



Commission for
Communications Regulation

Response to Consultation and draft Decision - on Proposed 3.6 GHz Band Spectrum Award

Document No: ComReg 15/140

Date: 22 December 2015

Disclaimer

This consultation is not a binding legal document and also does not contain legal, commercial, financial, technical or other advice. The Commission for Communications Regulation (“ComReg”) is not bound by it, nor does it necessarily set out ComReg’s final or definitive position on particular matters. To the extent that there might be any inconsistency between the contents of this document and the due exercise by ComReg of its functions and powers, and the carrying out by it of its duties and the achievement of relevant objectives under law, such contents are without prejudice to the legal position of ComReg. Inappropriate reliance ought not therefore, be placed on the contents of this document.

Contents

Section	Page
1 Introduction.....	9
2 Background	12
3 Revised draft RIAs	22
3.1 Introduction.....	22
3.2 Revised draft ‘Spectrum for Award’ RIA	23
3.3 Revised draft ‘Assignment Process’ RIA - Background	24
3.4 Revised draft ‘Assignment Process’ RIA	44
4 Key Aspects of the Proposed Award Spectrum	68
4.1 Introduction.....	68
4.2 3.6 GHz Band plan	68
4.3 National / Regional Licences	75
4.4 Licence duration	92
5 Award Type and Format.....	112
5.1 ComReg’s position in Document 15/70	112
5.2 Responses to Document 15/70	115
6 Licence Conditions	142
6.1 Introduction and Background.....	142
6.2 Technology and Service Neutrality	143
6.3 Non-exclusive assignment of 3.6 GHz rights	144
6.4 The notification of the termination of a technology	146
6.5 Spectrum transfers and spectrum leasing	148
6.6 Coverage and rollout conditions	154
6.7 Quality of Service (“QoS”)......	166
6.8 Technical conditions	169
6.9 Other Matters Raised	184
7 Transitional issues and Preparatory Licences	186

8 Draft Decision	215
1. DEFINITIONS AND INTERPRETATION.....	215
2. DECISION-MAKING CONSIDERATIONS.....	217
3. DECISIONS	219
4. STATUTORY POWERS NOT AFFECTED.....	223
9 Submitting Comments and Next Steps	224
9.1 Submitting Comments	224
9.2 Next Steps	225

Table of Figures

Section	Page
Figure 1. Proposed TDD band plan	75
Figure 2. Regional proposal for Option 1 in Document 15/70	78
Figure 3. Regional proposal for Option 2 in Document 15/70	80
Figure 4. Revised Regional proposal	91
Figure 5: SUF Calculation	129
Figure 6: ComReg's 15/70 Transition proposals and other key tools and the time periods to which they apply	189
Figure 7: ComReg's updated transition proposals and other key tools.	206

Table of Annexes

Section	Page
Annex 1: Glossary.....	227
Annex 2: Legal Framework and Statutory Objectives.....	240
Annex 3: Relevant EC/CEPT Decisions and technical documents	257
Annex 4: International Update	260
Annex 5: Award RIA and other issues	266
Annex 6: Other issues raised.....	295
Annex 7: CSO Population Data	307
Annex 8: Auction complexity.....	309
Annex 9: Draft RIA on Rollout and QoS Licence Conditions	317
Annex 10: Correspondence between Imagine and ComReg.....	336

Table of Tables

Section	Page
Table 1: Minimum Price, (5 MHz block) minimum SAF & Annual SUF per each region (2)	141
Table 2: Proposed base station rollout obligation by region	162
Table 3: The details of each region (as per the regions proposed in Chapter 4)	162
Table 4: TD-LTE frame structure options	174

Chapter 1

1 Introduction

- 1.1 The purpose of this document is to set out the Commission for Communications Regulation’s (“ComReg”) response to Document 15/70¹, further consultation and draft Decision concerning its proposed award of a limited number of individual rights of use to the 3400 – 3800 MHz (“3.6 GHz”) frequency band.
- 1.2 ComReg received 20 responses to Document 15/70², non-confidential versions of which have been published by ComReg in Documents 15/106 and 15/106R. ComReg also received some substantive correspondence in relation to Document 15/70, non-confidential versions of which are contained in Annex 10 to this document.
- 1.3 ComReg is grateful for all the submissions provided by respondents in response to Document 15/70 as well as to this consultation process overall and has given careful consideration to all the material submitted by interested parties³ as well as to other information before it, including the material contributed by the experts retained by it to advise and report in relation to the matters of relevance to the process.
- 1.4 In that connection, ComReg is publishing alongside this document:
 - An analysis prepared by ComReg’s economic and award design expert, DotEcon Limited (“DotEcon”), of the submissions received in response to Document 15/70 relating to the award design and format (published separately as Document 15/140a);
 - An updated reserve price benchmarking report prepared by DotEcon (published separately as Document 15/140b);
 - An analysis prepared by ComReg’s technical expert, Plum Consulting London LLP (“Plum”), of the submissions received in response to Document

¹ ComReg Document 15/70 entitled “Consultation on Proposed 3.6 GHz Band Spectrum Award”, published on 10 July 2015.

² Responses were received from: Airwave Internet, Aptus Ltd, BBNet, Carnsore Broadband, Digital Forge, Eircom/Meteor “Eircom”, Eurona Ireland, Imagine, Joint FWA 4 Operators “FWA 4”, Joint FWA 16 Operators “FWA 16”, KerNet Broadband, Munster Wireless Ltd, Net1 Ltd, Premier Broadband Ltd, Rapid Broadband Ltd, Real Broadband Ltd, Ripplecom, Three Ireland Hutchinson Ltd. (“3IHL”), Viatel and Vodafone the full list of respondents can be found in the glossary in Annex 1.

³ While ComReg has taken all the material provided by respondents into account, it is not a position to provide commentary on each and every point made by same.

15/70 relating to matters of a spectrum engineering nature (published separately as Document 15/140c); and

- An update of the report⁴ prepared by Plum analysing the spectrum potentially required for the provision of an advanced wireless broadband service in the 3.6 GHz band, having taken into consideration submissions received in response to Document 15/70 (published separately as Document 15/140d).
- 1.5 In arriving at the positions set out in this document, ComReg has had regard to the statutory functions, objectives and duties relevant to its management of the radio frequency spectrum, the most relevant of which are summarised in Annex 2. ComReg has also had regard to relevant international developments (see Annex 4), and various international decision documents and technical documents relating to 3.6 GHz band (see Annex 3).
- 1.6 This document is structured as follows:
- **Chapter 2:** which provides:
 - an overview of relevant ComReg publications relating to its proposed 3.6 GHz band award;
 - a brief background to the 3.6 GHz band;
 - an outline of recent international developments concerning the 3.6 GHz band; and
 - ComReg's response to submissions received in relation to the National Broadband Plan ("NBP");
 - **Chapter 3:** which sets out ComReg's views on the proposed award process, in addition to its updated draft regulatory impact assessments and assessment against other relevant statutory objectives and duties;
 - **Chapter 4:** which discusses matters relating to the band plan and frequency arrangements, geographic scope of 3.6 GHz rights proposed to be awarded, and duration of same;

⁴ Previously published as Document 15/75.

- **Chapter 5:** which discusses matters relating to award format, packaging of spectrum rights, competition caps and implementation matters;
- **Chapter 6:** which discusses licence conditions;
- **Chapter 7:** which discusses how ComReg intends to handle transitional issues;
- **Chapter 8:** which sets out ComReg's draft Decision on its proposed 3.6 GHz band spectrum award;
- **Chapter 9:** which details next steps in the process;
- **Annex 1:** Glossary;
- **Annex 2:** Summary of ComReg's statutory functions, objectives and duties relevant to the management of Ireland's radio frequency spectrum;
- **Annex 3:** List of relevant EC/CEPT Decisions and technical documents;
- **Annex 4:** Update on international developments re: 3.6 GHz band;
- **Annex 5:** Updated draft regulatory impact assessment of the spectrum for the award, and ComReg's response to various matters raised by respondents relevant to Chapter 3;
- **Annex 6:** Analysis and response to other issues raised by respondents;
- **Annex 7:** provides updated Central Statistics Office ("CSO") data on population flows;
- **Annex 8:** a discussion of the potential complexity likely to arise in the award process;
- **Annex 9:** Draft regulatory impact assessments on rollout and quality of service obligations; and
- **Annex 10:** Non-confidential versions of further submissions and correspondence between Imagine and ComReg

Chapter 2

2 Background

2.1 In this chapter, ComReg sets out:

- an overview of relevant ComReg publications relating to its proposed 3.6 GHz band award;
- a brief background to the 3.6 GHz band in Ireland;
- an outline of recent international developments concerning the 3.6 GHz band; and
- its response to submissions received in relation to the National Broadband Plan ("NBP").

2.1.1 Overview of relevant ComReg publications relating to its proposed 3.6 GHz band award

- 2.2 On 10 July 2015, ComReg published Document 15/70, which was, firstly, a response to consultation dealing with certain issues raised by respondents to Documents 14/101 and 14/126 relevant to the release of the 3.6 GHz band and, a further consultation dealing specifically with the proposed award of the 3.6 GHz band.
- 2.3 ComReg first signalled its intention to end the existing Fixed Wireless Access Local Area ("FWALA") licensing regime in the 3.6 GHz band as far back as 2010 with a view to awarding new rights of use in the band from 2017 on.

Document 10/29

- 2.4 In April 2010, ComReg highlighted important issues with the FWALA licensing scheme operating in the 3.6 GHz band.⁵ In particular, ComReg noted that the existing licensing regime does not provide for mobile wireless access services and so is not in line with the relevant European Commission ("EC") Decision harmonising the use of this band.⁶ Accordingly, ComReg made it clear that

⁵ Document 10/29 "Fixed Wireless Access Local Area Licensing End date of the FWALA licensing scheme in the 3.6 GHz band".

⁶ See 2008/411/EC: Commission Decision of 21 May 2008 on the harmonisation of the 3400-3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.

existing FWALA licences in the band would not be renewed or extended beyond 31 July 2017 in order to maximise the efficient use of the 3.6 GHz band, particularly in light of the 3.6 GHz EC Decision which provides for the introduction of mobility to this band.⁷

Document 14/101⁸

- 2.5 In preparation for the release of new rights of use in the 3.6 GHz band, ComReg, on 30 September 2014, published its consultation setting out its preliminary proposals on the details of a competitive award process for spectrum rights of use in the 700 MHz, 1.4 GHz, 2.3 GHz, 2.6 GHz and 3.6 GHz bands. ComReg proposed the release of all of the above bands in the same award process, whilst noting certain peculiarities around the 3.6 GHz and 700 MHz bands which would require further assessment before coming to firm proposals⁹.
- 2.6 For example, ComReg noted that while there were potential benefits to the inclusion of the 3.6 GHz band in this proposed award process, the band also had certain characteristics (e.g. the likely interest from different types of users) which would differentiate it from, and might justify its separate treatment to, other bands being considered for inclusion.
- 2.7 The responses received to Document 14/101 encompassed a wide range of issues. However, one of the more prominent issues raised by respondents related to the inclusion of the 3.6 GHz band in the proposed award process. Respondents commented on the differences between the 3.6 GHz band and the other bands being considered for inclusion. Indeed, a number of respondents strongly favoured the release of the 3.6 GHz band in a separate award process.

Document 14/126¹⁰

- 2.8 The EC's State Aid Guidelines (or "SAG")¹¹ notes that national regulatory authorities ("NRAs"), such as ComReg, can have a role in assisting Member States, in particular, in the design of appropriate access obligations relating to State aid broadband projects. In that context, on 4 December 2014, ComReg

⁷ See also Section 5.2 of ComReg Document 11/03 for further consideration of this issue.

⁸ ComReg Document 14/101 "Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands".

⁹ See, for example, paragraphs 3.74, 3.75 and Section 5.6 of Document 14/101.

¹⁰ Document 14/126 "National Broadband Plan Call for Input on Regulatory Implications".

¹¹ "EU Guidelines for the application of State Aid rules in relation to the rapid development of broadband networks" (2013/C 25/01)

issued a call for input with regard to the regulatory implications of the National Broadband Plan (“NBP”)¹². In addition to the responses received to Document 14/101, a number of the respondents to the call for input made submissions in relation to radio-spectrum related matters, including in respect of the 3.6 GHz band. ComReg took the latter submissions into account in the preparation of Document 15/70.

Document 15/14¹³

- 2.9 In light of the submissions received to Documents 14/101 and 14/126, ComReg, on 16 February 2015 published an Information Notice indicating that it intended to consider the possible release of rights of use in the 3.6 GHz band in a separate competitive award process.

Document 15/70

- 2.10 On 10 July 2015, ComReg issued Document 15/70 being a further consultation on the proposed award of spectrum rights in the 3.6 GHz band.

2.1.2 Background to the 3.6 GHz band in Ireland

- 2.11 The entire 3.6 GHz band is licensed in Ireland¹⁴. The majority of the band is currently licensed for the provision of fixed wireless services on a local area basis and the sub-band 3435 - 3475 MHz is licensed for the provision of State Services.
- 2.12 The FWALA licensing framework, initiated by ComReg in 2003¹⁵, has helped facilitate the provision of wireless broadband (WBB) services across Ireland and has been particularly beneficial for the provision of these services in small towns and rural areas.

¹² ComReg consultation titled “National Broadband Plan - Call for Input on Regulatory Implications” (Document 14/126).

¹³ Document 15/14 “Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands (ComReg Document 14/101) – Update”.

¹⁴ Excluding the guard band 3400 - 3410MHz

¹⁵ The regulations governing the issue of Fixed Wireless Access Local Area licences are the Wireless Telegraphy (Fixed Wireless Access Local Area licence) Regulations, 2003 (S.I. 79 of 2003) and Wireless telegraphy (Fixed Wireless Access Local Area licence) (amendment) Regulations, 2003 (S.I. 530 of 2003)

- 2.13 There are currently fourteen 3.6 GHz FWALA operators providing services in the band, serving approximately 25,258 customers¹⁶.
- 2.14 At a European level, the band is fully harmonised for terrestrial electronic communications services (ECS), mainly targeting the provision of WBB services since 2008 with EC Decision 2008/411/EC. The recently adopted EC Decision 2014/276/EU further strengthens the harmonisation of the band in Europe and is mandatory for all Member States including Ireland. Throughout the remainder of this document, the two decisions are referenced as “3.6 GHz EC Decision”. Where ComReg references the specific 2008 or 2014 EC Decision, the term “2008 3.6 GHz EC Decision” or “2014 3.6 GHz EC Decision” is used, respectively.
- 2.15 The 3.6 GHz band is considerably higher in frequency than the traditional, “core” mobile telecommunications bands assigned in Ireland (i.e. 800 MHz, 900 MHz, 1800 MHz and 2.1 GHz) giving it comparatively less favourable propagation characteristics for mobile applications. These limiting characteristics have, so far, reduced the interest from mobile operators generally and limited the deployment of mobile services in the band. In addition, the number of mobile devices available remains low relative to other bands.¹⁷
- 2.16 The 3.6 GHz band has, however, been identified by the Radio Spectrum Policy Group as a suitable band for addressing the potential spectrum “crunch” brought about by the wireless broadband data explosion. This is recognised in the 3.6 GHz EC Decision. Also, given the quantum of spectrum in the band and the preferred TDD channelling arrangement¹⁸, the 3.6 GHz band could be suitable for reducing mobile data capacity constraints for operators with a portfolio of spectrum holdings, in addition to being a core band for providing fixed WBB services.¹⁹

¹⁶ This estimate is based on data from ComReg’s latest Q3 2015 Quarterly Report and a questionnaire circulated to all 3.6 GHz licensees in February 2015. This figure only includes subscriber figures for 10 of the 14 3.6 GHz FWALA operators because some of the 3.6 GHz FWALA licensees did not respond to the questionnaire.

ComReg notes that certain responses to Document 15/70 raised issues relating to FWA subscriber numbers and these matters are addressed in Annex 6 of this document.

¹⁷ According to GSA (Global mobile Suppliers Association), in November 2015 there were 33 LTE devices available in the 3.6 GHz band. This is an increase of 7 since April 2015. By way of comparison the 800MHz band 20 has 1,052 devices. www.gsacom.com.

¹⁸ 2014 3.6 GHz EC Decision states that TDD shall be the preferred mode of operation in the 3400-3600 MHz band and the mode of operation for the 3600-3800 MHz band.

¹⁹ Fixed WBB services are also provided in Ireland via the licensed 10.5 GHz and 26 GHz bands and the licence-exempt 2.4 GHz and 5.8 GHz bands.

2.1.3 Outline of recent international developments concerning the 3.6 GHz band

- 2.17 World Radiocommunication Conferences (WRC's), organised by the International Telecommunications Union (ITU) are held every three to four years. It is the job of WRC to review, and, if necessary, revise the Radio Regulations, the international treaty governing amongst other things, the use of the radio frequency spectrum.
- 2.18 WRC-15 took place in November 2015, and under agenda item 1.1²⁰ the 3400 – 3800MHz band was considered as a candidate band to be allocated to the mobile service on a primary basis and also considered to be identified for International Mobile Telecommunications (IMT).
- 2.19 Prior to WRC-15 and in general terms, the common primary allocations across all three ITU Regions²¹ are to the fixed and fixed satellite (space to earth) services. While in certain countries across all three ITU Regions, certain parts of the band had allocations to the mobile service on primary basis and had identifications for IMT.²²
- 2.20 A number of proposals were made to the conference (including a proposal from 35 CEPT²³ countries) regarding both a primary mobile allocation and IMT identification in the 400 MHz range of 3400 - 3800 MHz.
- 2.21 Following WRC-15, a primary additional allocation was made in the band 3400 - 3600 MHz for the mobile except aeronautical mobile service and the band was identified for IMT in all countries of Regions 1 and 2 and in a number of countries of Region 3. It was not possible to agree a primary mobile allocation in Region

²⁰ "to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC-12);"

²¹ List of countries in each region <http://life.itu.int/radioclub/rr/itureg.htm>, Map of regions <http://www.itu.int/en/ITU-R/terrestrial/broadcast/PublishingImages/bcd%20images/ITU%20regions.jpg>

²² Specifically the following footnotes of the ITU Radio Regulations 2012 are relevant, 5.430A, 5.431A, 5.432B, 5.433A which identify the countries that prior to WRC-15 had a primary allocation to the mobile services and had identified the band for IMT.

²³ (CEPT) European Conference of Postal and Telecommunications Administrations

1 for the band 3600 – 3800 MHz²⁴, and the use of the mobile service in this band remains on a secondary basis without an identification for IMT²⁵.

- 2.22 ComReg also presents an updated summary of the status of the 3.6 GHz band in EU Member States in Annex 4.

2.1.4 ComReg's response to submissions received in relation to the National Broadband Plan

- 2.23 In this section, and by way of context to the remaining sections of this response to consultation, ComReg provides additional clarity in respect of certain overarching concerns raised by some respondents to Document 15/70, in particular with respect to the interaction between ComReg's role as spectrum manager on the one hand and the NBP and SAG on the other.
- 2.24 In section 2.2 of Document 15/70, ComReg noted it had issued a call for input on the regulatory implications of the National Broadband Plan (NBP) (ComReg Document 14/126). In that connection, ComReg took the opportunity to:
- *"reiterate that ComReg has no decision-making role in regard to the design of the NBP or the award of contracts under the NBP; and*
 - *confirm that, to the extent that interested parties have views how ComReg's spectrum award proposals may, in their view, better align with the NBP (including when more detailed information becomes available about the NBP), then ComReg remains open to consideration of such views in the context of ComReg's own statutory remit."* (page 12)
- 2.25 ComReg received submissions from several respondents in relation to the NBP and ComReg's detailed consideration of this material is set out in Annex 6 of this document.
- 2.26 In light of the concerns raised by certain respondents, including that ComReg's 3.6 GHz Band award proposals as set out in Document 15/70 are either inconsistent with, or contrary to, the NBP, ComReg takes this opportunity to address these points.

²⁴ However the sub band 3600-3700 MHz was identified for IMT in four countries of Region 2 (which included the United States of America)

²⁵ In many countries these bands are mainly used by the fixed satellite service for space to earth links (together with the 5850–6725 MHz band for earth to space links). They are of particular interest to countries in equatorial regions, where high rainfall rates make the alternative frequency bands less practical to use.

- 2.27 First, ComReg clearly welcomes and is completely supportive of the NBP, which is a Government policy initiative to deliver high speed broadband to citizens and businesses in areas of Ireland where it is uneconomic for the commercial sector to invest in the provision of same.
- 2.28 ComReg also recalls that achieving universal access to high speed broadband is a key target under the EU Digital Agenda for Europe (DAE)²⁶, which envisages that by 2020 all EU citizens will have access to speeds of 30Mbps, and that 50% of citizens will be subscribing to speeds of 100Mbps.
- 2.29 ComReg is also fully cognisant of the communication from the European Commission entitled "*EU Guidelines for the application of State Aid rules in relation to the rapid development of broadband networks*" (2013/C 25/01) ("State Aid Guidelines" or "SAG") for State aid broadband projects; as well as the particular role envisaged of national regulatory authorities (NRA's), such as ComReg, in the SAG (in particular paragraph 42). ComReg considers that the State is fully compliant with the SAG, including as regards ComReg's role as the expert NRA.
- 2.30 At the same time, ComReg observes:
- firstly, and as a matter of law, that as a statutory body it may only act within, and in accordance with, its own statutory remit; and
 - paragraph 42 does not in any way refer to the exercise of a NRA's spectrum management function in the context of State aid broadband projects and, in particular, in the manner as suggested by certain respondents (e.g. to favour fixed wireless access (FWA), fixed next generation access (NGA) and/or to "facilitate NGA investment").
- 2.31 In that context, ComReg notes that it has fully engaged with the Department of Communications Energy and Natural Resources (DCENR) in fulfilling its role as an expert NRA and refers in particular to its observer status on the NBP's Steering Group Committee.
- 2.32 ComReg also notes that particular reliance was placed by certain respondents on paragraph 44 of the SAG²⁷ in support of their claims. In that regard, ComReg observes:

²⁶ <http://ec.europa.eu/digital-agenda/digital-agenda-europe>

²⁷ Which provides that "Granting authorities shall also take into account spectrum (re-) allocations leading to possible network rollout in the target areas that could achieve the objectives of the granting authorities without the provision of direct grants".

