76 and 81-86 GHz Licences are generally issued for 10 years but there are exceptions for some bands. In particular, licences in the 28 GHz band are limited to Dec. 31, 2020.
IT	Current licences are valid until Dec. 31, 2022. There have been numerous waves of licence releases, starting in 2002, and more recently in 2014 and in 2016/17. (Ministry website; Update; art. 27 of the Electronic Communications Code 259/2003)	Information not available Max. duration of 20 years (for those licences released in 2002)
NL	Varies Maximum 5 years Licences per link	Other bands: 6, 7, 13, 15, 18, 23, 28, 32, 38 and 60 GHz Varies Maximum 5 years Licences per link
PT	One year - automatically renewable Source: Anacom regulation reviewing spectrum use rules for the Fixed Wireless Access bands assigned by auction in 1999 (annual fees established by Anacom regulation as amended)	Other bands: 3400-3800 MHz, 27.5-29.5 GHz One year - automatically renewable
ES	Varies Most licences in the band: June 1999 – Dec. 2019 (information on renewal not available) One Orange licence: 2002 – 2017 (information on renewal not available) Source: Ministry for the Digital Agenda (public spectrum register)	Varies • 13 GHz: 2005 – 2020 • 15 GHz: 1999 - 2019 • 18 GHz: 1999 – 2019 and 2006 -2021 • 23 GHz: 1999 – 2019 • 28 GHz: 2006 - 2021 • 38 GHz: 1999 – 2019 • 71-76 GHz 6 81-86 GHz: one licence (Vodafone 2014- 2019) Source: Ministry for the Digital Agenda (public spectrum register) Existing licences for radio-links in the 3.6-3.8MHz band must migrate to other bands before 2018 (Table)
SE	On May 17, 2005, Telia was awarded a national FWA licence in the 26 GHz band in a beauty contest. In Jan. 2007, on Telia's request, the licence was amended to allow the use of spectrum for point-to-point radio links.	28 GHz is another band used for radio links Three national licences were auctioned in 2009: • Net4Mobility (JV of Telenor and Tele2) – 8 blocks of 2x28 MHz

Country	Duration of radio fixed link spectrum licence	Duration of radio fixed link spectrum licences in other bands
	The licence covers a block of 2x161 MHz and was initially issued for 6 years, until Dec. 31, 2011. In 2011, its duration was extended by 10 years until Dec. 31, 2021.	• Telia – 6 blocks of 2x28 MHz • Hi3G – 4 blocks of 2x28 MHz Licences are technology neutral and can be used for radio links. Licence duration: 15 years There are multiple other bands allocated to fixed radio links. (See the full list) In some bands, block spectrum licences are issued on a national or regional basis but there are also bands where licences are issued for each individual radio link. Most of licences are valid until 2021.
UK	Indefinite The licences are valid until the payment interval on the licence, and thereafter so long as the licensee continues to pay the licence fee to Ofcom. Ofcom may at any time revoke the licence or vary the licence conditions, providing an explanation of the reasons for this action and with appropriate notice.	Fixed terrestrial links are used across a wide range of frequency bands, currently ranging from 450 MHz to 86 GHz. Indefinite The licences are valid until the payment interval on the licence, and thereafter so long as the licensee continues to pay the licence fee to Ofcom. Ofcom may at any time revoke the licence or vary the licence conditions, providing an explanation of the reasons for this action and with appropriate notice.