- the “allocation” of radio spectrum in Ireland lies within ComReg’s remit²⁸;
- as previously identified in Documents 14/101 and 15/70, the 3.6 GHz Band has been allocated across the EU, by way of the 3.6 GHz EC Decision, for the terrestrial provision of electronic communications services (ECS), an instrument with direct, binding effect on all Member States (and in contrast to the SAG²⁹);
- the 3.6 GHz EC Decision:
 - is service-neutral as it requires that any new 3.6 GHz rights holder be permitted to provide any ECS of their choice including, but not limited to, wireless broadband services;
 - is technology-neutral as it requires that any new 3.6 GHz rights holder be permitted to use any terrestrial electronic communications networks (ECN) which comply with the parameters of the Annex to the 2014 3.6 GHz EC Decision;
 - expressly obliges Member States to allow the use of the entire 3.6 GHz band for fixed, nomadic **and** mobile electronic communications networks; and
 - in relation to the above bullet point, recital 2 of the 2008 3.6 GHz EC Decision identifies that “[T]he designation of the 3 400-3 800 MHz band for fixed, nomadic **and** mobile applications is an important element addressing the **convergence of the mobile, fixed and broadcasting sectors** and reflecting technical innovation. The services provided in this frequency band should mainly target end-user access to broadband communication” (emphasis added).

2.33 That is, and in contrast to the suggestions that ComReg “favour” FWA or Fixed NGA over, for example, mobile services, the 3.6 GHz EC Decision expressly requires Member States to ensure that **all** compliant ECN (including nomadic and mobile) be permitted to be used in the **entire** 3.6 GHz Band, including with

²⁸ “Spectrum allocation” is defined in the Framework Regulations to mean “*the designation of a given frequency band for use by one or more types of radiocommunications services, where appropriate, under specified conditions*” (emphasis added).

²⁹ ComReg observes that it is a matter of settled case law that European Commission guidelines bind the European Commission alone; they are not binding on national authorities. The SAG falls within this category, which is acknowledged in the guidelines themselves.

the stated intention of addressing the **convergence** of the fixed, mobile **and** broadcasting sectors.

2.34 Moreover, ComReg observes that:

- recital 4 of the 2014 3.6 GHz EC Decision specifically identifies that the use of the 3.6 GHz band for wireless broadband should “*contribute to the economic and social policy objectives of the Digital Agenda for Europe*”;
- the 3.6 GHz Band has already been allocated in Ireland by ComReg for “Terrestrial electronic communications services, including FWALA”, in line with the 2014 3.6 GHz EC Decision; and
- section 5.5.3 of the PWC “NBP Ireland – State Aid Compliance Report – December 2015 update” makes clear that the DCENR is, in fact, taking into account the spectrum “(re)-allocations” as envisaged by paragraph 42 of the SAG.

2.35 Given the above factors, ComReg considers it entirely appropriate to take into account all ECS that may be provided with rights in the 3.6 GHz and via fixed, nomadic and mobile ECN, particularly in circumstances where a 15-year duration for 3.6 GHz rights of use was proposed in Document 15/70.

2.36 Furthermore, ComReg considers the claim that it has not appropriately taken into account the particular facts and circumstances of the FWA sector in the development of its award proposals to be unpersuasive given the extent to which its award proposals are informed by same. For example, proposals detailed in Document 15/70 in relation to regional licensing, base-station roll-out, competition caps (which take into account Plum Report 3 - *Analysis of the potential spectrum requirements for NGA services* (ComReg Document 15/75)) and transition.

2.37 At the same time, ComReg remains conscious of concerns expressed about the potential complexity of its award proposals, particularly given the different nature of potential award participants. In that regard, and as further detailed in Chapter 5, ComReg confirms that:

- it will seek to keep complexity to a minimum;
- it will assist all bidders in developing an understanding of the auction rules through the running of workshops, seminars and providing the tools necessary for bidders to simulate auction conditions; and

- the award process will be underpinned by a detailed Information Memorandum which will clearly outline the applicable rules.
- 2.38 Finally, and recalling its invitation in Document 15/70 for views from interested parties as to how its spectrum award proposals may better align with the NBP, ComReg would highlight that it is proposing, in Chapter 4 of this document, to modify its regional licensing proposal to align with the DCENR's NBP Lots. In ComReg's view, this revised proposal would accord with the principles identified by it in Document 15/70 and, at the same time, should avoid any unnecessary complications for those seeking to acquire 3.6 GHz spectrum rights for NBP-related purposes.

Chapter 3

3 Revised draft RIAs

3.1 Introduction

- 3.1 As noted earlier, all existing licences in the 3.6 GHz band awarded by ComReg under the Fixed Wireless Access Local Area (“FWALA”) scheme expire on or before 31 July 2017.
- 3.2 In Document 14/101, ComReg consulted on the possible inclusion of this band in a multi-band award process involving the 2.6 GHz band and other potentially suitable bands. However, and as noted in Chapter 1, responses to that consultation revealed broad support, for a variety of reasons, for the separate treatment of the 3.6 GHz band from that multi-band award process. Accordingly, ComReg stated in early 2015³⁰ that it was considering the possible release of rights of use in this band in a separate award process and, subsequently, issued Consultation 15/70 in that connection.
- 3.3 Chapter 3 of Consultation 15/70 discussed, at a high level, how rights of use in the 3.6 GHz band, in respect of the period following licence expiry, should be awarded. In particular, it set out ComReg’s draft regulatory impact assessments (RIAs) on:
 - i. whether the 3.6 GHz band should be released in a separate award process and, if so, what, if any, bands should be included in that award process (the “Spectrum for Award RIA”); and
 - ii. in light of the preferred option arising from the Spectrum for Award RIA, how best to assign the rights of use in the relevant band(s) (the “Assignment Process RIA”).
- 3.4 Chapter 3 concluded with ComReg’s assessment of the preferred option arising from the two draft RIAs (the “Preferred Option”) against ComReg’s statutory obligations in respect of the management of radio frequency spectrum³¹.
- 3.5 This chapter, and related annexes, set out ComReg’s revised draft RIAs taking into account, among other things, responses received to Consultation 15/70 and is structured as follows:

³⁰ See Information Notice 15/14.

³¹ Set out in Annex 2.

- Revised draft ‘Spectrum for Award’ RIA (section 3.2 of this Chapter 3 and Annex 5);
- Revised draft ‘Assignment Process’ RIA – Background (section 3.3 of this Chapter 3):
 - Summary of ComReg’s position in Document 15/70 (section 3.3.1 of this Chapter 3);
 - Outline of alternative administrative assignment proposals received in response to 15/70 and reasons in support of same (section 3.3.2 of this Chapter 3);
 - Assessment of alternative administrative assignment proposals received in the context of service- and technology-neutrality and non-discrimination (section 3.3.3 of this Chapter 3);
 - General observations on administrative assignment proposals and administrative assignment award format (section 3.3.4 of this Chapter 3); and
 - General observations on auction award format (section 3.3.5 of this Chapter 3).
- Revised draft Assignment Process RIA (section 3.4 of this Chapter 3); and
- ComReg’s preferred option arising from the above two revised draft RIAs”) and assessment of same against ComReg’s statutory obligations in respect of the management of radio frequency spectrum (section 3.5 of this Chapter 3).

3.2 Revised draft ‘Spectrum for Award’ RIA

ComReg’s position in 15/70

- 3.6 In Section 3.2.1 of Consultation 15/70, ComReg identified the following regulatory options:
- Option 1 – a single multi-band award process as proposed in Document 14/101;
 - Option 2 – an award of the 3.6 GHz band alone; and
 - Option 3 – an award of the 3.6 GHz band with the 2.3 GHz and/or 2.6 GHz bands.

- 3.7 ComReg assessed the impact of the above regulatory options on each of:
- industry stakeholders (being existing operators and potential new entrants);
 - competition; and
 - consumers.
- 3.8 ComReg came to the preliminary view that, on balance, Option 2 (i.e. the release of the 3.6 GHz band alone in a separate award process) was the preferred option in terms of its impact on stakeholders, competition and consumers.

Summary of responses received

- 3.9 All thirteen respondents who submitted a view on the matter expressed support for the release of the 3.6 GHz band alone in a separate award process (i.e. Option 2).

ComReg's position and revised draft Spectrum for Award RIA

- 3.10 In light of the support amongst all respondents for Option 2, and in the absence of any developments or new information to the contrary, ComReg remains of the view that, on balance, Option 2 is the preferred option in terms of its impact on stakeholders, competition and consumers.
- 3.11 As a result, the revised draft Spectrum for Award RIA contains minor changes and is set out in Annex 5.
- 3.12 The remainder of this Chapter focuses on the 'Assignment Process' RIA and the assessment of the preferred Option against ComReg's other relevant functions, objectives and duties.

3.3 Revised draft 'Assignment Process' RIA - Background

Summary of ComReg's position in Document 15/70

- 3.13 The draft 'Assignment Process' RIA set out in Document 15/70 identified the following two regulatory options:

Option 1: Assignment of all available spectrum in the 3.6 GHz band using a competitive, open, transparent auction format; and

Option 2: Assignment of some or all available spectrum in the 3.6 GHz band by administrative assignment.

3.14 In summary, ComReg considered the merits of an administrative award of spectrum and was of the preliminary view that it would not promote the efficient use of spectrum for a number of reasons including that:

- administrative awards restrict certain outcomes (services, technologies, applicants) increasing the probability that spectrum rights are assigned below their opportunity cost;
- it is difficult for ComReg to make an accurate assessment of the alternative assignment options in terms of applicant selection and the available spectrum, because of limited information about the actual value of such services, increasing the risk of it being assigned inefficiently;
- if used, a reservation of spectrum for specific operators in this particular award (incumbents or new entrants) would place other potential bidders, who may have the potential to provide a more efficient and differentiated range of services, at a disadvantage or even exclude them altogether; and
- potentially awarding spectrum to less efficient users risks delaying the introduction of advanced data services or limiting their entry entirely which would not maximise consumer welfare.

3.15 In contrast, ComReg was of the preliminary view that an auction format, subject to certain rules and fees, would best ensure the efficient use of the radio spectrum for reasons including that:

- spectrum auctions are designed to incentivise bidders to express their willingness to pay for spectrum, and aim to assign the available spectrum to bidders who value it the most;
- an auction format reveals information about the most valuable uses, information which is not directly available to the regulator;
- by assigning spectrum using an appropriately designed auction, prices are determined within the award process and are at a level which winners are willing to be assigned spectrum;
- by ensuring that those bidders who value the spectrum the most obtain the rights to the spectrum, auctions should result in an efficient outcome in terms of assignment; and

- potential issues of disruption to existing consumer services post-award can be addressed via appropriate regulatory measures, e.g. allowing existing licensees under certain pre-conditions the possibility of obtaining a Transition Unprotected Licence.

3.16 Accordingly, ComReg was of the preliminary view that Option 1 was its preferred option.

Outline of alternative administrative assignment proposals received in response to Document 15/70

3.17 Twenty respondents provided comments on issues relating to the draft Assignment Process RIA.³² Submissions relevant to the assignment RIA, and in particular the administrative award proposals are addressed in this chapter. Any remaining material issues raised by respondents in response to Chapter 3 of Document 15/70 are addressed in Annex 5.

3.18 A number of responses advocated an administrative assignment of spectrum rights rather than the Preferred Option outlined in Document 15/70. Based on the responses received, ComReg has identified the following categories of administrative assignment that have been proposed:

- “To...consider its SAG obligations and to reallocate (sic) the spectrum on an administrative basis both to existing incumbents and to the remainder of the FWA sector at fees which are easily affordable to that sector.” (FWA16³³);
- Administratively assign some of the 3.6 GHz band exclusively or “primarily” to FWA use and/or FWA operators (Airwave, Carnsore). There were several variants of this general administrative assignment approach including:
 - variants which differentiated based on service/network type (e.g. FWA generally and “NGA” FWA);
 - variants which differentiated based on technology type (e.g. TDD and FWA provided using LTE technology); and
 - variants which differentiated based on a regional dimension (e.g. a portion of spectrum in rural areas reserved for FWA, including “NGA”

³² 3IHL, Airwave, Aptus, BBnet, Carnsore BB, Digital Forge, Eircom, Eurona, Imagine, FWA 16, FWA 4, KerNet, Munster Wireless, Net1, Premier BB, Rapid BB, Real BB, Ripplecom, Viatel, Vodafone.

³³ ComReg assumes, for the purposes of the following discussion, that this proposal would involve the administrative assignment of the entire 3.6 GHz band to FWA operators.

FWA), including on a smaller regional dimension than that proposed by ComReg in Document 15/70.

- Imagine's proposal that ComReg release the 350MHz of spectrum as two classes of Licence (A-type and B-type) with different conditions, where:
 - the A-type licence would:
 - *"be a National Licence of a minimum of 160MHz of spectrum and would have specific conditions ensuring a rapid national NGA rollout of a network that can support open, wholesale access of fixed NGA services across the country";*
 - *"should be awarded as part of an administrative award process with rollout conditions in terms of the Rate, Scale, Technical Performance, geographic deployment etc. aligned with the NBP objectives and in advance of the implementation of the NBP";* and
 - comprise certain minimum roll-out obligations³⁴;
 - *"The B-type licences would consist of lots from the remaining 190MHz of spectrum and have less restrictive rollout conditions, and would be awarded under conditions broadly similar to the approach that ComReg is currently proposing which allows mobile operators to consider their value for the spectrum given their unlikely, but conceivable, future demand for the spectrum";* and
- Ripplecom's proposal that *"a portion of the spectrum in rural areas should be designated primarily for FWA, where operators have expressed an interest in rollout of NGA equipment"*. More specifically, Ripplecom proposes that *"ComReg set out a number of conditions which would apply to companies who are awarded these licenses and which would need to be complied with, on an ongoing basis, to maintain the right to use the spectrum"*.

3.19 Reasons provided by respondents in support of using an administrative award format include the following:

- Matters relating to the NBP and SAG – which are discussed earlier in Chapter 2 and also at section 2 of Annex 6;

³⁴ The numbers of base stations and associated time period proposed by Imagine have been redacted because Imagine states that these are based upon its own confidential commercial strategy.

- Claims that an assessment of demand for 3.6 GHz spectrum in order to justify the use of an auction was not undertaken;
 - Lack of demand for mobile use in the 3.6 GHz band;
 - Propagation characteristics of the 3.6 GHz band are not suited to mobile use;
 - Ireland's low population density is inconsistent with the use of 3.6 GHz band for mobile services; and
 - Mobile use of the 3.6 GHz band would be limited to mobile hotspots in large towns.
- 3.20 Given the breath of matters already addressed in this Chapter, ComReg considers this additional material in section A5.3 of Annex 5.

ComReg's consideration of administrative assignment proposals received in response to Consultation 15/70 in the context of service and technology neutrality and non-discrimination

- 3.21 In this section, ComReg considers the administrative assignment proposals received in response to Consultation 15/70 in the context of the following aspects of ComReg's statutory framework relevant to its function of the management of the radio frequency spectrum:
- (1) service- and technology-neutrality; and
 - (2) non-discrimination.

- 3.22 Readers are referred to Annex 2 of this document for a summary of ComReg's statutory framework relevant to the management of the radio frequency spectrum.

Principle and obligations in respect of service and technology neutrality

- 3.23 By way of background, ComReg notes that a key approach to the management of radio frequencies promoted by the Regulatory Framework is that of service- and technology-neutrality.³⁵ This principle is reflected in ComReg's obligations under the Framework Regulations³⁶, RSPP Decision³⁷ and the 2002 Act³⁸.
- 3.24 Furthermore, a key obligation under the 3.6 GHz EC Decision is service- and technology-neutrality, in that it requires that holders of new 3.6 GHz rights be

³⁵ For example, recitals 32 and 34 of the 2009 Amending Directive.

³⁶ For example, Regulations 17(2) and 17(4) of the Framework Regulations.

³⁷ For example, Articles 2(1)(e), 2(2)(a), 3(f) and 6(3) of the RSPP Decision.

³⁸ Section 12(6) of 2002 Act.

afforded the flexibility to provide the electronic communications service/s of their choice and using the technologies of their choice (the latter being subject to compliance with the technical conditions set out in said decision). In particular, the 3.6 GHz EC Decision obliges Member States to allow the use of the entire 3.6 GHz Band for fixed, nomadic **and** mobile electronic communications networks³⁹.

3.25 In the present case, ComReg does not consider it appropriate or permissible for it to deviate from the above principle to favour FWA use and/or existing or potential FWA service providers in the manner proposed by certain respondents to Consultation 15/70 (including restricting the use of mobile wireless access technology/networks and/or providers using same) to some or all of the 3.6 GHz Band) because, among other things:

- ComReg is obliged to “promote the harmonisation of the use of radio frequency spectrum across the European Union...**having regard to all decisions and measures adopted by the European Commission in accordance with the Radio Spectrum Decision**” (emphasis added)⁴⁰; and
- as identified above, the 3.6 GHz EC Decision requires that Ireland apply a service- and-technology-neutral approach to the making available of this band and, in particular, ensure that the entire band may be used for fixed, nomadic **and** mobile ECN (and in circumstances where one of the stated intentions of the designation is to address the “**convergence** of the mobile, fixed and broadcasting sectors”⁴¹ (emphasis added)); and
- Without prejudice to the foregoing, and noting that certain respondents are proposing that ComReg favour FWA services and/or service providers for new 3.6 GHz rights of use to take account of the NBP⁴², ComReg observes that the NBP is, itself, a proposed State intervention for common interest objectives (including as specified in the Digital Agenda for Europe⁴³). Accordingly, spectrum assignment proposals that would entail ComReg favouring FWA use and/or FWA service providers could amount to unauthorised State aid and would be contrary to ComReg’s statutory remit.

3.26 In terms of the specific administrative assignment proposals put forward, ComReg observes that:

³⁹ Article 3 of 2008 3.6 GHz EC Decision.

⁴⁰ Regulation 17(1)(c) of the Framework Regulations.

⁴¹ Recital 2 of 2008 3.6 GHz EC Decision.

⁴² Such as the Joint FWA 16 submission reference to the “promotion of social, regional or territorial cohesion”- page 14 of that submission.

⁴³ See para 36 of the SAG.

- The Joint FWA 16 proposal, as presently understood by ComReg, would completely exclude all potential providers of ECN/ECS other than FWA in terms of their ability to acquire and make use of spectrum rights in the entire 3.6 GHz Band for such services, including on a nomadic and mobile basis; and
- each of the remaining administrative assignment proposals (including, in that regard, Imagine's proposal and Ripplecom's proposal) would, to varying extents, also restrict the ability of potential providers of ECN/ECS other than FWA in terms of their ability to acquire and make use of 3.6 GHz spectrum rights for such services depending on the quantum of the 3.6 GHz Band proposed to be reserved for FWA use and/or FWA service providers under each proposal. This includes both outright restrictions proposed (i.e. where an applicant for the administrative assigned spectrum would need to be a FWA provider⁴⁴) and implicit restrictions (such as where proposed award criteria and/or licence conditions are tailored for FWA (including NGA-type FWA) and these would effectively restrict/impair the ability of potential providers of ECN/ECS from making use of the administratively assigned spectrum for uses other than FWA⁴⁵).

- 3.27 As a consequence, ComReg considers that all of the administrative assignment proposals, received in response to Document 15/70, would not permit ComReg to appropriately comply with the principle of service and technology neutrality including, in particular, its obligations under the 3.6 GHz EC Decision to permit all ECN/ECS, including but not limited to other forms of wireless broadband, to be provided in the entirety of the 3.6 GHz band on a fixed, nomadic and mobile basis.
- 3.28 ComReg also observes that Eurona's proposal, which would entail the reservation of a "larger proportion of the spectrum band be used for the delivery of LTE / FWA" (including that the band be "primarily used for LTE-TDD") would also be contrary to the technology-neutrality requirements of the 3.6 GHz EC Decision.

Non-discrimination

- 3.29 ComReg further notes that another key principle which it must apply in carrying out of its spectrum management function is that of non-discrimination.⁴⁶ This

⁴⁴ For example, the proposals of Joint FWA 16, Airwave, Carnsore, Premier Broadband, Joint FWA 4, and Eurona.

⁴⁵ For example, the proposals of Imagine and Ripplecom.

⁴⁶ For example, Regulation 16(2)(b) of the Framework Regulations.

principle is also reflected in obligations that arise under the Framework⁴⁷ and Authorisation Regulations⁴⁸and the RSPP Decision⁴⁹.

- 3.30 The principle and obligation of non-discrimination is particularly relevant in two contexts:
1. as between different providers of ECS/ECN; and
 2. as between different providers of FWA services.
- 3.31 In relation to the different providers of ECS/ECN, and recalling the principle of service and technology neutrality including as required under the 3.6 GHz EC Decision, ComReg considers that selection criteria for the grant of new 3.6 GHz rights of use which seek to differentiate on the basis of the service and/or technology that would be made of these rights (or the services/technologies currently employed by undertakings seeking to acquire new 3.6 GHz rights) would also raise serious concerns in respect of its non-discrimination obligations. That is, whilst existing FWA service providers are clearly different from, for example, MNOs, they are, at the same time, in similar circumstances in the context of the 3.6 GHz EC Decision, because they are all potential acquirers of new 3.6 GHz rights seeking to use such rights in the manner provided for under the same decision (i.e. able to provide any ECS, via fixed, nomadic and mobile ECN, and using the permitted technologies).
- 3.32 In relation to the different providers of FWA services, ComReg observes that some of the administrative assignment proposals would additionally favour certain types of existing and potential FWA providers and, in so doing, disadvantage the remaining classes of FWA providers, including in respect of:
- the level of FWA services which could be provided (e.g. NGA level or non-NGA-level); and/or
 - the geographic dimension of a FWA provider's business (or business case).
- 3.33 For example, Imagine's Type-A licence proposal is put forward on terms that would effectively disadvantage any potential provider of ECN/ECS, including FWA providers, seeking to provide services other than in accordance with Imagine's own commercial FWA strategy (i.e. on a national basis, using 160 MHz spectrum so as to provide "NGA FWA", and based on its own base station roll-out targets).

⁴⁷ Regulation 17(2) of the Framework Regulations.

⁴⁸ Regulation 11(2) of the Authorisation Regulations.

⁴⁹ Article 2(1)(a).

- 3.34 In that regard, ComReg considers that such proposals would raise additional serious concerns in respect of its obligation of non-discrimination.⁵⁰

ComReg's general observations regarding administrative assignment proposals and administrative assignment format

- 3.35 At paragraphs 3.75 to 3.84 of Consultation 15/70, ComReg outlined, at a high level and in general terms, some relative advantages/disadvantages of administrative assignment and auction spectrum award formats.
- 3.36 Given the level of responses received with regard to the assignment format (and particularly an administrative assignment format), ComReg would also make the following general observations regarding the administrative assignment proposals received and the administrative assignment award format more generally.
- 3.37 These observations are broadly grouped in terms of the award outcomes that ComReg must determine through this award process, noting that these apply *irrespective of the assignment format adopted*, be that an auction or some form of administrative assignment process. These award outcomes are as follows:
1. which electronic communications networks/services and, of those, using which technologies, are going to be the ones most likely to provide the greatest end-consumer benefits for the next 15 years?^{51 52}
 2. which of all the interested providers of the ECN/ECS (and using potentially different technologies) identified in (1) are going to be the ones most likely to provide the greatest end-consumer benefits for the next 15 years and should, therefore, be issued 3.6 GHz rights of use?⁵³

⁵⁰ ComReg also notes DotEcon's analysis at paragraph 44 of its response Document 15/140a in this regard.

⁵¹ Recalling that the 3.6 GHz EC Decision is service- and technology-neutral.

⁵² Noting that:

the services which end-consumers value most may change over time, i.e. what may, or may appear to be, the optimal service/technology combination currently and in the short term may not be the optimal service to be provided over the lifetime of the right of use in terms of generating the overall benefit to end-customers; and

services which are not directly provided to end-consumers for payment (e.g. backhaul links in wireless broadband access networks), may still be valued by end-consumers, for example to the extent that such services improve the price, quality etc. of the associated end-service, e.g. wireless broadband services.

⁵³ Noting that there may be numerous parties seeking to provide these various services (i.e. competing demand to obtain new 3.6 GHz rights so as to provide these services).

3. for the ECN/ECS providers identified in (2), what quantum of 3.6 GHz spectrum rights should be assigned to each and, further, in which of ComReg's proposed regions?⁵⁴
 4. for each ECN/ECS provider holding spectrum rights in each region identified in (3), which part of the 3.6 GHz band those spectrum rights in each region should be located?⁵⁵
- 3.38 In the present context of spectrum rights used for the provision of ECS, ComReg observes that the notion of what may constitute the “maximum benefits to users” in terms of choice, price and quality⁵⁶ relates primarily to the economic dimension of spectrum efficiency and can be viewed in terms of ensuring that spectrum rights are used to (a) provide the services that are most highly valued by consumers (e.g. services which consumers would purchase, either directly or indirectly, and lead to the greatest consumer benefits (e.g. overall sales)) and (b) in a manner which would be valued by end-consumers (e.g. high quality/service levels at the lowest cost), over the lifetime of the right of use.
- **Award outcome 1: Which electronic communications networks/services, using which technologies, are going to be the ones most likely to provide the greatest end-consumer benefits for the next 15 years?**
- 3.39 An administrative assignment of spectrum is subject to the limitation that the regulator is likely to have relatively little information about which of these, and other possible uses, generates the greatest social/economic value. There is a difficulty for the regulator in choosing one service over another or compromising the efficiency of any one service by splitting the band across multiple services. A regulator is unlikely to have access to sufficiently accurate information to allow it to assess which bidder(s) could generate the greatest social value from using the spectrum.
- 3.40 This limitation is particularly acute when a regulator is faced with seeking to make such determinations over a long time, for example, over the 15 year proposed duration of 3.6 GHz rights of use. By placing too great an emphasis on a short term benefit, of which there is likely to be more available information,

⁵⁴ Noting that potential ECN/ECS providers may have different business cases in terms of (a) the provision of ECN/ECS on a national or sub-national basis (and in respect of the latter, different combinations of ComReg's proposed regions) and (b) service/product type and differentiation (e.g. network speed/capacity, quality of service, coverage etc.), and thus different spectrum requirements.

⁵⁵ Noting that different ECN/ECS providers may have different valuations on where in the 3.6 GHz spectrum band they wish to have their assignments. This may reflect technical and other differences in terms of the ability to, and costs associated with, “retuning” existing equipment to move to new frequency assignments.

⁵⁶ See section 12(2)(a)(i) and (iv) of 2002 Act.

a regulator could artificially and unintentionally undermine competition and delay future technology migration in the band.

- 3.41 For these reasons, it is not surprising that the Regulatory Framework is critical of “command-and-control” type spectrum management decisions and, instead, promotes a market-based/liberalised approach to same, including as obliged in harmonisation decisions such as the 3.6 GHz EC Decision and the regulatory principle identified in Article 2(1)(a) of the RSPP Decision.
- 3.42 Furthermore, ComReg notes that one of the key rationales for proposing an administrative award over an auction appears to be the assumption that the former would be more expeditious. Given the issues described above and elsewhere in this chapter, this is simply not the case.
- **Award outcome 2: Determination of optimum service provider/s to provide these services for the next 15 years**
- 3.43 ComReg observes that many of the administrative assignment proposals received, either (a) are silent on criteria by which to determine which FWA providers should actually be assigned the reserved spectrum rights under these proposals or (b) propose criteria which are unlikely to be particularly effective in distinguishing between the range of potential FWA applicants.
- 3.44 The following general discussion therefore assumes that ComReg adopts the kind of criteria used historically for the administrative award of mobile/telecommunications licences but in a manner that did not, of themselves, unduly disadvantage different types of FWA providers.⁵⁷
- 3.45 First, in an administrative assignment process using such criteria, the regulator would require accurate information to allow it to assess how a given spectrum band, or part thereof, could be distributed amongst a potentially large number of potential users with a view to determining which of those potential users would generate the greatest social value from using the spectrum.
- 3.46 Applicants would therefore likely need to submit detailed information on their respective business plans regarding their ability to provide services effectively and efficiently. In that regard, ComReg observes that applications received in beauty contests can be voluminous⁵⁸ and, coupled with the fact that there may well be a large number of potentially interested/eligible FWA providers (such as existing licensees in the 3.6 GHz and other bands), the length of time involved

⁵⁷ Such as: financial strength of the company, technical plan, business plan, experience and knowledge, quality of service, geographical coverage and/or roll-out timescale .

⁵⁸ For instance, Sims, Youell and Womeresley (Understanding Spectrum Liberalisation, 2015, CRC Press) note that applications received by the US Federal Communications Commission (FCC) for some its beauty contests were over 1000 pages in length (p40). ComReg also notes that applications received in respect of its 3G licensing process were several hundred pages each.

in reviewing, comparing and analysing the number of applications which could be received would likely be extensive.

- 3.47 Further, considerable information asymmetries would likely exist between applicants that could lead to the creation of a number of serious substantive and procedural risks which are outlined below.
- 3.48 First, such information asymmetries make it very difficult for the regulator to properly assess applications in their own right.⁵⁹ Second, given the commercially sensitive information usually being considered, it may be particularly difficult for a regulator to make comparative evaluations which are sufficiently robust, that is, they entail some level of subjective evaluation by the regulator.⁶⁰ Furthermore, complaints about the subjective nature of a regulator's decision and lack of sufficient transparency about the evaluation can create real risks of legal disputes for assignments made by way of beauty contests.⁶¹ Delays because of such disputes can be particularly detrimental for participants in those awards and for market development, competition and consumers (e.g. resulting delays to getting new services to market may have considerable socio/economic costs).
- 3.49 In addition, and in particular contrast to an auction format (as outlined later), beauty contests are vulnerable to applicants exaggerating their business cases in order to increase the chances of being assigned the spectrum. In that regard, expert commentators have observed⁶²:
- to win, there is an incentive on applicants to promise more than the other participants, but once the applicant has won, there is an incentive not to

⁵⁹ For example, Sims, M, Youell, T and Womersley, R observe at page 42:

- “Business plans are necessarily about predicting the future: How can the regulator - or anyone else - prove that an applicant's claim of obtaining a 25% market share is unachievable?”
- “What experience or knowledge is required to run a mobile network? A regulator may dismiss an application because it lacks technical expertise, but the rejected applicant could perfectly well argue that mobile is primarily a business which requires strategic vision and sufficient funding. Technical knowledge can be brought in at a later stage.”

⁶⁰ See, for example, RSPG draft report on Efficient Awards and Efficient Use of Spectrum RSPG16-619, 21 October 2015, at page 11. Specifically, “There are some disadvantages to beauty contests; most notably they include more subjective criteria than auctions, leading to potential risk of disputes on criteria or possible legal challenge.”

⁶¹ See, for example:

- relevant issues surrounding the grant of the second mobile licence in Ireland to Esat Digifone in 1996, including as considered by the Moriarty Tribunal;
- the challenge by Orange against the award of the third Irish GSM licence to Meteor (Orange v ODTR (1998 no. 1216OP), Orange v ODTR (224 & 278/1999 & 14/200) which resulted in a delay of the eventual grant of this licence to Meteor of around 2 years; and
- challenge by unsuccessful applicants in the Swedish 3G licence award in 2000.

⁶² See Sims, M, Youell, T and Womersley, p 43-44.

deliver because these promises (e.g. of extra coverage or higher speeds) involve higher costs; and

- it is difficult for the regulator to withdraw the licence because of a failure to deliver on such promises because customers could lose their service and terminating a licence would make the market less competitive and less attractive to investors.

3.50 This vulnerability means that it is even less likely that a regulator can accurately assess the optimum service provider by way of an administrative award process.

3.51 Finally, there is an inherent moral hazard with beauty contests – regulators make a decision but do not suffer the consequences of that decision, rather, it is the customer who will suffer through poorer services or lack of competition. ComReg notes that the general limitations of beauty contests (as outlined in this chapter and elsewhere) means they have become less frequent in more recent spectrum awards.⁶³

- **Award outcome 3: Determination on the quantum of 3.6 GHz spectrum rights that should be assigned to each provider and in which of ComReg's proposed regions**

3.52 In preparing an application for an administrative assignment process, applicants would need to consider (a) the quantum of spectrum required and (b) the region(s), and the package of both that best reflects its particular commercial strategy.

3.53 In order for ComReg to carry out its statutory functions effectively, each application would have to be given equal and full consideration. However, ComReg observes that in assessing each application individually, and determining the winning applicant(s), it would need to undertake a comparative assessment of all applications with a large number of permutations, of which only a small number are likely to generate the greatest benefit.

3.54 In that regard, ComReg notes that it would potentially have to consider a large number of applications⁶⁴ with each application potentially requiring a different quantum of spectrum in various combinations of blocks across nine different regions, or a different package of regions⁶⁵. ComReg notes that even where there are only a few significant award outcomes to be considered, accurately

⁶³ See, for example, RSPG draft report on Efficient Awards and Efficient Use of Spectrum RSPG16-619, 21 October 2015 generally.

⁶⁴ The various responses to Consultation 15/70 suggest that perhaps between 50 (Aptus) to 80 (FWA 16) FWA operators currently exist.

⁶⁵ ComReg's proposals set out nine regions and the level of competition across each region is likely to vary.

assessing the most efficient package of individual elements becomes a complicated empirical task in which all permutations and combinations of applications, spectrum and regions and the interaction between these must be assessed or modelled. In particular, it would be difficult for ComReg to assess what combination of applicant(s) and spectrum, across each region individually or collectively would generate the greatest benefit and ensure the efficient use of the radio spectrum.

- 3.55 In addition, ComReg observes that many of the administrative assignment proposals are silent on the criteria by which to determine how much spectrum should be assigned to each FWA operator in each of ComReg's proposed regions.⁶⁶ The appropriate resolution of how to distribute the quantum of spectrum is not trivial, particularly when:
- the 3.6 GHz band is already largely assigned to existing 3.6 GHz FWALA licensees (noting that the FWA 16 proposal would seek a reservation of the 3.6 GHz band for existing 3.6 GHz licensees and FWA providers in other bands e.g. licence exempt bands); and
 - even leaving aside the potential demands from FWA providers operating in bands other than 3.6 GHz, there is a clearly stated desire by some FWA operators to provide FWA services of higher bandwidth than currently provided (e.g. Imagine, Ripplecom, KerNet etc.) which would require some of these operators to hold more spectrum rights than they currently hold.
- 3.56 For a multi-regional or national application, ComReg would need to ensure that such a provider would ensure the efficient use of radio spectrum and deliver the greatest overall benefit for a given amount of spectrum in all regions. Seeking to decide on these matters in a manner that would not unduly disadvantage different types of regional FWA business cases would be extremely difficult in particular given the likely material information asymmetries faced by ComReg.
- 3.57 In addition, this exposes certain bidders to possible aggregation risks in two ways:
- an applicant who requires more than one region may be a winning applicant in one or more but not all required regions; and
 - applicants requiring an assignment across more than one block could be exposed to aggregation risks if they have synergy values across more than one lot.

⁶⁶ Imagine outline that 160 MHz should be assigned on a national basis.

- 3.58 In order to prevent such risks, an applicant may only be able to submit one application, and is either assigned that spectrum to satisfy that application or not. Such a scenario could cause large amounts of spectrum rights to remain unassigned in certain regions, if the applicant was prepared to be assigned lower amounts of spectrum and/or across less regions.
- 3.59 Even if applicants were able to submit multiple mutually exclusive applications, this would not allow them to adjust their demands in response to an iterative process, which might be necessary for finding an efficient distribution of spectrum rights. Further, evaluating multiple applications from each application would exponentially increase the effort and time for assessing the outcome.
- **Award Outcome 4: Determination on which part of the 3.6 GHz band those spectrum rights in each region should be located**
- 3.60 Most administrative assignment proposals were also silent on how to determine which part of the 3.6 GHz band the administratively assigned rights for each region would be located. An administrative award of spectrum would require an assessment by the regulator on where to place each winning applicant in the band.
- 3.61 In that regard, ComReg observes:
- holding large contiguous blocks of spectrum in certain parts of the band will likely be factored into an applicant's valuations and in delivering their proposed business plans;
 - where more than one applicant has a preference for the same position in the band, in an administrative assignment process the regulator would likely lack sufficiently accurate information in order to determine which applicant is better placed to deliver the best outcomes given a particular position in the band; and
 - therefore, where the regulator assigns spectrum in particular parts of the band, and, if the value difference between different positions in the band is material, there is a possibility that certain applicants would not be awarded a certain assignment of frequencies even if it had the highest value of all applicants, on account of not having the opportunity to express its full value for such an assignment.
- 3.62 ComReg expects that incumbent FWA operators would prefer to retain existing positions to avoid costs of retuning and equipment changes. ComReg also currently understands that incumbent operators' existing equipment is largely frequency specific with limited flexibility for re-tuning to other parts of the band.

However, assigning spectrum to incumbents in their existing positions would result in a bias in favour of operators or technologies already established in the market, placing new FWA entrants or incumbents who wish to enter, or move, at a disadvantage. Furthermore, even if incumbents were to retain their existing positions, incumbents seeking more spectrum than assigned to their current position could be exposed to fragmentation risks if they fail to be assigned a block that is contiguous to their existing holdings but end up winning the block in a different part of the band.

ComReg's general observations on auction format

- **Award outcome 1: Which electronic communications networks/services, using which technologies, are going to be the ones most likely to provide the greatest end-consumer benefits for the next 15 years?**
- 3.63 First, ComReg observes that an auction process would allow all potential providers of all ECN/ECS to compete for, acquire and make use of spectrum rights in the entirety of the 3.6 GHz Band for all ECN/ECS including on a fixed, nomadic and mobile basis (subject to the proposed competition caps).
- 3.64 Second, an auction process would avoid the potential for making the types of poor administrative decisions identified in recital 32 of the 2009 Amending Directive. In particular, it would not require ComReg to “pick winners” (such as in terms of “preferred use”) in circumstances where it cannot reliably predict what will be the best ECN/ECS and technologies that will provide the greatest consumer benefits over the proposed 15 year duration of the rights of use.
- 3.65 Instead, an auction creates incentives for the truthful revelation of information about the relative value of different potential uses (and networks/technologies for same) over the lifetime of the right of use through the interaction and competition between potential providers of:
- different permissible uses (e.g. the relative value of wireless broadband use compared to other ECS);
 - different permissible networks (e.g. the relative value of wireless broadband provided by each of fixed, nomadic and mobile ECN); and
 - different permissible technologies (e.g. the relative value of wireless broadband provided by fixed, nomadic and mobile ECN using existing technologies (e.g. WiMax, LTE, Cambium), and even potential future technologies (e.g. 5G)).

- 3.66 Importantly, as described in detail in Document 15/70, an auction allows the award outcome to be established based on information provided by market players who are far better placed to judge such matters than the regulator.
- **Award outcomes 2 and 3: Determination of optimum service provider/s to provide these services for the next 15 years**
- 3.67 Under this heading, ComReg considers both the determination of the optimum service provider and the quantum of spectrum per region.
- 3.68 Under an auction format, all existing and potential providers (whether in Ireland or elsewhere) of **any** ECN/ECS on a fixed, nomadic **and** mobile basis, seeking to use any of the technologies permitted by the 3.6 GHz EC Decision, would be afforded the same opportunities to compete for, acquire and make use of spectrum rights in the entire 3.6 GHz Band (subject to the proposed competition cap).⁶⁷
- 3.69 As such, an auction format would, firstly, avoid issues around *ex-ante* determination of the quantum and geographic dimension of any administrative assignment process for FWA⁶⁸. It would also avoid the risk of challenge from unsuccessful applicants in a beauty contest about insufficient transparency⁶⁹, objectivity, due diligence etc. in the evaluation process and outcome, and the delays associated with such challenges.
- 3.70 Further, an auction is the award format considered most likely to (a) put the spectrum rights in the hands of those who value it the most and (b) incentivise those persons to make the best use of it.⁷⁰.
- 3.71 Given that certain responses received in relation to this point appear to indicate a misunderstanding of how an auction format would result in these outcomes⁷¹, ComReg sets out below some further clarity on:

⁶⁷ For the avoidance of doubt, existing and potential FWA providers seeking to win the maximum amount of spectrum permitted by ComReg's proposed competition caps so as to provide "NGA-type" FWA services on a national or sub-national footprint, would not be disadvantaged by an auction process in terms of their ability to compete for, acquire and make use of spectrum rights, compared to those choosing alternative FWA business/commercial strategies and, indeed, potential providers of other ECN/ECS.

⁶⁸ See also in this regard, paragraph 44 of DotEcon's response report.

⁶⁹ Ibid, pages 42 and 43. See also RSPG's draft consultation report on Efficient Awards and Efficient Use of Spectrum, RSPG15-619, October 2015, p11.

⁷⁰ See, for example:

- RSPG draft consultation report on Efficient Awards and Efficient Use of Spectrum, RSPG15-619, October 2015, page 10; and
- Joint BEREC/RSPG Working Group on Competition Issues, *Report on exploring the economic and social value of radio spectrum for certain electronic communications services with respect to frequency assignment procedures*, BoR (12) 15 / RSPG 12-410 rev2, April 2012 at page 14.

⁷¹ For instance, the FWA 16 submission repeatedly, and in various forms, contends that ComReg is trying to achieve the highest price for the award spectrum by assigning spectrum to bidders with the highest valuation,

- what is meant by having the highest valuation, in terms of how a potential bidder may determine such a number in the context of an auction for spectrum rights of use;
- how this valuation relates to achieving the greatest overall benefit for society, and the efficient use of spectrum;
- opportunity cost pricing; and
- why a bidder's valuations in an auction is a more reliable and appropriate basis by which to determine spectrum award outcomes than the use of selection criteria in an administrative award.

Private Valuation

- 3.72 The value of spectrum to an operator (i.e. its private valuation) is reflected in an operator's maximum willingness to pay in an award process. The private valuation is typically determined by the Net Present Value (NPV) of profits that can be generated from using the spectrum for the provision of services over the duration of the licence. The NPV profit stream is determined as revenue (ARPU⁷², payments from MVNOs, trading, leasing etc.) minus costs (operating cost⁷³, network capex, administration etc.). While this valuation may be greater or less than the final auction price for a licence, an operator would not rationally pay above its private valuation and therefore this represents its maximum willingness to pay for a licence..
- 3.73 Private valuations are likely to vary across operators as an individual operator's private valuation depends on its relative cost efficiency, including the use of existing spectrum holdings, network planning, etc. Where downstream competition is effective an operator is unable to extract monopoly revenues, therefore, provided that downstream competition is effective, how an operator's private valuation compares to that of rival bidders depends largely on its relative efficiency.

Greatest overall benefit and efficient use of spectrum

- 3.74 The efficient assignment of spectrum is the assignment of spectrum to those best able to generate the greatest overall benefit. When downstream competition is effective, the objective of achieving the greatest overall benefit from spectrum can be achieved by assigning the spectrum to whoever values it

which is inaccurate and misunderstands both the preferred auction format and how such a format results in the user who values the spectrum the most being assigned that spectrum.

⁷² Expectations depend on forecasts of future ARPU, data usage, costs and future market structure (4v3 etc.).

⁷³ The cost of obtaining access to spectrum resources can be included as a factor in determining net project value for a wireless network project (ITU 2010).

the most. This arises because any differences in private valuation by different bidders, referred to above, should reflect a bidder's ability to provide services demanded by consumers and any potential cost savings or quality improvements in delivering those services. Where downstream competition is effective, these benefits are passed on to consumers; therefore the operator who values the spectrum the most would provide the greatest overall benefit among competing alternatives.

- 3.75 Auctions have the distinct advantage of using competition between potential bidders to reveal who values the spectrum rights the most. This is not available in any type of administrative award in which decisions must be made by the regulator. Therefore, provided that measures are taken to ensure that downstream competition remains effective⁷⁴, auctions are highly appropriate in determining the efficient assignment of spectrum.

Price determination

- 3.76 Opportunity cost pricing is an important method of limiting the extent to which a losing bidder can question the outcome of an award process as the price for spectrum is set at the lowest level that ensures that losing bidders would not wish to be awarded the spectrum at prices paid by the winners. It is not as the FWA 16 submission suggests "*the price the highest bidder would pay*" or "*the maximum ComReg can wring out of them*". Indeed, a winning bidder may be prepared to pay a higher price than its winning price. However, if spectrum were assigned below opportunity cost, then there would be other applicants who could rightly complain that they would have been prepared to pay more and that the regulator awarded spectrum to a winner paying less than this, and contrary to its statutory objectives and duties. See Chapter 5 and in particular Box 1 for a more detailed discussion.

Bidders' valuations are more reliable and appropriate basis for determination of award outcomes

- 3.77 ComReg would also highlight the following additional advantages of auctions as observed by expert commentators.⁷⁵
- 3.78 First, and in contrast to beauty contests, an auction format does not create incentives for participants to overpromise because winning bidders face the consequences of their actions. Specifically, as winning bidders are required to pay the opportunity cost of the spectrum rights, they must be reasonably certain

⁷⁴ Such measures include spectrum competition caps, fees and licence obligations.

⁷⁵ See Sims, M, Youell, T and Womersley, p44. 44.

that they can deliver on their business plans so as to recoup the investment cost of the spectrum rights. Therefore, the valuations they place on the spectrum rights are more likely to be based on a thorough assessment of the investment conditions.

- 3.79 Second, requiring that winning bidders pay the opportunity cost also creates real incentives for them to rollout networks and provide services in order to be able to recoup the price paid for the licence. .
- 3.80 Third, an auction format allows the market to carry out the same comparative function performed by the regulator in a beauty contest and probably more effectively. Specifically, whereas in a beauty contest the comparative evaluation function would be performed solely by the regulator, in an auction, each bidder may have to justify their spectrum/business investment plans to their respective shareholders, bankers, lawyers and/or the share market. Further, such parties conducting due diligence of these investment plans are likely to have more resources than the regulator and better expertise in their relevant fields. For instance, if a bidder's lender(s) doubts the strength of a bidder's business case or the competency of its management, then the bidder is unlikely to obtain the financing for the investment.
- 3.81 Finally, it is worth noting that auctions are the most common award mechanism for the award of spectrum rights in bands allocated for ECS, in Europe and elsewhere.⁷⁶
 - **Award Outcome 4: Determination on which part of the 3.6 GHz band those spectrum rights in each region should be located?**
- 3.82 Auction formats also allow for the market to determine the specific frequency assignments to be awarded to each winning bidder. For instance, the auction process proposed by ComReg for 3.6 GHz award includes an assignment stage, which allows winners to make bids for the rights of use they have won to be assigned at various specific frequencies.
- 3.83 The purpose of the assignment stage of an auction is to determine the specific frequencies to be assigned to winning bidders in the award process by allowing winners of frequency-generic lots to express their relative valuations (in the form of bids) for particular frequency assignments in accordance with the quantum of spectrum they have won in each region. Prices are determined in a similar manner to the first stage (i.e. a second price rule based on opportunity costs) in

⁷⁶ BEREC/RSPG Working Group, April 2012, Report on exploring the economic and social value of radio spectrum for certain electronic communications services with respect to the frequency assignment procedures. See also draft RSPG report on Efficient Awards and Efficient Use of Spectrum.

order to avoid incentives to bid less than true values. Any bidder that has no preference over the frequencies that it could be assigned can simply choose to enter zero bids in the assignment stage. As the assignment stage provides an opportunity for bidders to express their value for specific frequencies, the problems identified under this heading previously, in respect of administrative assignment options proposed by respondents, would not be present where an auction is used.

3.4 Revised draft ‘Assignment Process’ RIA

- 3.84 Bearing in mind the previous discussion, and the views of respondents this section sets out ComReg’s revised draft “Assignment Process” RIA.
- 3.85 First, ComReg refers to the discussion on the general RIA framework as described the revised draft ‘Spectrum for Award’ RIA which is contained in Annex 5. See, in particular, paragraphs A5.7 – A5.8

Policy issue

- 3.86 ComReg is of the view that the primary policy issue to be considered in this revised draft Assignment Process RIA is how best to assign rights of use in the 3.6 GHz band, bearing in mind the four award outcomes discussed in paragraph 3.37 above.

Objectives

- 3.87 The focus of this revised draft Assignment Process RIA is to assess the impact of the proposed measure(s) (see regulatory options below) on stakeholders, and on competition and consumers. ComReg can then identify and implement the most appropriate and effective means by which to assign 3.6 GHz spectrum rights of use, while achieving its objectives of:
- assigning rights of use in the 3.6 GHz band in line with the 3.6 GHz EC Decision and other relevant legislation;
 - selecting those to whom such rights may be granted on the basis of objective, transparent, non-discriminatory selection criteria;
 - minimising potential negative consumer disruption by ensuring the continued availability of fixed wireless services where spectrum rights of use are not assigned to incumbent providers; and
 - promoting the interests of the economic development of the State and the electronic communications sector.

- 3.88 ComReg also aims to design and carry out this assignment process in accordance with its broader statutory objectives (set out in Annex 2), including, but not limited to, the promotion of competition in the electronic communications sector.
- 3.89 A further key objective in designing and carrying out this assignment process is to seek to encourage the efficient use and ensure the effective management of the radio frequency spectrum. ComReg's other overarching objectives are to contribute to the development of the internal market and to promote the interests of users within the Community. ComReg also notes that, in achieving its objectives, its ultimate aim is to choose regulatory measures which maximise the benefits for consumers in terms of price, choice and quality.

Identifying the regulatory options

- 3.90 First, it is ComReg's normal practice to only consider viable regulatory options in a RIA.
- 3.91 In that regard, ComReg recalls the concerns identified above in relation to the administrative assignment proposals received in respect of service and technology neutrality and non-discrimination.
- 3.92 Without prejudice to these concerns and conscious of the stated relative inexperience of certain industry stakeholders with spectrum assignment processes (including auction formats), in the present case ComReg is prepared to consider the two broad categories of administrative assignment proposals received in response to Consultation 15/70 in this revised draft Assignment Process RIA. This is for the purposes of further aiding such stakeholders' understanding of the relative merits of alternative assignment formats in the context of their potential impact upon industry stakeholders, competition and consumers.
- 3.93 The following options are therefore considered:
- **Option 1:** Regional assignment of all available spectrum in the 3.6 GHz band using a combinatorial clock auction (CCA)⁷⁷;
 - **Option 2:** Regional assignment of some (e.g. 150 MHz) or all available spectrum in the 3.6 GHz band by way of administrative assignment to FWA providers; and

⁷⁷ This Option refers to the proposal as set out in this document and for the avoidance of doubt allows a bidder to package its bid in order to provide services on a national basis

- **Option 3:** National assignment of 150 MHz (up to the proposed spectrum competition cap⁷⁸) in the 3.6 GHz band by way of administrative assignment to an FWA provider, and the remaining 200 MHz of spectrum to be assigned in line with Option 1.

Determining the impact on stakeholders

3.94 Stakeholders consist of two main groups:

- consumers (for the purposes of this RIA, consumers include both business and residential end users of spectrum); and
- industry stakeholders.

3.95 There are a number of key industry stakeholders in relation to the matters considered in this chapter:⁷⁹

- existing FWA providers including:
 - licensees with spectrum rights of use in the 3.6 GHz band (e.g. FWALA licensees);
 - parties who currently provide FWA services using other licensed (10.6 GHz) or unlicensed (5.8 GHz) spectrum;
- Potential new entrants to the FWA sector⁸⁰; and
- Non FWA providers (e.g. MNOs).

Impact on stakeholders

3.96 It is recognised that, to the extent that a stakeholder has submitted an award proposal, they are likely to prefer the option that most closely reflects that proposal. Otherwise, stakeholders are likely to prefer an option which would offer the greatest amount of contestable spectrum (so as to provide the greatest chance of obtaining spectrum rights).

⁷⁸ See Chapter 5 for discussion of spectrum competition caps.

⁷⁹ ComReg acknowledges that other stakeholders have an interest in the 3.6 GHz Band including the State (in respect of State services provided using spectrum in the Band), entities using the adjoining spectrum and equipment manufacturers. However, it does not appear to ComReg that these stakeholders would be significantly impacted by how the 3.6 GHz band is assigned. Accordingly, they are not considered further in this chapter.

⁸⁰ In the draft RIA of Document 15/70, ComReg referred to operators not currently assigned spectrum in the 3.6 GHz band as potential 'new entrants' to the 3.6 GHz band. Ten of the twenty responses were from such operators, and who provide fixed wireless services across bands other than the 3.6 GHz band. These responses suggested a clear preference for Option 2.

- 3.97 In that context, existing FWA providers⁸¹ (with the exception of Imagine) and potential new entrant FWA operators may prefer Option 1 over Option 3 because:
- Option 3 is unlikely to be favoured by existing FWA providers and potential new entrants for the following reasons:
 - all FWA providers expressed a clear preference for spectrum rights of use to be assigned on a regional basis. We expect that those seeking to operate on a sub-national basis may not be in a position to effectively compete to compete for a national licence, and would therefore have less contestable spectrum to compete for on a regional basis; and
 - it would prevent other FWA providers seeking to provide services using less than 150 MHz of spectrum from participating in the administrative part of the award. This, in turn, would reduce the amount of contestable spectrum for such providers; and
 - In contrast, under Option 1:
 - all available spectrum is contestable and would not restrict providers from competing for all available spectrum;
 - it would provide an opportunity for such providers to express their willingness to pay for spectrum that satisfies their demand on a sub-national basis; and
 - block sizes of 5 MHz and package bidding would allow bidders to express their full valuation for packages of lots up to 150 MHz.
- 3.98 While a national FWA provider would clearly prefer Option 3, it would likely prefer Option 2 to Option 1 to the extent that this option would still reserve all or a large portion of spectrum for FWA use and could still allow for the possibility of the assignment of spectrum rights of use in all regions. However, under Option 2 there is no certainty that such a provider would be assigned its preferred quantum of spectrum or its use on a national basis.
- 3.99 ComReg is of the view that other interested parties, for example, MNOs would likely prefer Option 1⁸² over Option 2 or 3 as this provides for the assignment of all available spectrum rights on a service and technology neutral basis and gives

⁸¹ Viatel was the only FWA provider that expressed a preference for an auction format, citing its previous positive experience of a CCA in the UK and, as such, is likely to favour Option 1.

⁸² Noting that MNOs may not agree with the specific auction format proposed by ComReg as set out in Chapter 5.

all operators an equal opportunity to access spectrum up to and including on a national basis. The administrative award of some, or all, of the band for fixed wireless would exclude other providers (e.g. MNOs) entirely or reduce the quantum of spectrum available to other providers and could cause the cost of any residual spectrum rights of use to artificially increase.

Impact on competition

3.100 The impact on competition is assessed at two levels which are interconnected:

- Competition during the award process. This occurs where bidders/applicants compete with each other in order to be assigned spectrum; and
- Downstream retail competition between winning bidders and other market participants. The promotion of competition at this level is a primary goal of this proposed award process because competition at retail level is ultimately will drive consumer benefits.

Competition within the award process

3.101 At a general level, the more intense the competition in the assignment process (the greater the level of participation), the higher the probability that the spectrum usage rights will be awarded to those operators that value it the most, and who are incentivised to use the spectrum most efficiently and compete most vigorously in the downstream retail market.

3.102 Firstly, any form of assignment which excludes certain users from participating in the award process reduces the level of competition within the award process. The more extensive the restriction, in terms of the possible assignment outcomes which it precludes, then the more likely it is that competition is restricted and the actual optimal assignment is precluded from arising.

3.103 The level of competition within any of the administrative options outlined above is limited to the inclusion of other ECN/ECS providers. Indeed, the request for a reservation of the band for a particular use in the first place, suggests that more than one type of user would have participated in the award absent such reservation.

3.104 In that regard, ComReg notes that:

- Option 3 would likely result in the lowest level of competition in the administrative award since it restricts FWA providers who wish to provide services on a regional basis.

- Option 2 would have a greater level of competition than Option 3 since it allows for a greater range of outcomes (i.e. assignment on a regional and national basis) but competition is still limited to the extent that certain ECN/ECS, particularly MNOs, are excluded.

3.105 Secondly, the lack of transparent procedures in an administrative award limits the extent of competition within the award. Specifically:

- applicants may be unable to respond to specific commitments made by competing applicants, and even where they can, the lack of objective selection criteria makes it difficult for competing applicants to determine the effectiveness of the bids (in terms of the outcome) they make.
- applicants may be exposed to substitution risk and are unable to switch between regions in response to bids made by rivals, particularly where some applicants may be indifferent between one or more regions⁸³. In this way competition between regions within the award would be restricted.

3.106 Thirdly, under Option 3 but also potentially Option 2 where the administrative award of spectrum does not satisfy a reserved bidder's demand entirely, the reserved bidder would hold a considerable advantage over alternative bidders who wished to compete on the same basis for residual spectrum. This would likely distort the nature of competition in the residual award as, the spectrum fees per MHz of spectrum would likely be less for the reserved bidder because a portion of its demand was satisfied through an administrative award rather than through an open competition.

3.107 Option 1 would, in ComReg's view and considering all of the above factors, provides the greatest level of competition during the award process for the following reasons:

- it takes a service and technology neutral approach and allows all credible bidders⁸⁴ to compete for the same spectrum;
- it encourages participation in the award from national and regional operators alike through the use of package bidding;
- it ensures that all bidders compete on an equal basis for all available spectrum and not artificially on the basis of any mechanism designed to favour incumbency; and

⁸³ Even where applicants can switch bids to alternative regions, applicants could hide demand by bidding on unwanted regions and then switching demand later in the award.

⁸⁴ The minimum price is set high enough in order to ensure non-credible bidders are excluded.

- a multi-round format is transparent as it assists in price discovery allowing bidders to select their preferred combination of lots on a regional basis in response to changes in the relative price of lots in different regions, increasing competition for regions and lots.

3.108 Therefore, and for all of the reasons stated in this section, Option 1 would, in ComReg's view, better promote competition within the award process.

Competition at retail level

3.109 The 3.6 GHz EC Decision requires that Ireland apply a service and technology neutral approach where one of the stated intentions of the designation is to address the “**convergence** of the mobile, fixed and broadcasting sectors” (emphasis added). Under Option 2 and 3, the reservation of spectrum to one sector has the potential to distort competition between wireless broadband services. Importantly, over the duration of the licence the basis for competition could change or shift from the data rates and prices offered through the different platforms towards converged services and content demanded by end-users. Additionally, in terms of technology both mobile and fixed WBB providers are converging in terms of transmission standards, with both sectors moving towards adoption of LTE technology.

3.110 Because Option 3 favour specific commercial strategies (i.e. national provider) it may restrict the amount of contestable spectrum for FWA operators, likely distorting competition between FWA providers. Furthermore, Option 3 would substantially restrict the extent to which such a provider on a national basis would be subject to regional competition in localised areas or larger regions. Under Option 3, it is likely that regional competition would only be possible through the assignment of the residual spectrum. However, the extent to which such competition would occur, would be limited for the following reasons:

- only the residual spectrum would be available for assignment among all ECN/ECS providers;
- any regional operator would require at least 100 MHz to offer a NGA type service in those regions (as indicated by the Plum report)⁸⁵. Given the likely participation of other ECN/ECS providers, the assignment of 100 MHz or above to a single operator from the residual spectrum is less likely than would have been the case under Option 1 from all available spectrum.

⁸⁵ Update of Plum Report 3 Document 15/140d

- the residual spectrum would likely be at a higher price to reflect the opportunity cost of the spectrum in that award and to reflect the artificial reduction in supply caused by the reservation; and
- the likely higher price/MHz would probably result in a regional provider operating on a higher cost base than otherwise would be the case.

3.111 ComReg also notes that there is no reason to believe that regional FWA providers are less capable of providing FWA services in the areas in which they operate compared to a FWA provider having a national footprint.

3.112 More generally, an assignment of spectrum to less efficient operators made by the regulator under Option 2 or Option 3 could lead to reduced competition and, consequently, lower quality services being offered by less efficient operators and higher prices from more efficient operators offering improved services, than would have been the case in an open transparent auction.

3.113 Under Option 2 and 3, ComReg notes that if such an award process fails to deliver an efficient outcome this would likely result in a negative impact on downstream competition. Therefore, there is a risk that applicants seeking to provide a differentiated range of services to consumers may be awarded less spectrum than would be efficient, or none at all, while less efficient operators are awarded spectrum.

3.114 In the long run, spectrum usage fees (SUFs) serve an important role in encouraging the return of unused spectrum. In order for SUFs to be effective, they should be set at a level that reflects the opportunity cost of holding the spectrum. In terms of the SUF, this cannot be known prior to the award, (as SUFs are paid at a future date) however, in setting the SUF as a proportion of the minimum price, and ultimately the final price, which does reflect the opportunity cost of the spectrum, the SUF should encourage return of unused or underused spectrum to ComReg (Option 1).

3.115 In the case of an administrative assignment, it is difficult for ComReg to make an accurate assessment of the alternative assignment options thereby setting a price that reflects the opportunity cost of the spectrum. This is exacerbated to the extent that usage fees, if any, prescribed under Options 2 and to a lesser extent Option 3, are unlikely to encourage the licensee to return unused or underused spectrum if they do not reasonably reflect the opportunity cost of the reserved use. As such, under these options long-term competition could be restricted because there is less of an incentive to return the spectrum over the duration of the licence to allow alternative users provide services.

3.116 Alternatively, compared with Options 2 and 3, Option 1 provides for the greatest level of competition in downstream markets for the following reasons:

- it produces a more efficient outcome by assigning the spectrum to operators who attach the highest value to it, which will generally be those operators that can generate the greatest benefits to society from the use of that spectrum;
- Allows for consumer services to be provided through a combination of regional, multi-regional and national assignments through the use of package bidding;
- the auction promotes incentives for bidders to engage in a manner expected of normal competition, and not engage in strategic or collusive behaviour.⁸⁶
- the use of binding bids ensures that bidders are committed to the bids they make, and the delivery of services from the use of the assigned spectrum; and
- avoids outcomes where spectrum goes unsold despite efficient demand existing for that spectrum.

3.117 Therefore, and for the reasons stated above, Option 1 would, in ComReg's view, better promote downstream competition.

Impact on Consumers

3.118 Consumers are likely to prefer Option 1 to Options 2 or 3 because all available spectrum is offered to all providers of all services, and non-FWA services (e.g. mobile & backhaul) are not restricted from participating in the award. Administratively assigning spectrum to certain stakeholders automatically denies this spectrum to other potential providers of services and potentially more efficient providers of services. Consumers would be negatively impacted if the administrative assignment of spectrum resulted in restricting other service providers from providing services in the future.

3.119 Additionally, under Options 2 and 3, there could be a negative impact on consumers as it would create the risk that spectrum would be assigned to a less efficient operator. Even small losses to consumer welfare as a result of an administrative assignment could result in a substantial aggregate loss over the period of the licence. In particular, under Option 3, the assignment of all reserved spectrum to one operator on a national basis creates the risk that all

⁸⁶ See Section 5.2.2 in Document 15/70;

reserved spectrum could be assigned to one operator who may not be the most efficient among competing alternatives.

3.120 For all administrative options, the negative impacts on downstream competition for FWA services as outlined above would in turn have a negative impact on consumers. In particular, Option 3 provides a worse outcome for fixed wireless consumers than Option 2 because it unduly restricts different forms of FWA competition in two ways:

- (i) it reduces regional competition; and
- (ii) it limits consumer choice for those customers who may prefer lower speeds at a better price⁸⁷.

3.121 In an administrative award, the potential for failure to deliver on commitments made in terms of coverage, rollout or investment ultimately affects the delivery of services to consumers. In an administrative award no effective ex-ante mechanism exists with which to restrain the extent to which some commitments are made. This could potentially have a significant impact on consumers if the winning application(s) fails to deliver on their commitments.⁸⁸ In contrast, under Option 1, the use of binding bids ensures that bidders are committed to the bids they make, incentivising the delivery of services from the use of the assigned spectrum.

3.122 ComReg notes in respect of the potential disruption to current FWA services, certain consumers (24,302 in the 3.6 GHz band, Q3, 2015) might prefer Options 2 or 3 because it could better ensure that those consumers would not face any disruption to existing services by removing the risk that an incumbent would not win sufficient spectrum in an open auction. As described in Chapter 5, the proposed auction design is such that there would not be an unmanageable risk to business continuity, and therefore disruption to existing services, absent a decision by an existing FWA provider not to pay a higher spectrum fee than another bidder in order to secure the spectrum. As set out in Chapter 7, ComReg is also proposing transitional arrangements and rules with which to, amongst other things, mitigate against the potential for adverse effects on existing

⁸⁷ ComReg notes that FWA services are currently offered in large urban areas where NGA access is already available.

⁸⁸ For example, Norway assigned four 3G Licences using a beauty contest. One of the winners (Enitel) became insolvent and another (Tele 2) returned its licence after being unable to meet the network deployment commitments it had given. Similarly in Sweden, the coverage obligations were only reached three years after the initial deadline, followed by remaining operators seven months later.

consumer services where a current FWA operator does not win sufficient spectrum rights in the proposed award.

3.123 Compared with Option 2 and 3, Option 1 provides the most positive impact on consumers for the following reasons:

- it should have the most positive impact on downstream competition. Therefore, by extension, Option 1 would be better for consumers than either of the administrative options.
- it ensures that spectrum is awarded to those operators who value it most and who are better placed to ensure that consumer welfare is maximised where spectrum rights of use are made available.
- it provides for a range of outcomes and differentiated services:
 - it allows for services to be provided to consumers on a regional and national basis;
 - it allows for various types of FWA services/technologies to be delivered depending on spectrum assigned to individual bidders, potentially increasing the choice for consumers; and
 - it allows for mobile operators to complement their existing spectrum holdings, improving existing and future services to consumers.
- Option 1 is less likely to delay the ultimate delivery of services due to challenge, as the use of opportunity cost pricing ensures that there are no dissatisfied losers in terms of the price paid⁸⁹;
- Option 1 provides better incentivises users of the 3.6 GHz band to return unused spectrum to ComReg for reassignment to users that provide services to consumers; and
- Option 1 transition proposal (Chapter 7) mitigates against the potential for adverse effects on existing consumer services.

3.124 In light of the above benefits to consumers from an open auction, in ComReg's view, consumers would likely prefer Option 1 if concerns about disruption to existing services could be sufficiently mitigated against.

⁸⁹ The final prices paid are at a level at which winners are willing to be assigned the spectrum while losers are not willing to be assigned the same spectrum at this price level.

Preferred Option

- 3.125 ComReg firstly notes its views as stated in Para 3.91, and its willingness, *in this instance*, to consider certain categories of administrative assignment. This assessment has considered the impact of the various options from the perspective of industry stakeholders, as well as the impact on competition and consumers, and should aid stakeholders' understanding of the relative merits of the alternative assignment formats.
- 3.126 In summary, it is likely that FWA providers would prefer Option 2 whereby spectrum is reserved for FWA use in the band. Imagine or any potential national FWA provider would prefer Option 3. However, based on the analysis above, it is clear that these options would be in the best interests of those particular stakeholders, and not in terms of competition and consumers. Furthermore, it seems likely that even some FWA stakeholders would prefer Option 1 over the assignment of spectrum under Option 3 to only one operator on a national basis.
- 3.127 Option 1, in this case, also appears to be the best means to promote competition for spectrum usage rights and, in turn, promote competition in the related downstream retail market. Option 1 would also ensure an efficient award outcome and therefore ensure that competition in the downstream market is maximised to the benefit of consumers. Such an outcome would not be assured under Option 2 or Option 3.
- 3.128 Therefore, and for the reasons outlined in this RIA, ComReg's preferred Option is offering all of the available spectrum in the 3.6 GHz band, and subjecting the auction format to certain rules and fees that reflect the value of retaining spectrum for potential future use. This approach is more flexible, as it allows for the full band to be utilised if there is strong demand for spectrum in the present award, while at the same time it would ensure that the spectrum is only assigned if its value to potential licensees is sufficiently high, relative to the value of retaining spectrum for future assignment. Finally, the potential for service continuity issues to arise can also be addressed by non-award measures, such as the proposed transition arrangements and rules outlined in Chapter 7.

Overall Preferred Option

- 3.129 In light of the preceding discussion on the preferred assignment process and the outcome the 'Spectrum for Award' RIA (see Annex 5), ComReg is of the view that the 3.6 GHz band should be assigned by way of auction with no other bands included in the auction.

3.130 In Chapter 5 of this document, ComReg considers a number of different types of competitive award formats suitable for the award of rights of use in the 3.6 GHz band. Of the various auction formats considered, ComReg has reached the view that a CCA format best mitigates against the risks described in Chapter 5.

3.131 The following section assesses the above Preferred Option against ComReg's other relevant functions, objectives and duties.

3.5 Assessment of Preferred Option against ComReg's other relevant functions, objectives and duties

3.132 ComReg notes that certain respondents raised a number of issues with the assessment of the Preferred Option against ComReg's other relevant functions, objectives and duties as outlined in the draft RIA in Document 15/70. To the extent that such issues are considered material they are addressed separately in Annex 5, and the following assessment has been updated accordingly.

3.133 The draft RIAs considered 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).

3.134 In this section, ComReg has undertaken an assessment of the Preferred Option with regard to other statutory provisions relevant to the management of Ireland's radio frequency spectrum which are set out in Annex 2 of this document. It is not proposed to exhaustively reproduce those statutory provisions here. However, set out below is a summary of all statutory provisions which ComReg considers to be particularly relevant to the use and management of the radio frequency spectrum with an assessment (to the extent not already dealt with as part of the draft RIA) of whether, and to what extent, the Preferred Option accords with those provisions. In carrying out this assessment, ComReg has highlighted below some of the relative merits / drawbacks which would arise if it was to select some of the alternative options assessed under the draft RIA above.

3.135 For the purposes of this section, the statutory provisions which ComReg considers to be particularly relevant to the management of the radio frequency spectrum in the State are grouped as follows:

- general provisions on competition;
- contributing to the development of the internal market;

- to promote the interest of users within the Community;
- efficient use and effective management of spectrum;
- regulatory principles;
- relevant Policy Directions and Policy Statements; and
- general guiding principles (in terms of spectrum management, setting of fees and licence conditions):
 - Objective justification;
 - Transparency;
 - Non-discrimination; and
 - Proportionality.

General Provisions on Competition

3.136 As noted above, there is a natural overlap between the aims of the draft RIA and an assessment of ComReg's compliance with some of its statutory obligations, and, in particular, one of its core statutory objectives under Section 12 of the 2002 Act of promoting 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.⁹⁰

3.137 There are also other various statutory provisions requiring ComReg generally to promote and safeguard competition in the electronic communications sector including, amongst other things:

- Regulation 16(2) of the Framework Regulations which requires ComReg to apply objective, transparent, non-discriminatory and proportionate

⁹⁰ The final two statutory obligations were introduced by Regulation 16 of the Framework Regulations.

regulatory principles by safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure based competition;

- Regulation 9(11) of the Authorisation Regulations which requires ComReg to ensure that competition is not distorted by any transfer or accumulation of rights of use for radio frequencies;
- Article 4 of Directive 2002/77/EC (Competition Directive) which requires ComReg to refrain from granting exclusive or special rights of use of radio frequencies for the provision of electronic communications services; and
- the General Policy Direction on Competition (No. 1 of 2 April 2004) which requires ComReg to focus on the promotion of competition as a key objective, including the promotion of new entry.

Based on the draft RIAs, ComReg's view is that the Preferred Option is the one that would best safeguard and promote competition to the benefit of consumers.

Contributing to the development of the Internal Market

3.138 In achieving the objective of contributing to the development of the Internal Market, another of ComReg's core statutory objectives under Section 12 of the 2002 Act, ComReg considers that the following factors are of particular relevance in the context of this award process:

- the extent to which the Preferred Option would enable ComReg to ensure that harmonisation of the use of radio frequency spectrum across the EU is promoted, consistent with the need to ensure its effective and efficient use and in pursuit of benefits for the consumer such as economies of scale and interoperability of services, having regard to all decisions and measures adopted by the European Commission in accordance with the Radio Spectrum Decision⁹¹ (Regulation 17 of the Framework Regulations);
- the extent to which the Preferred Option would encourage the establishment and development of trans-European networks and the interoperability of pan-European services, in particular by facilitating, or not distorting or restricting, entry to the Irish market by electronic communication services providers based or operating in other Member States; and

⁹¹ Decision No. 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the EU.

- in order to ensure the development of consistent regulatory practice and the consistent application of EU law, the extent to which ComReg has had due regard to the views of the European Commission, BEREC and other Member States in relevant matters, in selecting an option and considering any regulatory action required by ComReg in respect of such an option.

Promoting harmonised use of radio frequency spectrum across the EU

3.139 In relation to the first factor identified above, for the reasons set out in Annex 5, it is ComReg's view that the Preferred Option will result in a more timely award of spectrum rights of use in the 3.6 GHz band which are suitable for the provision of advanced WBB services. In this regard, the Preferred Option is consistent with and promotes the objectives of the relevant harmonisation decisions of the European Commission which emphasise the suitability of this band for WBB services.

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

3.140 ComReg notes the overlap between this objective and the objective of promoting competition in the provision of electronic communication networks and services. Encouraging the establishment and development of trans-European networks requires that operators from other Member States seeking to develop such networks are given a fair and reasonable opportunity to obtain spectrum rights of use required for such networks and, particularly, access to critical spectrum rights of use. Accordingly, options which would restrict or distort competition or otherwise unfairly discriminate against potential entrants (such as through administrative assignment of rights of use to critical spectrum to incumbent operators) would not, in ComReg's view, satisfy the requirements of this objective.

3.141 In this regard, ComReg refers to the draft RIA and its preliminary finding that the Preferred Option is likely to be preferred by non FWA ECN/ECS. This is because the Preferred Option would not involve an administrative assignment of valuable spectrum that is more likely to favour incumbents simply by virtue of their incumbency, with the associated disincentives for potential participation by undertakings from other Member States in the proposed award process.

Promoting the development of consistent regulatory practice and the

consistent application of EU law

3.142 In relation to this aspect of contributing to the development of the internal market, ComReg continues to cooperate with other National Regulatory Authority's ('NRA's), including closely monitoring developments in other Member States to ensure the development of consistent regulatory practice and consistent implementation of the relevant EC harmonisation measures and relevant aspects of the Common Regulatory Framework.

3.143 For instance, ComReg has had clear regard to international developments in the context of:

- promoting the provision of WBB services;
- considering whether to include the 700 MHz, 1.4 GHz, 2.3 GHz and 2.6 GHz bands in the award process;
- harmonisation developments and equipment availability in relation to the 3.6 GHz and potential candidate bands;
- licence durations for spectrum rights in the 3.6 GHz band; and
- licence fees (and benchmarking in particular).

3.144 Furthermore, ComReg will continue to have regard to international developments during the course of this consultation process.

3.145 In the present case, ComReg considers that the Preferred Option is consistent with the approaches taken by and being considered in other Member States.

Promote the interest of users within the Community

3.146 The impact of the Preferred Option and other options on users from a more general perspective and, in the context of ComReg's objective to promote competition has been considered in the context of the draft RIA and it is not proposed to consider this matter in any further detail here.

3.147 ComReg also observes that the majority of measures set out in Section 12(2)(c)(i) to (vii) of the 2002 Act, aimed at achieving this statutory objective, are more relevant to consumer protection, rather than to the management of the radio frequency spectrum.

Efficient Use and Effective Management of Spectrum

3.148 Under Section 10 of the 2002 Act, it is one of ComReg's functions to manage the radio frequency spectrum in accordance with a Policy Direction under

Section 13 of the 2002 Act. Policy Direction No. 11 of 21 February 2003 requires ComReg to ensure that, in managing spectrum, it takes account of the interests of all users of the radio frequency spectrum (including both commercial and non-commercial users) (see discussion on this policy direction below). Importantly, in pursuing its objective to promote competition under section 12(2)(a), ComReg must also take all reasonable measures to encourage efficient use and ensure effective management of radio frequencies. Section 12(3) of the 2002 Act also requires that measures taken with regard to encouraging the efficient use and ensuring the effective management of radio frequencies must be proportionate.

- 3.149 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.
- 3.150 In relation to the Policy Direction No. 11, the revised draft RIA takes into account the interests of all users of the radio frequency spectrum (and assesses the extent to which such interests are consistent with ComReg's own statutory obligations), both commercial and non-commercial. ComReg is of the view that the Preferred Option identified as a result of the draft RIA is one that would safeguard and promote those interests. In that regard, see also the transition measures discussed in Chapter 7.
- 3.151 In addition, the spectrum assignment process preferred (an auction) should facilitate efficient new entry, and encourage an efficient use of spectrum by those successful in the proposed assignment process. This is because an auction will ensure that, subject to reasonable constraints inherent in the design of an auction e.g. spectrum competition caps, those who value the spectrum the most will win it and, because of these financial incentives, are the most likely to use the spectrum efficiently.
- 3.152 In that light, ComReg is of the view that the Preferred Option complies with the obligations contained in the above statutory provisions. ComReg is also of the view that the alternative spectrum and assignment options considered in the draft RIA would fail to satisfy the above provisions to the same extent, if at all.

Regulatory Principles

- 3.153 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.⁹²

- 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

3.154 ComReg notes that it places importance generally on promoting regulatory predictability and, as illustrated below, has complied with this principle in carrying out the current process.

3.155 In the present context, ComReg considers the following objectives to be of particular importance to achieving the aims of this regulatory principle:

- promoting regulatory predictability in relation to availability of spectrum rights to other users of spectrum by applying an open, transparent, and non-discriminatory approach to spectrum release; and
- promoting regulatory predictability by, to the extent appropriate, taking a consistent approach to the award of spectrum in this award process as that taken in other recent spectrum awards.

3.156 In relation to the first objective, ComReg notes that the Preferred Option ensures that the future assignment of rights of use in the 3.6 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. The alternative of potentially delaying the award of rights of use in this band would not, in ComReg's view, contribute to the promotion of regulatory predictability.

⁹² Some of those principles listed in 16(2) are not listed here because they are either dealt with elsewhere in this chapter or were considered by ComReg as not being relevant to this award process.

- 3.157 In relation to the second objective, ComReg considers that the alternative options 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 lengthy duration of the spectrum rights at issue. Rather, relying on a full market based mechanism (with objective, transparent, non-discriminatory and proportionate rules) to assign rights of use in a large amount of valuable spectrum across a range of bands better promotes regulatory predictability. In that regard, current mobile network operators in Ireland (post MBSA) and further afield are becoming increasingly familiar with competitive auction processes and the use of such processes should contribute to regulatory predictability. With respect to other potential award participants, such as existing FWA licensees, who may not have previous auction experience, ComReg notes that it is putting in place safeguards to assist their participation and reduce award complexity (See Chapter 5).
- 3.158 In addition, ComReg considers that the Preferred Option - which, amongst other things, facilitates potentially significant variations in demand characteristics through regional licensing and would incorporate appropriate spectrum caps informed by this consultation to facilitate advanced WBB service provision while avoiding extreme outcomes - would better minimise the risk of award participants failing to win their desired spectrum assignments for reasons other than competitive tension within the award.
- 3.159 In light of the above, ComReg is of the view that the Preferred Option complies with the regulatory principle of promoting regulatory predictability.

Promoting Efficient Investment and Innovation in New and Enhanced Infrastructures

- 3.160 ComReg considers that the Preferred Option is consistent with the aims of this regulatory principle because it:
- does not restrain the ability of non-FWA ECS/ECN providers from competing and acquiring spectrum rights of use for non-FWA services.
 - has the capacity to facilitate a fully competitive release of the 3.6 GHz band at the earliest possible opportunity. Providing clarity around the availability of this band as soon as possible ensures that winners of rights of use are appropriately incentivised to invest in new and enhanced infrastructures, to deploy new technologies and to provide advanced WBB services to end users, while avoiding the potential costs, uncertainties and inefficiencies associated with a delayed release of such rights; and

- would give participants the scope to bid according to their own valuation of the spectrum rights, based on their own business plans and market and financial positions, and thus to invest efficiently.

Conditions of Competition in Various Geographic Areas

3.161 ComReg observes that the application of this regulatory principle is primarily relevant in the context of (a) the nature and extent of coverage conditions which may be attached to new 3.6 GHz rights of use and (b) existing local area FWA services being provided in the 3.6 GHz band. ComReg has addressed geographic considerations in detail in Chapters 4, 5, 6 and 7 of this document and is of the view that the proposed release of sub-national rights of use, appropriately designed coverage obligations and proposed transition measures would satisfy this regulatory principle.

Relevant Policy Directions and Policy Statements

3.162 ComReg has taken due account of the Spectrum Policy Statement issued by DCENR in September 2010 and its Consultation on Spectrum Policy Priorities issued in July 2014. ComReg notes that the core policy objectives, principles and priorities set out therein are broadly in line with those set out in the 2002 Act and in the Common Regulatory Framework and, in turn, with those followed by ComReg in identifying the Preferred Option.

3.163 Section 12(4) of the 2002 Act requires ComReg, in carrying out its functions, to have regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to it, in relation to the economic and social development of the State. Section 13 of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources (“the Minister”) as he or she considers appropriate to be followed by ComReg in the exercise of its functions.

3.164 ComReg considers below those Policy Directions which are most relevant in this regard (and which have not been considered elsewhere in this chapter).

Policy Direction No.3 of 21 February 2003 on Broadband Electronic Communication Networks

3.165 This Policy Direction provides that:

“ComReg shall, in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government

wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.”

- 3.166 The purpose of this Policy Direction was to ensure that the regulatory framework for electronic communications plays its part in contributing to the achievement of the Government’s objectives regarding the rollout of broadband networks.
- 3.167 ComReg is cognisant of the fact that the three year objective described in this policy direction has now expired. In any case, ComReg is of the view that the Preferred Option is aligned with this Government objective, insofar as it is the option most likely to maximise utilisation of the available radio frequency spectrum for WBB services. For example, it would promote the introduction of advanced WBB services in the 3.6 GHz band at the earliest possible date and it complements other schemes aimed at ensuring the widespread availability of affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis.
- 3.168 In addition, the proposed auction process should result in a greater competitive tension than in the case of an administrative assignment, and it can be expected to positively impact on downstream retail markets in the deployment, or augmented deployment, of enhanced services in terms of bandwidth.
- 3.169 Furthermore, ComReg considers it unlikely that some form of administrative assignment of spectrum in the place of a competitive award procedure would incentivise the roll out of broadband infrastructure by recipients to the same extent as the Preferred Option, if at all.

Policy Direction No.4 of 21 February 2003 on Industry Sustainability

- 3.170 This Policy Direction provides that:

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

- 3.171 The purpose of this policy direction is to ensure that any regulatory decisions take due account of the potential impact on the sustainability of industry players, in particular in light of the business cycle at the time such decisions are taken⁹³.
- 3.172 ComReg observes that this policy direction concerns the sustainability of the industry as a whole rather than just the position of individual players. Notwithstanding, in its draft RIA above, ComReg has considered the impact of its award proposals in the context of all industry stakeholders, including different types of industry stakeholders. ComReg considers that an open auction which facilitates greater participation on a non-discriminatory basis facilitates the sustainability of the industry as a whole.
- 3.173 This Policy Direction is clearly relevant in terms of those costs that industry must bear which are, to some extent, within the control of ComReg, for example, the nature and extent of any minimum prices in the proposed award process and the related issue of the duration of spectrum rights of use. ComReg has regard to this policy direction if devising its proposals in relation to licence duration and minimum prices.

Policy Direction No.11 of 21 February 2003 on the Management of the Radio Frequency Spectrum

- 3.174 This Policy Direction provides that:

“ComReg shall ensure that, in its management of the radio frequency spectrum, it takes account of the interests of all users of the radio frequency spectrum.”

- 3.175 The purpose of this policy direction is to ensure that ComReg achieves an appropriate balance between the interests of various users of the radio frequency spectrum, in particular, the respective interests of commercial and non-commercial users.
- 3.176 In preparing the RIA, ComReg has considered the Preferred Option in light of the interests of various categories of industry stakeholders and consumers.
- 3.177 ComReg is of the view, therefore, that it has complied with this requirement in preparing the RIA and that the Preferred Option is the one that best serves the interests of all users of the radio frequency spectrum and strikes an appropriate balance where those interests may conflict.

⁹³ In the context of this award process, the business cycle for services in the 3.6 GHz band is more than likely entering a new phase where the existing services and technologies are likely to be surpassed by the introduction of advanced services via new technologies (e.g. via LTE) due to the increasing consumer demand for more WBB capacity. Transition measures are proposed in this award process to facilitate the existing licensees in transitioning to these new services and technologies.

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

3.178 ComReg notes that it is required to comply with the guiding principles of objectivity, transparency, non-discrimination and proportionality in carrying out its functions under the 2002 Act and the Common Regulatory Framework. In relation to the current process, ComReg considers that these principles are most relevant in terms of its functions concerning spectrum use and management, attaching conditions to rights of use and the setting of licence fees.

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

- Regulation 11(2) of the Authorisation Regulations requires that ComReg grants rights of use for radio frequencies on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate; and
- the regulatory principle set out in Regulation 16(2) of the Framework Regulations requires ComReg in pursuing its objectives to apply objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things, ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services.

3.180 ComReg notes that the above guiding principles are Irish and EU law principles that ComReg abides by generally in carrying out its day to day regulatory functions.

3.181 ComReg is of the view, having regard to the applicable legislation and legal principles, its draft RIAs and other analyses, its expert advice and reports, and the material to which it has had regard, that its Preferred Option is objectively justified, transparent, proportionate and non-discriminatory.

Chapter 4

4 Key Aspects of the Proposed Award Spectrum

4.1 Introduction

- 4.1 In accordance with Regulation 9(2) of the Authorisation Regulations, ComReg proposes to grant individual rights of use for radio frequencies under the proposed award process as this is necessary to, amongst other things:
- avoid harmful interference;
 - ensure technical quality of service; and
 - safeguard the efficient use of the spectrum proposed for inclusion in the award process.
- 4.2 This chapter discusses and addresses submissions received relating to the key aspects of the rights of use to be awarded under the proposed award process, in particular:
- the proposed band plan and frequency arrangement for the 3.6 GHz band;
 - the proposed geographic scope of rights of use to be released in this award process; and
 - the proposed duration of the rights of use to be released in this award process.
- 4.3 While the above issues will ultimately influence the licence conditions attached to the rights of use to be awarded (discussed in Chapter 6 below), they are discussed here as they are prerequisites to the discussion of the award type and format which follows in Chapter 5.

4.2 3.6 GHz Band plan

- 4.4 In Section 4.1 of Document 15/70, ComReg sets out its proposal for the band plan and frequency arrangements to be used for the assignment of rights of use in the 3.6 GHz band. This proposal is in line with and is intended to implement the 3.6 GHz EC Decision. The two principal issues discussed in Document 15/70 of relevance to the design of the band plan were as follows:

- State Services and guard bands; and
 - the duplex arrangement to be used for the band.
- 4.5 For ease of reference and taking the above two issues in turn, ComReg summarises its preliminary view as outlined in Section 4.1 of Document 15/70. ComReg then considers the additional information available to it, including the recommendations of its independent economic and technical advisors, and the relevant responses received to that consultation and sets out its preliminary conclusions on these matters.

4.2.1 State Services and guard bands

Summary of ComReg's view in Document 15/70

- 4.6 In Documents 14/101 and 15/70, ComReg noted that a portion of the band (3435 – 3475 MHz) is in use by the State for its own purposes (the “State Services”) and that these services are expected to continue beyond the anticipated timeframe of the proposed award process.
- 4.7 ComReg also noted the requirement for a guard band from 3400 – 3410 MHz. ComReg further noted that the existing band plan for the FWALA licensing scheme, as detailed in ComReg Document 06/17R7, has a 10 MHz guard band from 3400 - 3410 MHz, and that this guard band is identified in the ComReg Radio Frequency Plan for Ireland (Document 13/118R), as the upper limit for airborne radars. ComReg also noted that this guard band is likely to be required going forward and should therefore be incorporated into the 3.6 GHz band plan.
- 4.8 Notwithstanding this, ComReg noted it would keep the above issues under review in line with its objective of encouraging the efficient use of spectrum.

Views of respondents

- 4.9 Two respondents made submissions in relation to the operation of State Services in the 3.6GHz band.
- 4.10 Viatel expressed the view that it would like to see ComReg questioning further the effective usage of the State Services in the band.
- 4.11 Eircom noted that part of the band 3435 – 3475 MHz is currently in use for unspecified State Services and that ComReg is considering the interference scenarios between State Services and adjacent users. Eircom further considered that it would be beneficial to release the whole band for award and

requests ComReg to undertake a cost benefit analysis of the continued State use of this band.

- 4.12 Eircom welcomed ComReg's intentions to conduct interference modelling to understand the coexistence situation between State Services and adjacent users.

ComReg's assessment

- 4.13 First, ComReg is now in a position to clarify that the State Services in the 3.6 GHz band relates to airborne communications systems in the frequencies 3435 – 3475 MHz consisting of microwave links from aircraft to fixed and mobile receiving stations located around Ireland. The operation of these airborne transmissions are generally transitory in nature.
- 4.14 ComReg commissioned Plum to carry out a detailed adjacent channel co-existence study, which modelled potentially critical interference scenarios between potential mobile/fixed communications networks (MFCN) and existing State Services in the 3.6 GHz band.⁹⁴ The Plum study concluded that co-existence is possible in most scenarios for both the restricted and permissive block edge masks ("BEMs").⁹⁵ The study also recommended that in the unlikely event of interference from State Services into MFCN base station receivers, additional filtering at the MFCN base station would be a potential solution to mitigate such issues. ComReg notes that co-existence between State Services and current FWA operators in the 3.6 GHz band occurs in practice under the current licensing scheme⁹⁶.
- 4.15 In relation to the suggestions that ComReg review the continued use of the State Services in the 3.6 GHz band, ComReg considers that the following points to be particularly relevant:
- Excluding the spectrum currently used by State Services, there remains a sizeable amount of spectrum available in the band and that the release of 350 MHz of internationally harmonised spectrum in a single award is unprecedented in Ireland;

⁹⁴ MFCN modelling parameters are based on the 2014 3.6 GHz EC Decision 2014/276/EU and ECC Report 203, while the State Services modelling parameters are based on confidential data provided by the responsible state body.

⁹⁵ As this report contains confidential data relating to the operation of the State Services, ComReg is not in a position to publish this report; however the main outcomes are set out above.

⁹⁶ ComReg notes the current scheme has been in operation for roughly 12 years.

- The proposed release of 350MHz of spectrum in the proposed award process would result in an increase of circa 86% in the total amount of harmonised spectrum available in Ireland for fixed, nomadic and mobile wireless broadband services.⁹⁷ This means that there is ample spectrum already being made available even excluding portion of the 3.6 GHz band used by State Services; and
 - Noting the expiry of existing 3.6 GHz licences on 31 July 2017 and, further, that a majority of respondents to Document 15/70 expressed a strong desire to obtain further certainty in relation to the future of the 3.6 GHz band as soon as possible in advance of licence expiry⁹⁸, ComReg observes that revisiting the use of the 3.6 GHz band by State Services at this point in time, including the conduct of a detailed cost/benefit analysis, would likely lead to a significant delay in the release of the 3.6 GHz band.
- 4.16 In light of the above factors, ComReg remains of the view that the 40 MHz of spectrum assigned to State Services should not be considered for release as part of the current proposed award process. ComReg will, however, continue to keep State Services use under review.

4.2.2 Duplex arrangement

Summary of ComReg's view in Document 15/70

- 4.17 ComReg noted that the 3.6 GHz EC Decision requires the implementation of a TDD band plan in the upper part of the band (i.e. 3600 - 3800 MHz) and, as such, observed that it does not have any discretion in this regard.
- 4.18 Therefore, the matter considered by ComReg in Document 15/70 related to the duplex arrangement for the lower part of the 3.6 GHz band i.e. 3400 – 3600 MHz.
- 4.19 In that regard, ComReg noted that the 3.6 GHz EC Decision identifies a preference for TDD in this sub-band but also permits the implementation of an FDD arrangement for specific purposes.⁹⁹

⁹⁷ 405 MHz has been released post the MBSA award.

⁹⁸ Further noting that this was one of the reasons for ComReg subsequently taking forward the 3.6 GHz band separately from the multi-band award originally proposed in Document 14/101.

⁹⁹ The following three specific purposes are listed in the Annex to the 3.6 GHz EC Decision:

- a) ensuring greater efficiency of spectrum use, such as when sharing with existing rights of use during a co-existence period or implementing market-based spectrum management; or

4.20 ComReg stated that, on balance, TDD would be the optimum configuration for the sub band 3400 – 3600 MHz, as it would be in the interests of the various stakeholder groups and would best meet ComReg’s statutory functions, objectives and duties having regard to, among other things:

- the responses received to Document 14/101;
- the importance of harmonisation;
- the strong view for TDD expressed by industry;
- that operators are generally dependent on industry in determining the equipment they use; and
- that flexibility in allowing both FDD and TDD in the band would create technical inefficiencies with respect to the requirements for guard bands and, on the basis that uplink traffic is expected to be much lower than the downlink traffic, the uplink spectrum may consequently be inefficiently utilised.

Views of respondents

4.21 Twelve respondents made direct or indirect comments on this issue¹⁰⁰. All twelve respondents generally supported ComReg’s preliminary view that the band should be awarded using a TDD configuration, in line with the duplex mode of operation preferred in the 3.6 GHz EC Decision. Of those who provided reasons for their support, the main reasons given were as follows:

- the TDD duplex configuration aligns with the preference expressed in the 3.6 GHz EC Decision (Eircom, Viatel and Imagine). This will ensure that users in the band in Ireland will benefit from a rich equipment ecosystem that should evolve from the widespread exploitation of this spectrum on a harmonised basis (Eircom);
- this plan was widely supported in the responses to ComReg document 14/101 and it seems that most interested users would want to use the band in TDD mode only. This means it represents the most efficient duplex arrangement (3IHL);

-
- b) protecting existing uses or avoiding interference; or
 - c) coordination with non-EU countries.

¹⁰⁰ Being: 3IHL, Aptus, Digital Forge, Eurona (indirect), Eircom, FWA 4 (indirect), Imagine, Premier BB, Rapid BB (indirect), Ripplecom, Viatel and Vodafone.

- there are many advantages to TDD and with synchronisation great frequency efficiencies can be achieved (Aptus); and
 - a TDD duplex arrangement gives most flexibility in breaking up the band (Vodafone).
- 4.22 However, one respondent (Viatel), while agreeing that the band should be released in line with the preference expressed in the 3.6 GHz EC Decision, considers that it may be appropriate to keep a portion of the band available for FDD or TDD. In this regard, Viatel states that the 3.6 GHz EC Decision allows Member States to alternatively implement FDD in certain cases. In particular, the case of protecting existing uses (i.e. (Case B in Table 6 of the Annex to the 3.6 GHz EC Decision) may be relevant due to the widespread existing use of FDD in the band and Viatel notes that one respondent to Document 14/101 (permaNET) expressed interest in FDD.
- 4.23 Viatel references the recent Slovakian 3.6 GHz band auction where this flexibility was afforded to bidders. Viatel suggests that, in the Irish context, the portion of the band 3410 – 3435 MHz paired with 3510 – 3535 MHz could be used for FDD. Viatel further expresses the view that there is sufficient spectrum available in the band to afford this flexibility, acknowledging that this flexibility does mean that some spectrum must be sacrificed for guard bands.

ComReg's assessment and preliminary conclusion

- 4.24 ComReg firstly observes that all the submissions (with a variant proposed by Viatel) received on this issue in response Document 15/70 are in agreement that TDD is the appropriate duplex configuration for the sub band 3400 – 3600 MHz.
- 4.25 ComReg also observes that the reasons provided by respondents generally accord with those identified by ComReg in Section 4.1.4 of Document 15/70.
- 4.26 In relation to Viatel's submissions regarding flexibility being afforded to allow FDD use in a portion of the 3400 – 3600 MHz sub-band, ComReg notes that the two principle reasons given for this view are that, firstly, another operator (permaNET) had expressed an interest for an FDD configuration in response to Document 14/101¹⁰¹ and, secondly, that FDD use is widespread in the band currently.

¹⁰¹ However, ComReg observes that the Joint operator response to Document 15/70 in which permaNET is a party, is in support of the TDD mode of operation.

- 4.27 In relation to the first reason, it is important to note that the FDD frequency arrangement proposed by permaNET in response to Document 14/101 does not align with the FDD frequency arrangement identified in the 3.6 GHz EC Decision. In particular, this proposal was to divide up the band so that an operator could acquire an asymmetric FDD spectrum holding to account for the trend towards an asymmetry in data traffic¹⁰². In any case, ComReg notes that the TDD configuration, by design, can account for traffic asymmetry.
- 4.28 In relation to the second reason, all existing rights of use in the parts of the 3.6 GHz band being made available under the proposed award process expire on 31 July 2017 and the matter for consideration is the most appropriate duplex arrangement for new rights of use.
- 4.29 ComReg understands, however, that there may be a need for operators who acquire new rights of use to migrate from their existing operations (currently provided on an FDD basis) to their new operations¹⁰³. ComReg addresses this issue in the context of transitional arrangements in Chapter 7 of this document.
- 4.30 Viatel also references the recent Slovakian 3.5 GHz award which allowed for flexibility in determining the band plan. ComReg notes DotEcon's comments in this regard. DotEcon observes that "*allowing for a flexible band plan (where the auction determines whether spectrum uses a TDD or FDD mode of operation) would unavoidably introduce significant complexity to the auction, not just for implementation of the auction, but also for bidders in understanding the mechanics of the auction. A number of respondents have called for a process that is less complex than the MBSA award, whilst many (if not all) of the incumbent FWALA operators have little or no experience with spectrum auctions. Therefore, it is undesirable to introduce additional complexity to the process unless there is a clear benefit in doing so.*"
- 4.31 In light of the above and having considered the following:
- its assessment in Section 4.1.4 of Document 15/70;
 - the overwhelming support expressed by respondents for a TDD configuration and the reasons for same;

¹⁰² The FDD frequency arrangement in the 3.6 GHz EC Decision is a paired frequency with an equal assignment of spectrum in the uplink and the downlink, with a duplex spacing of 100MHz.

¹⁰³ Subject to the results of the award ComReg understands that operators may need to transition to new spectrum locations and/or to new equipment

- the lack of persuasive reasoning provided in support of an FDD configuration for a portion the 3400 – 3600 MHz sub-band;
- the recommendations of its independent economic and technical advisors; and
- the significant additional undesirable complexity that a flexible band plan would entail,

ComReg has formed the preliminary conclusion that the entire 3.6 GHz band should be released in a TDD configuration as per Figure 1 below.

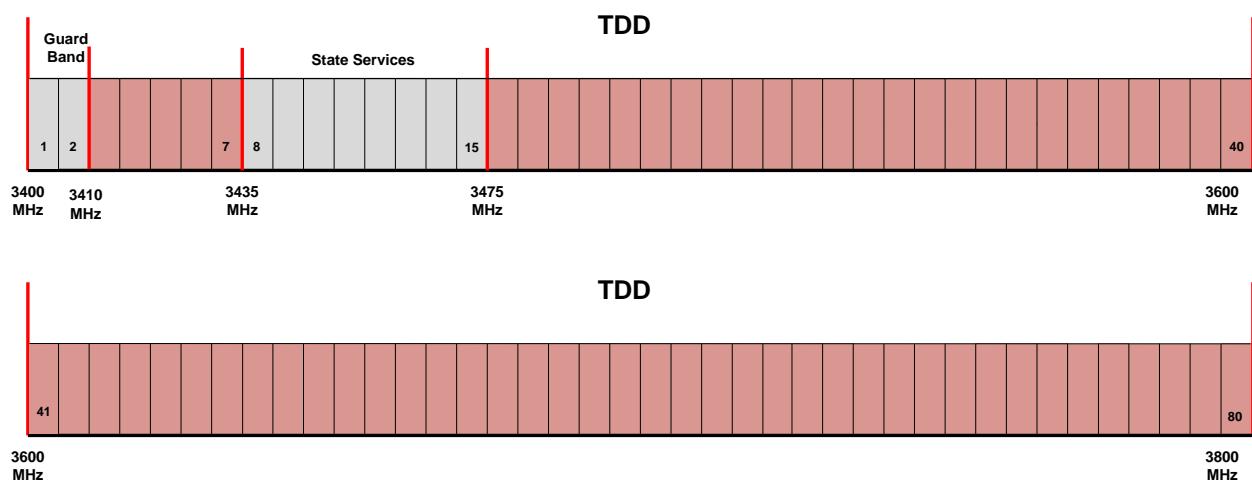


Figure 1. Proposed TDD band plan

4.3 National / Regional Licences

4.3.1 Summary of ComReg's view in Document 15/70

4.32 In Section 4.2.2 of Document 15/70, ComReg discussed the potential for facilitating national and regional licences in the 3.6 GHz band. As part of this discussion, ComReg considered a number of issues, including the justification for national / regional licences, the appropriate number of regional areas, how to define region boundaries and the other principles upon which the regions should be established.

4.33 Following this discussion, ComReg came to the preliminary view that:

- regional areas should be established and that it is appropriate to define both urban and rural regions to take account of the potentially different uses in these areas; and
 - the main urban areas should be the five main cities and suburbs (Dublin, Cork, Limerick, Galway and Waterford) and the boundaries for these should be established using their respective CSO boundaries.
- 4.34 In defining the regional boundaries and, in particular the larger more rural regional areas, ComReg proposed that it should be guided by the following five objective principles:
1. there should a small number of regions (i.e. between circa five to nine regions) including the major cities to provide a balance between allowing bidders flexibility to obtain licences in an appropriately-sized area and limiting auction complexity;
 2. established boundaries should be used for the identification of borders between regions e.g. County boundaries and/or County council boundaries;
 3. the instances of tri-lateral agreements occurring between operators at boundaries between regions should be minimised;
 4. the instances where a city region is adjacent to two other regions should, as far as practicable, be eliminated; and
 5. by extension, the potential for each regional operator to acquire both a city and surrounding rural region should be facilitated.
- 4.35 These objective principles were devised by ComReg having regard to its statutory functions, objectives and duties in respect of the management of the radio frequency spectrum.
- 4.36 ComReg then considered two regional options: Option 1 – being the Joint FWA proposal put forward in response to Document 14/101 and Option 2 - being a variant of Option 1 following suitable modifications to take into account the above objective principles.
- 4.37 ComReg formed the preliminary view that Option 2 should be used to identify the appropriate regions for the proposed award process and also indicated its intention to make available the band plan in Figure 2 in all the regional areas of Option 2
- 4.38 For ease of reference, these two options are shown below.

Option 1 – Joint FWA Proposal

4.39 The Joint FWA Proposal consists of the following five regions:

- Borders: Including Counties Donegal, Leitrim, Cavan, Monaghan and Louth;
- Connaught: less county Leitrim and the CSO boundary for Galway City and Suburbs;
- Leinster: less county Dublin and county Louth;
- Munster: less the CSO boundary for Limerick City and Suburbs and Cork City and Suburbs; and
- Dublin County.

4.40 To aid understanding by interested parties, ComReg mapped Option 1 against county council boundaries and combined the boundaries into regions. This can be seen in Figure 3 below.

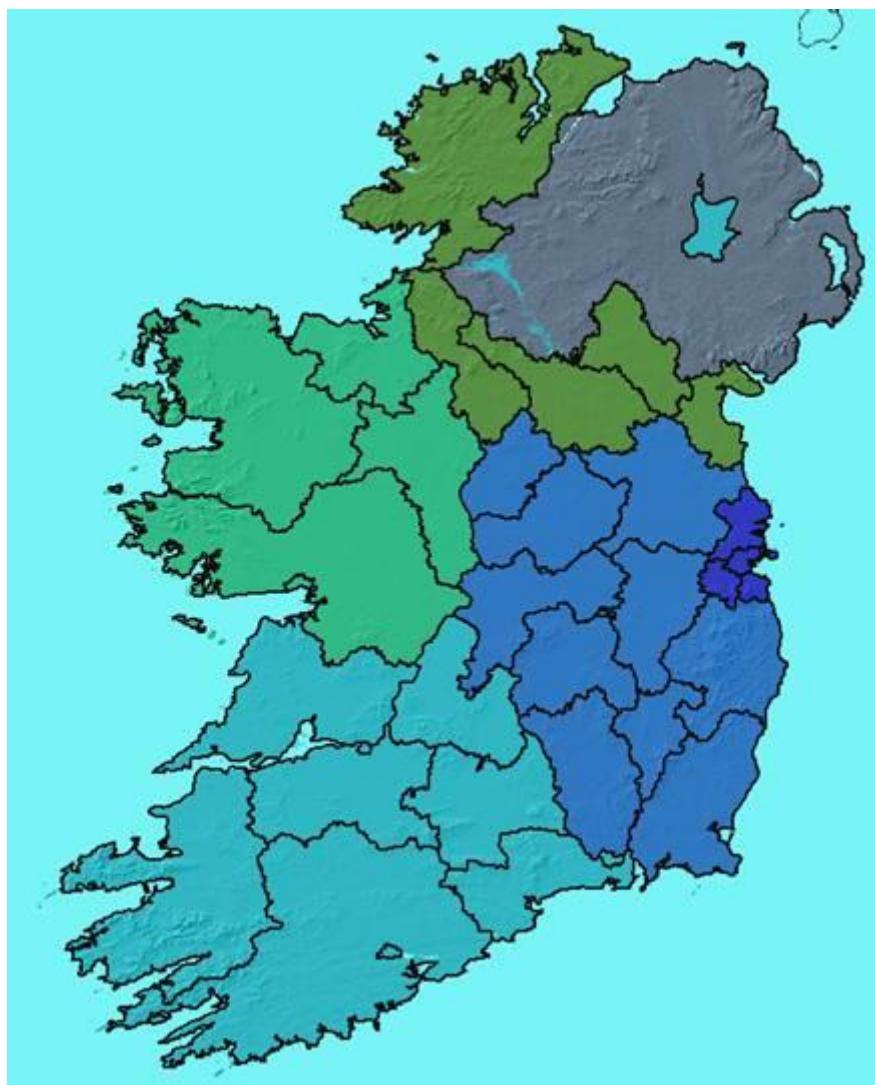


Figure 2. Regional proposal for Option 1 in Document 15/70

Option 2 – ComReg variation of Joint FWA Proposal

4.41 Option 2 consists of the following nine regions:

- **North West:** Counties Donegal, Leitrim, Sligo, Mayo, Roscommon and Galway excluding the Galway CSO City and Suburb region;
- **North East:** Counties Cavan, Monaghan, Louth, Longford, Westmeath, Meath, Offaly, Laois, Kildare, Wicklow and Dublin excluding Dublin CSO City and Suburb region;
- **South East:** Counties Kilkenny, Carlow, Wexford, the legal boundary of South Tipperary and Waterford, excluding Waterford City and Suburbs;

- **South West:** Counties, Clare, Limerick excluding Limerick CSO City and Suburbs, Kerry and Cork excluding Cork CSO city and Suburbs and the legal boundary for North Tipperary;
 - **Dublin CSO boundary for City and Suburbs;**
 - **Cork CSO boundary for City and Suburbs;**
 - **Limerick CSO boundary for City and Suburbs;**
 - **Galway CSO boundary for City and Suburbs;** and
 - **Waterford CSO boundary for City and Suburbs.**
- 4.42 ComReg mapped Option 2 against county council boundaries and combined the boundaries into regions, which can be seen in Figure 3 below. It will be noted that the CSO boundaries for the cities are larger than their respective legal boundaries.

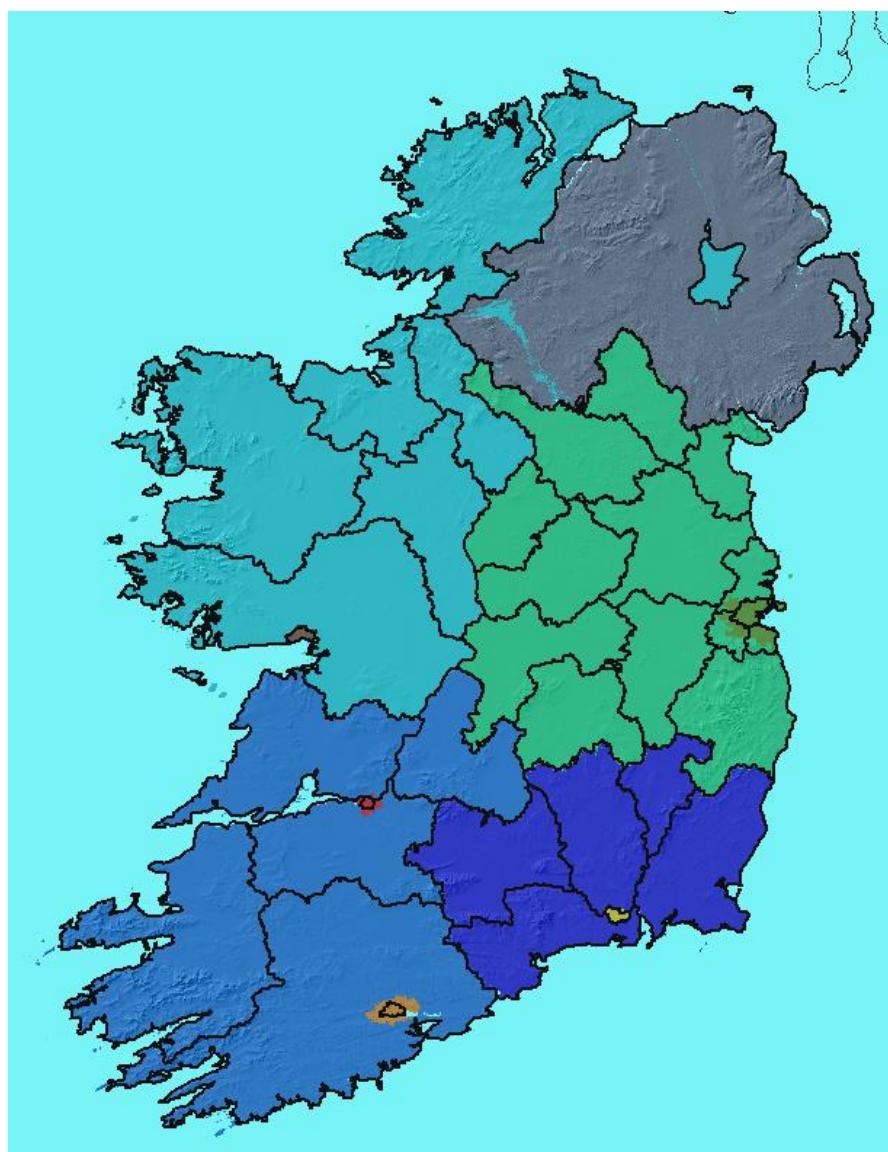


Figure 3. Regional proposal for Option 2 in Document 15/70

4.3.2 Views of respondents and ComReg's assessment

4.43 19 respondents addressed this matter either directly or indirectly¹⁰⁴. Twelve respondents provided general support for the regional proposals established

¹⁰⁴ Being from: 3IHL, Airwave, Aptus, BBnet, Digital Forge, Eircom, Eurona, Imagine, FWA 4, FWA 16, KerNET, Munster Wireless, Net1, Premier BB, Rapid Broadband, Real Broadband, Ripplecom, Viatel and Vodafone.

based on the principles identified and, with the exception of Imagine¹⁰⁵, eleven¹⁰⁶ agreed with the regional areas as detailed in Option 2.

4.44 Reasons put forward by the 12 respondents¹⁰⁷ who expressed support for Option 2 included:

- that the five cities should be defined as separate regions, which recognises the potential for different uses in the urban regions from that in the rural regions (3IHL, Eircom, Vodafone and Imagine);
- CSO boundaries should be used to define the cities rather than the political boundaries, as this is more reflective of actual population densities, which is the most important factor in determining the type of service to be provided (3IHL);
- Eircom agrees with ComReg that “*In considering the number of regional areas to be awarded ... there is a balance to be struck between allowing bidders flexibility to obtain spectrum licences in an appropriately sized geographic area, and the complexity of the auction mechanism.*”;
- Eircom agrees that the number of and the design of regions should be such to minimise the complexity of coordination between users at the borders; and
- Net1 Ltd agrees that the regions should be established in line with the principles identified by ComReg as this would allow a single operator or group of operators to achieve a significant administrative and financial mass to provide real competitive services in rural areas.

4.45 Five respondents did not favour Option 2, while some others qualified their support for Option 2 by suggesting variations or identifying other matters to be further considered by ComReg. The main concerns and alternative proposals can be summarised as follows:

- a concern that the regions are too large for smaller operators;
- a proposal that the five cities should form one lot in the award;

¹⁰⁵ It is noted that Imagine only support regional licence areas in its type “B” licence proposed.

¹⁰⁶ 3IHL, Aptus, BBNet, Eircom, Eurona, FWA 4, KerNet, Net1, Premier BB, Ripplecom and Viatel

¹⁰⁷ 3IHL, Aptus, BBNet, Eircom, Eurona, Imagine, FWA 4, KerNet, Net1, Premier BB, Ripplecom and Viatel

- a concern that high sites in one region should be available for use to provide services in any adjacent region; and
 - a proposal that the regional areas identified for ComReg's award process should align with the competition lots of the NBP.
- 4.46 In the following section, ComReg first summarises and then assesses each of the concerns / proposals in turn.

4.3.3 ComReg's assessment

Concern that the Option 2 regions are too large for smaller operators

Views of respondents

- 4.47 Reasons provided by respondents¹⁰⁸ expressing concern that the Option 2 regions are too large for smaller operators included that:
- any existing FWA operator would find it difficult / impractical to deploy to the whole regional area (Airwave, Rapid BB);
 - there is a lot of interest from operators to obtain spectrum in smaller areas in line with their current area rather than the whole province (Real BB); and
 - the size of the area and the proposed pricing structure would put smaller operators out of contention (Digital Forge).
- 4.48 Some of these respondents also proposed alternatives or ways of making the larger areas more acceptable to them, including:
- a) a mechanism of sub-letting 3.6 GHz spectrum rights to allow smaller operators to acquire the necessary spectrum rights from larger regional operators (Airwave, Real BB);
 - b) making the regions smaller to facilitate smaller players acquiring spectrum in their local area (Digital forge, Real BB);
 - c) allowing multiple FWA operators to bid together as part of a consortia for the larger regional areas (Rapid BB); or
 - d) reducing the proposed licence fees [of the regional areas] (Digital Forge).

¹⁰⁸ Airwave, Digital Forge, Munster Wireless, Rapid BB, Real BB

ComReg's assessment

- 4.49 In respect of (a) above, ComReg sets out its position on the issue of spectrum leasing in Chapter 6.
- 4.50 In respect of (b) above, in paragraphs 4.68 through to 4.73 of Document 15/70 ComReg discussed the matter of the appropriate number of regional areas for the award. Among other things, ComReg observed that there was a balance to be struck between allowing bidders flexibility to obtain spectrum licences in an appropriately sized geographic area, and the complexity of the auction mechanism. This was considered to be a guiding principle in establishing the regional areas for the proposed award.
- 4.51 If local area regions are identified to be of a similar size to those of the existing smaller operators, as many as 50 or more regional areas would need to be established. This large number of regional areas would have a significant impact on the complexity of the auction. DotEcon at paragraph 29 of Document 15/140a makes a number of additional observations which further militates against increasing the number of regional areas.
- 4.52 DotEcon also notes that a number of respondents have highlighted either their inexperience with auction processes or their desire for the process to be made simpler. Therefore any modification to the process that would increase auction complexity such as an increase in the number of regional areas would need to demonstrate sufficient benefit to be justifiable, which has not, in ComReg's view, been shown here.
- 4.53 In addition, ComReg notes that if a large number of regional areas are established there would be many more situations where inter-operator agreements would be needed. Increasing the number of regional border areas has the potential effect of increasing the network density and ultimately the cost of network deployment for operators in meeting their licence conditions¹⁰⁹.
- 4.54 In summary, increasing the number of regions to more closely mirror the existing situation would add considerable complexity to the award and to successful bidders. In ComReg's view, respondents have not provided sufficient objective justification for such an approach.
- 4.55 In respect of (c) above, ComReg notes that consortia bidding would be permitted in the proposed award and encouraged to allow smaller operators to come together to acquire spectrum rights in a regional or national area. Further details

¹⁰⁹ Plum in Document 15/73 detail mitigation measures that an operator may choose to deploy in proximity to regional boundaries, including reducing EIRP levels of base stations.

of the rules relating to consortia bidding will be set out in a draft Information Memorandum (IM) which is the next publication due to be published in relation to the 3.6GHz award.

- 4.56 Alternatively, smaller operators could engage in leasing arrangements with larger regional operators. This is discussed further in Chapter 6.
- 4.57 In respect of (d) above, ComReg sets out its proposed approach to fees for rights of use to be awarded under the proposed award process in Chapter 5. However, ComReg would point out that Digital Forge's proposal would raise significant issues in terms of compliance with ComReg's statutory obligations. In particular, Regulation 19 of the Authorisation Regulations requires that spectrum fees must reflect the need to ensure the optimal use of the radio spectrum and must also be objectively justified, transparent, non-discriminatory and proportionate. Given the aim of Digital Forge's proposal to spectrum fees is simply to benefit smaller operators in acquiring spectrum rights, this would clearly not accord with ComReg's obligations under Regulation 19 and is therefore not considered further in this paper.
- 4.58 In summary, and in relation to the concerns raised by respondents as outlined above, ComReg observes that a number of options are available to smaller operators seeking to obtain rights of use of spectrum in a smaller area more suited to their particular circumstances, including:
 - forming a consortium to acquire spectrum rights in a region in the proposed award¹¹⁰; and
 - acquiring spectrum rights for their specific local area/s by way of transfer or leasing following the proposed award.
- 4.59 ComReg also notes that it is proposing transitional arrangements that may assist operators (in the short to medium term) in adapting to the proposed regional structure and establishing longer term agreements with other operators.
- 4.60 Considering the above, ComReg remains of the view that having between 5 and 9 regions is appropriate in terms of striking the right balance between allowing bidders flexibility to obtain spectrum licences in an appropriately-sized area and limiting auction complexity.

¹¹⁰ A conceivable variant of this is that smaller operators could establish an infrastructure provider and wholesale access agreements could then be arranged.

Proposal that the five cities should form one lot in the award**View of respondent**

- 4.61 One respondent (3IHL) suggested that the cities could form one lot in the award process because it would reduce the regional areas from nine to five, thereby reducing auction complexity, and, in 3IHL's view, any bidder that is interested in obtaining spectrum rights for an urban service would want to cover all five cities rather than just one.

ComReg's assessment

- 4.62 Whilst 3IHL's proposal could reduce auction complexity, it would, however, be inconsistent with ComReg's fifth principle for establishing regional boundaries, being to facilitate the potential for each regional operator to acquire both a city and surrounding rural region. In ComReg's view, regional bidders should be given the opportunity to compete for a single city region adjacent to a desired region without having to bid for all five city regions if they do not wish to. Otherwise, this could effectively preclude most, or all, regional bidders from competing for city regions.
- 4.63 Further, DotEcon, in considering this proposal, observes that there is no material advantage in combining the cities into a single region and that doing so could, in fact, disadvantage some bidders and have a detrimental impact on the efficiency of the award. DotEcon notes that a CCA award format allows for package bidding and, by keeping the cities in separate regions, offers flexibility for bidders to express their demand for individual or any combination of the five cities and suburbs without aggregation risks. Accordingly, DotEcon recommends that the cities are kept as separate regions and bidders be allowed to choose their preferred combination.
- 4.64 In light of the above, ComReg considers that the benefits to facilitating flexibility in the award process through having separate city regions would outweigh any additional complexities that might be caused by this approach.

Concern that high sites in one region should be available for use to provide services in adjacent region**Views of respondents**

- 4.65 Three respondents (FWA 4, KerNet, Viatel) expressed a concern that, under Option 2, there are high sites in one region that could be used to provide services in an adjacent region. For example, a transmission site in an urban

region which has extensive coverage in a rural region or where a site in a rural region can be used to provide coverage in an urban region¹¹¹.

4.66 These respondents also proposed potential solutions to their concerns including:

- in respect of the transmission from rural into urban regions, a proposal that these urban regions could be defined in a similar way to the licence areas in the existing FWALA scheme, by specifying a radius which would include these high rural sites (Viatel); and
- that sub-leasing of spectrum be made obligatory provided that the requesting operator can demonstrate to ComReg's satisfaction that their frequency plan does not impact on the requested operator (FWA 4 and KerNet).

4.67 Viatel also identified a specific issue of a transmission site (Rossmore Hill) in one rural region used by it to provide service in an adjacent rural region (the South East region which contains Carlow Town). Viatel proposes that the whole of county Laois is included in the South East region to address this issue and considers that this adjustment should not entail any great imbalance between regions. Viatel further submits that licence conditions should allow sub-leasing on specific sets of electoral divisions in order to resolve any further issues which may arise from the use of county boundaries.

ComReg's assessment

4.68 At paragraph 4.77 of Document 15/70, ComReg observed that using established boundaries would probably afford the best opportunity to unambiguously define the border of a regional area. ComReg further observed that:

- established boundaries have clear definitions and are widely understood by all, for example by operators and consumers alike; and
- statistics (such as population, population densities, households, demographics etc.) are measured for these established boundaries and are independently reported.¹¹² They can, therefore, provide a useful input to operators in the development of business plans (including for the

¹¹¹ For example, Three Rock outside Dublin City CSO boundary and Woodcock Hill outside Limerick City CSO boundary.

¹¹² By various bodies notably the Central Statistics Office.

purposes of determining an appropriate valuation of any transfer or lease of 3.6 GHz rights¹¹³). Furthermore they can be used as an appropriate measure for generating spectrum usage fees/ reserve pricing.

- 4.69 In this context, ComReg considers that accounting for the local topography would be disproportionate and inefficient. For example, every known, or possible, high site would need to be identified and somehow evaluated in a 3.6 GHz scenario as to whether it would be useful to provide a certain service for an adjacent area. There are clear information asymmetries in this regard.
- 4.70 Instead, ComReg considers that the leasing of 3.6 GHz spectrum rights would be a more appropriate mechanism by which to resolve this issue¹¹⁴ because operators are best placed to identify any specific issues that are worth addressing and such matters can be resolved on a case by case basis as required by each regional operator. Leasing and licence conditions generally are discussed in Chapter 6.

Proposal that the regional areas identified for ComReg's award process should align with the Lots of the NBP

Views of respondents

- 4.71 Three respondents suggested that the regional areas for the award should align with the Department of Communication Energy and Natural Resources (“DCENR”) NBP Lots. Some of the statements by these three respondents on this matter were as follows:

- *“It is of clear importance that the definition of Regions outside of the main urban conurbations should align completely with those Regions envisaged to be created under the NBP. To not align these Regions is inefficient and will give rise to avoidable complexity as one ‘region’ overlaps another. There is no clearly articulated logic for the formulation of regions that do not align with those of the NBP and many obvious reasons why it is highly preferable that they are aligned. We strongly urge ComReg to liaise with DCENR and agree a common approach to these regions”. (Imagine)*

¹¹³ ComReg notes that Viatel eludes to this point in its response, referencing metrics for town or District Electoral Divisions.

¹¹⁴ And the specific issue raised by Viatel.

- “Dividing the country into Regions is a reasonable approach. The design of the split must align with the regional split used in National Broadband Plan.” (Vodafone); and
- “The region model (option 2) proposed by ComReg with the principles identified by ComReg is appropriate. We would strongly recommend that ComReg shares [this] region map with DCENR so they can correlate NBP lots with these region boundaries.” (Ripplecom)

ComReg’s assessment

- 4.72 Firstly, ComReg notes that at the time of publication of Document 15/70 (10 July 2015), the DCENR had yet to publish its Broadband Intervention Strategy, including its proposals relating to the lots for the NBP.
- 4.73 Secondly, it is important to note that ComReg is, under Irish and EU law, the independent national regulator responsible for, among other things, the management of the radio frequency spectrum. Accordingly, it must be guided by its own statutory functions, objectives and duties in the design of its spectrum award proposals (including those relating to the geographic dimension of spectrum rights of use).
- 4.74 In that connection, ComReg has different objectives to those of the DCENR under the NBP.¹¹⁵ For example, in setting the regions ComReg is primarily driven by the promotion of competition through ensuring the efficient use of radio spectrum. This is reflected in the objective principles that ComReg has developed and applied in designing an appropriate approach to regions. However, ComReg notes that the DCENR, in designing its lot structure, may be guided by factors materially different to those of ComReg and, in particular, is not motivated by spectrum efficiency considerations.
- 4.75 In that context and in light of submissions received, ComReg has considered the potential merits of aligning the proposed 3.6 GHz regions for the award with the NBP lots and observes:
- a potential tenderer for the NBP may wish to use 3.6 GHz spectrum rights as part of its tender for the NBP contract;
 - if the regional areas of the 3.6 GHz band and the NBP are not compatible, and a regional operator wishes to tender for the NBP only in one NBP lot, it

¹¹⁵ A summary of ComReg’s statutory powers, functions and duties in respect of the management of the radio frequency spectrum is set out in Annex 2 of this document.

may need to obtain spectrum rights of use in multiple regions, including counties that it may not require to provide its envisaged service. Hence spectrum in certain counties may be inefficiently used; and

- It could give rise to additional complexity for bidders for 3.6 GHz rights that wish to tender for the NBP where one region overlaps potentially multiple others.
- 4.76 In the context of the NBP consultation process, ComReg was made aware of the DCENR's revised thinking on its NBP lots and ComReg notes that the DCENR has now finalised its NBP lots as outlined in its publication of 22 December 2015.
- 4.77 In light of this new information, ComReg has considered whether Option 2 as set out in Document 15/70 could be adjusted to allow ComReg's regions to be compatible with the NBP lots and, importantly, be consistent with the objective principles identified in Document 15/70.
- 4.78 In that regard, ComReg observes that a change to two of the Option 2 regions would enable compatibility between the NBP lots and the 3.6 GHz regions. Specifically, the counties of Louth, Cavan, Monaghan, Longford Westmeath, Offaly and Laois could be moved from being part of the North East region to being part of the North West region.
- 4.79 ComReg has considered this potential modification against its objective principles, and observes *inter alia*, that such a modification would:
- be in line with the first principle, because there would be no change in the number of regions, i.e. there would still be nine regions in total;
 - be in line with the second principle, because the boundaries would continue to use established boundaries, i.e. county / county council boundaries;
 - be in line with the third principle, because there would be no material change in the instances of potential trilateral agreements being required;
 - be in line with the fourth principle, because there would be no change to the instances where a city region is adjacent to two other regions; and
 - be in line with the fifth principle, because there would be no change to regions that would limit a regional operator from acquiring a city and its surrounding rural regional area.

- 4.80 Accordingly, ComReg considers that the potential modification to the Option 2 regions as described above would be in line with the principles identified for establishing the 3.6 GHz regional areas.
- 4.81 In light of this and also having regard to (a) the potential benefits arising from the alignment of ComReg's rural 3.6 GHz regions with the NBP lots and (b) that the possibility for modifying the 3.6 GHz regions subsequent to the proposed award is remote, ComReg therefore proposes that the regional boundaries of its 3.6 GHz award would be adjusted to facilitate alignment with the lots of the NBP.

ComReg's revised proposal on regional areas for its proposed 3.6 GHz band award

- 4.82 ComReg's revised proposal consists of the following 9 regional areas:
- **Borders, Midlands and West** : Counties Donegal, Leitrim, Sligo, Mayo, Roscommon, Cavan, Monaghan, Louth, Longford, Westmeath, Offaly, Laois, Galway excluding the Galway CSO City and Suburb region;
 - **East**: Counties, Meath, Kildare, Wicklow and Dublin excluding Dublin CSO City and Suburb region;
 - **South East**: Counties Kilkenny, Carlow, Wexford, the legal boundary of South Tipperary and Waterford, excluding Waterford City and Suburbs;
 - **South West**: Counties, Clare, Limerick excluding Limerick CSO City and Suburbs, Kerry and Cork excluding Cork CSO city and Suburbs and the legal boundary for North Tipperary;
 - **Dublin CSO boundary for City and Suburbs**;
 - **Cork CSO boundary for City and Suburbs**;
 - **Limerick CSO boundary for City and Suburbs**;
 - **Galway CSO boundary for City and Suburbs**; and
 - **Waterford CSO boundary for City and Suburbs**.

- 4.83 ComReg has mapped the revised regional boundaries against county council boundaries¹¹⁶ and combined the boundaries into regions. This can be seen in Figure 4 below. It will be noted that the CSO boundaries for the cities are larger than their respective legal boundaries as illustrated in Annex 5 of Document 15/70.

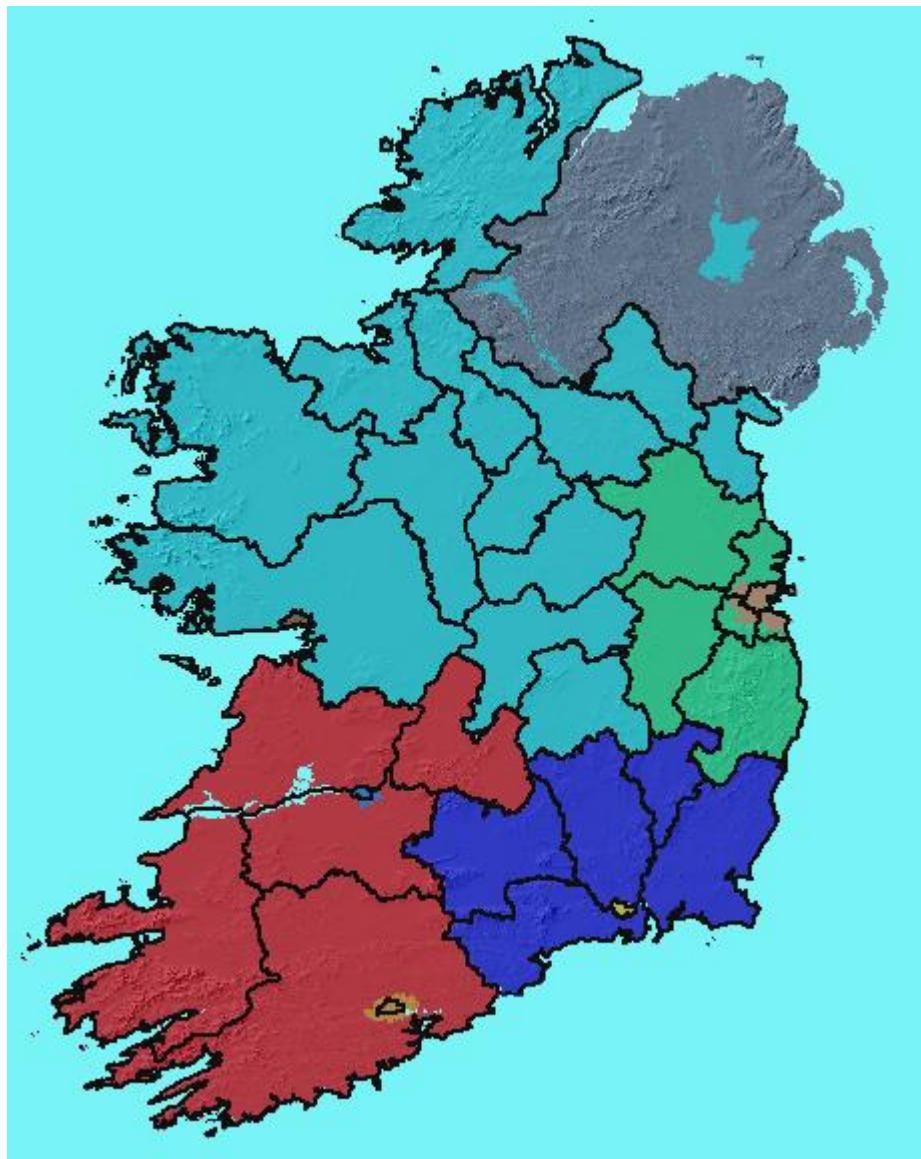


Figure 4. Revised Regional proposal

¹¹⁶ The boundary files are taken from the CSO Census 2011 boundary file data set and reflect the county council boundaries at that point in time.

4.3.4 ComReg's view on regional areas

4.84 Having considered the submissions received in response to Document 15/70 and other material before it, ComReg has formed the preliminary conclusion that the regions identified above are appropriate.

4.4 Licence duration

4.4.1 ComReg's view in Document 15/70

4.85 In Sections 4.3 and 4.4 of Document 15/70, ComReg set out its proposals on the duration for rights of use in the 3.6 GHz band that would be assigned on foot of the proposed award process.

4.86 In doing so, ComReg considered submissions by respondents to Document 14/101 regarding the following three matters:

- whether rights of use awarded under the proposed award process should be of finite or infinite duration;
- if rights of use are to be of finite duration, what would be the appropriate duration for such rights of use, having regard to the nature of the spectrum involved and ComReg's obligations under the regulatory framework; and
- in considering the latter, whether it is desirable that rights of use should co-terminate with other rights of use, be they existing or future rights of use.

4.87 Based on its analysis, ComReg formed the preliminary view that new 3.6 GHz rights:

- should be of finite duration;
- should be for a duration of somewhere between 15 and 20 years; and
- need not co-terminate with spectrum rights of use awarded under the MBSA process.

4.88 Further, and in light of the additional issues discussed at paragraphs 4.143 to 4.145 of Document 15/70, ComReg came to the preliminary view that a duration of 15 years would be appropriate.

4.4.2 Views of respondents and ComReg's assessment

4.89 ComReg received 17¹¹⁷ responses on this issue. For ease of reference, the views expressed can be grouped into the following four categories of proposals:

1. that licences be of indefinite duration¹¹⁸;
2. that licences can be extended beyond licence expiry;¹¹⁹
3. that licences should not co-terminate with those of the MBSA award¹²⁰; and
4. that licences be of an alternative finite duration to that proposed by ComReg¹²¹.

4.90 Additionally, some respondents raised the issue of when ComReg should commence consultation in the future with regard to the expiry the new 3.6GHz rights of use.¹²²

4.91 In the following section, ComReg firstly summarises the responses on each of the above categories and provides its assessment on each in turn.

Proposals for indefinite licences

Views of respondents

4.92 Two respondents (3IHL and Eircom) stated that indefinite licences are preferable in their view.

4.93 Two respondents (3IHL and FWA 4) contend that, for a period of time (between 5-7 years) prior to licence expiry, there is little incentive for operators to invest in their networks. 3IHL suggests that this period of “zero investment incentive” would not occur if ComReg was to issue licence rights of use of indefinite duration. The FWA 4 submission, while not explicitly advocating indefinite licences, suggests that, irrespective of licence duration, its perceived lack of

¹¹⁷ 3IHL, Eircom, Net1, Premier BB, Viatel, Carnsore BB, Aptus, BBNet, Imagine, KerNet, Ripplecom, Vodafone, Airwave, Digital Forge, Eurona, FWA 4 and Real BB,

¹¹⁸ 3IHL and Eircom

¹¹⁹ From 3 respondents, Eurona, FWA 4 and Viatel.

¹²⁰ Eircom

¹²¹ From 14 respondents, excluding Viatel, Premier BB and Net1

¹²² From 7 respondents, Airwave, FWA 4, Real BB, Digital Forge, Carnsore BB, Eurona, Premier BB

investment towards the end of licence duration would persist and that this is apparent in lack of investment in FWA.

ComReg's assessment

4.94 In Section 4.4.3 of Document 14/101 and in Document 15/70, ComReg set out its general position regarding indefinite licences. In summary, ComReg favours licences of finite duration because, among other things, this approach:

- promotes competition, spectrum efficiency and the internal market;
- is wholly compatible with the Common Regulatory Framework (see Annex 2 in this regard);
- once sufficiently long, allows licence holders sufficient time to obtain a return on investment in line with the expected life-cycle of the technology deployed;
- provides a sufficiently flexible approach to address future co-ordinated approaches that may be taken to particular spectrum bands at an EU-wide level;
- ensures that there are no long-term barriers to releasing bands in line with international harmonisation measures, which is particularly important where international harmonisation is necessary to introduce new and innovative services to a spectrum band¹²³; and
- ensures that the desired change in line with international harmonisation can be brought about without perverse incentives emerging for incumbent firms to hold out strategically with a view to gaining more rents.

4.95 ComReg also noted that adopting a consistent approach in this regard across similar award processes contributes to regulatory certainty. Therefore, ComReg's preliminary view was that new 3.6 GHz rights of use should be of finite duration.

4.96 As noted at paragraph 4.125 of Document 15/70, ComReg has considered and consistently addressed the issue of indefinite licences on many occasions in the past.¹²⁴ ComReg notes that the reason suggested for licences of indefinite duration or a variant thereof are in the same vein as previously put forward by

¹²³ ComReg notes that the 3.6 GHz band is a notable example where international harmonisation measures has changed the attractiveness of this band considering the potential for substantial economies of scale to be achieved.

¹²⁴ See, for example, Section 3.4.2 of Document 11/88, Section 4.3 of Document 11/89, Section 4.4.6 of Document 12/25 and, more recently, Section 4.4 of Document 14/101.

some operators and have been considered by ComReg in developing its current position on licences of indefinite duration. Notwithstanding, ComReg again considers the issue raised by respondents below.

4.97 Considering the above, ComReg favours spectrum licences of finite duration as it facilitates the periodic coordination and potential realignment of the most important bands as and when required while at the same time reducing the potential for licensees to resist changes in the coordination of such bands for strategic reasons. Such strategic behaviour could have serious consequences for consumer welfare, for example in terms of delays to the deployment of new services. As also noted in previous ComReg documents¹²⁵ and for the reasons set out therein, ComReg considers the arguments regarding diminished incentives for investment to be overstated and do not accord with the likely economic incentives of incumbent operators. In this regard, ComReg refers to Section 3.4.2 of Document 11/88¹²⁶ where it observed the following:

- *“reducing investment may actually encourage outside firms to enter on the basis that the incumbent firms appear to believe that their substantial advantages of incumbency are not sufficient to allow them to outbid their likely competitors in an auction;*
- *moreover, incumbent firms are competing with each other on the retail market and any loss in network quality (arising from non-investment) could translate to worse outcomes on the retail market. Hence, they will be strongly motivated to maintain their network quality or risk losing valuable customers (and customer groups that value network quality highly);*
- *these factors may explain the considerable network investment by incumbent 900 MHz licensees in recent times. Indeed, and notwithstanding claims that such investment was made on the assumption that licences would be renewed or otherwise extended to prevent widespread disruption to consumers, ComReg notes NERA’s view that empirical evidence for decreasing investment in mobile networks as licence expiry approaches is ambiguous;*

¹²⁵ See, for example, paragraph 4.94 of Document 12/25.

¹²⁶ Response to consultation - Review of the Period 2008 – 2010 & Proposed Strategy for Managing the Radio Spectrum: 2011 – 2013.

- *with indefinite licences there would not be the same incentive to fear new entry and hence investment rates would likely fall, once a stable market equilibrium emerges*¹²⁷; and
- *in relation to the view regarding the potential for spectrum to lie idle, ComReg notes that this can be addressed by considering, and where appropriate, consulting on decisions in relation to the future use of spectrum bands with fixed term licences significantly in advance of expiry of same.”*

- 4.98 ComReg has no reason to believe that the above observations are any less applicable to the proposed award process.
- 4.99 In relation to the claim that a lack of incentive to invest is evidenced by the lack of investment in FWA, ComReg notes that any lack of investment in FWA networks in recent years is likely to be attributable to a range of factors. Most importantly, the provision of broadband services in Ireland has, in recent years, moved rapidly towards higher bandwidth services¹²⁸ in which consumers are less likely to be satisfied with the broadband speeds currently provided by many licensed FWA operators. There has also been increased competition in the broadband sector in recent years (from both fixed and mobile operators) with those providing slower, less reliable services being most likely to lose out¹²⁹. In that context, it is conceivable that some FWALA licensees have chosen not to invest¹³⁰, particularly where the scope of existing licences¹³¹ are largely unsuitable for the provision of the types of broadband services now being

¹²⁷ It was also noted in a footnote added here that “*Trading would not undermine this market situation as in the most valuable bands trading (or even leasing) would likely not occur. ComReg is currently of the view that, absent a distress sale, within a market trading may well not occur for strategic reasons. Even if a firm has valuable spectrum that it is currently not using intensively it may well choose to maintain this position in order to be able to react to growth in demand etc. that it had not previously predicted. Selling such spectrum to a rival is a probably irreversible decision that the seller may come to regret later. Similar concerns also surround leasing to a rival even if there comes a time when the spectrum reverts to the original licence holder*”.

¹²⁸“Broadband providers in Ireland do offer connection speeds of 24Mb to 240Mb with some even claiming speeds of 120Mb and 1000Mb via super-fast fibre connections but these are an exception to the rule”.<https://switcher.ie/broadband/guides/broadband-speeds-in-ireland/>

¹²⁹ <http://www.parksassociates.com/blog/article/pr-11302015-needforspeed>

¹³⁰ However, ComReg notes that investment did occur by some operators over the last 5 year period. ComReg Document 10/29 reported that there were 163 licences issued to 16 operators in the 3.6 GHz band. ComReg further notes that there are 208 licences (November 2015) issued to 14 operators currently in the band, a circa 27% increase in licences since 2010.

¹³¹ Including, localised licensing (i.e. 20km circles) and associated interference zones (10km radius for each operator), no guarantee of contiguous spectrum assignments and relatively small bandwidths available (from 10-50MHz) in any one licence.

demanded by Irish end-users. In addition, the risk of a lack of investment, if it exists, would be far less likely when approaching the expiry of rights of use assigned under the proposed award process, which is designed (e.g. by making available large amounts of contiguous spectrum on a regional/national basis) to facilitate the roll-out of, among other things, high speed wireless broadband services. Accordingly, ComReg does not consider this to be persuasive in the context of supporting the notion of licences of indefinite duration.¹³²

4.100 In light of the above and in the absence of any evidence to the contrary, ComReg remains of the view that new 3.6 GHz rights of use should be of finite duration.

Proposals for licences to be extended for a further period after licence expiry

4.101 ComReg notes that this proposal would involve ComReg making an upfront decision to, in certain circumstances, extend licences beyond licence expiry for a certain duration. There are therefore obvious similarities between this proposal and a proposal to simply award licences of longer duration than that proposed by ComReg. Notwithstanding, ComReg has considered this issue separately.

Views of respondents

4.102 Three respondents proposed that licences should be extended beyond the initial licence term of 15 or 20 years for a further 5 or 10 years. The views expressed by those respondents include the following:

- the licence period should be extended for a further 10 years (after an initial 15 or 20 years), subject to performance conditions, as this would enable stakeholders to undertake future directions, investment plans and preparations for any technology upgrading or business changes (Eurona);
- to provide for business continuity and ongoing network investments there has to be an option for the regulator to extend licenses beyond the proposed 15 or 20 years (FWA 4 submission); and
- ComReg should incorporate a 5 years extension post the initial licence term on the basis that there is no material requirement to reclaim the spectrum (Viatel).

¹³² ComReg also refers to paragraphs 7.38 to 7.40 of Document 15/131(Draft Radio Spectrum Management Strategy 2016 to 2018)

ComReg's assessment

4.103 By way of background, ComReg recalls that:

- the Common Regulatory Framework provides that in determining the appropriate duration of rights of use, regard shall be had to the network or service concerned in view of the objective pursued and taking due account of the need to allow for an appropriate period for investment amortisation¹³³; and
- amendments to the rights (such as licence duration), conditions and procedures for rights of use for radio frequencies may only be made in objectively justified cases and in a proportionate manner¹³⁴.

4.104 First, ComReg observes that the proposals received appear to be driven by the desire to have more certainty when making investment decisions for the period beyond licence expiry.

4.105 Second, ComReg notes that, at this point in time, it is simply not possible to assess the necessity for such a regulatory intervention so far into the future. ComReg also notes that even those parties pursuing such a course of action are ambiguous as to what the future use and investment would be in such an extended period. Accordingly, making a decision now rather than closer to licence expiry regarding whether to grant such a licence extension would neither be an objectively justified or proportionate response to this perceived concern.

4.106 Furthermore, in relation to the suggestion that a licence should be renewed based on performance conditions, ComReg firstly observes that this respondent does not specify what constitutes an appropriate set of performance conditions. ComReg further observes that attempting to establish performance conditions now for a spectrum band that can be used for any ECS including, but not limited to wireless broadband, including on a fixed, mobile or nomadic basis raises clear practical and substantive difficulties, such as in terms of trying to identify appropriate performance conditions for the range of possible uses that could be made with new 3.6 GHz rights and, further, on such terms that would remain appropriate so far into the future (15 to 20 years as suggested by this respondent).

4.107 In light of the above, ComReg considers that periodic predetermined re-release of spectrum is the most appropriate mechanism for the release of new 3.6 GHz

¹³³ Regulation 9(6) of the Authorisation Regulations.

¹³⁴ Regulation 15(1) of the Authorisation Regulations.

spectrum rights. For the avoidance of doubt, there would not be any implied or express right of renewal, extension or any other form of prolongation.¹³⁵

Co-termination

Views of respondents

4.108 ComReg received one response (from Eircom) on the matter of co-termination of spectrum rights of use in the 3.6 GHz band with those of the MBSA.

4.109 Eircom notes that, even with a finite licence duration, practical considerations must be taken into account such as the temporal separation between the termination of the licences for the 3.6 GHz award and that of the MBSA award. Assuming a licence commencement date of April 2016, Eircom observes that a licence expiry of (presumably) April 2031 would be too close to that of the MBSA (July 2030) and could, in its view, prove disruptive.

ComReg's assessment

4.110 In response, ComReg first observes that Eircom's argument is based on an incorrect commencement date for licences under the proposed award process. Given that existing 3.6 GHz FWALA licences are due to expire on 31 July 2017, ComReg notes that new 3.6 GHz licences that would be granted on foot of the proposed award process would commence no earlier than 1 August 2017. Hence, with a 15 year licence duration as currently proposed, new licences would expire on 31 July 2032, being a full two years after the expiry of the rights of use awarded in the MBSA process, rather than 9 months assumed by Eircom.

4.111 ComReg notes that given the bands awarded in the MBSA (800 MHz, 900 MHz and 1800 MHz) are significantly lower in frequency than the 3.6 GHz band, and in the main can be regarded as coverage bands, they are not likely to be substitutable with 3.6 GHz band.

4.112 In light of the above, ComReg has no reason to believe that a temporal separation of two years would raise the concerns noted by Eircom above to the same extent, if at all.

4.113 ComReg observes however that if circumstances were to change over time in relation to operators' perception of the substitutability of this band with other

¹³⁵ This is without prejudice to ComReg's statutory powers such as those provided for under regulation 15 of the Authorisation Regulations.

bands, ComReg could potentially introduce appropriate award mechanisms to address such circumstances closer to licence expiry.

Licence duration

Views of respondents

4.114 ComReg received 17 responses on this issue. Three respondents supported a licence duration of 15 years and the remaining 14 suggested that a longer licence duration of 20 years is more appropriate.

4.115 Of the three respondents that considered a licence duration of 15 years to be appropriate (Net 1 Ltd, Premier BB and Viatel), Net1 noted that a 15 year licence duration would make "*it economically viable for an operator to achieve a return on investment and provide enough time for finances to be raised to upgrade equipment to second or third generation of FWA equipment to provide enhanced services to customers*".

4.116 The reasons expressed by the respondents that favoured a longer licence duration of 20 years can be summarised as follows:

- the asset life is not the important determinant, rather the period over which the investment in the asset is recovered economically (Eircom);
- ComReg is effectively saying that it does not hold any confidence in market mechanisms determining the most efficient use of spectrum (Eircom);
- ComReg has not presented sufficient justification for its licence duration proposal of 15 years and the proposal is arbitrary in nature (Eircom);
- if ComReg is to be consistent with its own reasoning then the duration of 3.6 GHz licences should be in the range of 7 to 10 years (Eircom);
- a longer licence duration of 20 years is necessary because migration from existing and unlicensed networks will take time and that it would not be practical or affordable to do so immediately (Airwave);
- licences need to be longer to ensure investment certainty, including by reference to DotEcon where it comments that "*spectrum use typically*

requires long-term, large-scale investments" (Digital Forge, Eurona, FWA 4, BBNet and KerNet);

- the licence duration should align with the contract term of the NBP (which at the time of consultation response submissions was 20 years duration) (3IHL, Aptus, BBnet, Imagine, KerNet, Ripplecom and Vodafone)¹³⁶.

4.117 In relation to the NBP, further comments / reasons were provided including that:

- some service providers may plan to use 3.6 GHz spectrum for fixed wireless access as part of the NBP and a 20 year licence term would seem to be compatible given the envisaged commitments (3IHL);
- if the licence duration of the 3.6 GHz band and the NBP term are not synchronised then this would actively discriminate against FWA in an NBP Tender process and lead to other difficulties, including concerns regarding compliance with State Aid Guidelines and mandated EU procurement processes (Imagine); and
- having a licence duration less than the NBP contract duration could effectively prevent the 3.6 GHz band from being used as part of any NBP tender submission. (Ripplecom)

ComReg's assessment

4.118 For ease of reference, those submissions above which propose the alignment of the licence duration with the proposed NBP contract duration are addressed further below. All other submissions are considered first.

4.119 ComReg, in establishing a licence duration, is guided by the Common Regulatory Framework which requires that where spectrum rights of use are granted for a limited period of time, the duration is to be appropriate for the service concerned in view of the objective pursued taking due account of the need to allow for an appropriate period for investment amortisation.

4.120 In setting a licence duration ComReg:

- has regard to the particular facts and circumstances of the licences concerned (such as in terms of service and networks) in view of the objective pursued;

¹³⁶ The DCENR proposed a 20 year contract term for the NBP in its July 2015 publication.

- takes due account of the need to allow for an appropriate period for investment amortisation;
- in relation to the above two factors, including by reference to relevant international practice and experience¹³⁷;
- consults with interested parties; and
- takes due account of ComReg's statutory functions objectives and duties generally.

4.121 In terms of understanding the nature of the services concerned in view of the objective pursued, as discussed earlier in this document, ComReg is proposing to release the band in accordance with the 3.6 GHz EC Decision. This decision requires that Member States release the band in a manner suitable for the deployment of fixed, nomadic and mobile electronic communications networks mainly targeting the provision of wireless broadband services to end users. In this regard and as a further consideration in relation to allowing a sufficient period of investment amortisation, ComReg observes that the asset lives of the equipment used in the deployment of networks, in its Mobile Termination Rate consultations¹³⁸ and draft model, ComReg noted that an asset life of 8 years is used for the vast majority of the mobile elements. Given that mobile and fixed deployments in the 3.6 GHz band appear to be moving towards the use of similar underlying technologies, ComReg observes that this asset life could be equally applicable to future fixed and nomadic deployments in the band.

4.122 In relation to Eircom's comments that:

- The physical asset life is not the important determinant in determining the licence duration but rather the period over which the investment in the asset is recovered; and
- ComReg is in effect saying it has no faith in market mechanisms by selecting a licence duration towards the lower end of the 15-20 year range,

ComReg believes that Eircom has misunderstood its views.

4.123 In relation to the first point, Document 15/70 does not (as suggested by Eircom) equate the life of an asset as equivalent to the period over which the investment

¹³⁷ Noting section 12(5) of the 2002 Act.

¹³⁸ See ComReg 15/19a – Table 22.

in the asset can be recovered. Instead ComReg outlined that the asset life, in this case 8 years, is a factor that suggests that a duration at the lower end of 15-20 years would be appropriate. If the licence duration is shorter than the life of a ‘stranded asset’, operators cannot recover their investment and earn a return. Therefore it is reasonable for ComReg to consider the likely asset life in determining the appropriate duration of a licence. The licence duration should, in ComReg’s view, also recognise the different investment profiles that different bidders may face when contemplating network rollout and earning a return. Eircom has not presented any evidence to suggest that the licence duration of 15 years is too low or too high in terms of a rights holder earning a reasonable return on its investment.

4.124 In relation to the second point, a market mechanism provides an efficient outcome to the extent that the user who values the spectrum the most is assigned that spectrum.¹³⁹ Any decision to assign spectrum can only be made based on the information available to both the regulator and potential bidders. As described in Chapter 3 and the RIA, ComReg considers that a market mechanism is best placed to determine the most efficient outcome by allowing potential users to reveal information about their willingness to pay, expressed in the form of binding bids. Notwithstanding, the assignment of spectrum can only be made at a point in time and the extent of innovation and the evolution of technology is such that it will likely require assignment to alternative uses or users at some point in the future. ComReg notes that the longer the licence duration the greater the risk that alternative users will not be able to access suitable spectrum when alternative uses are possible as technology develops.

4.125 Bearing in mind the above, ComReg observes that a 15 year duration should be appropriate in the context of the provision of fixed wireless services because, in addition to the above and among other things:

- a duration of 15 years would be more than double the duration provided under the existing FWALA scheme;
- ComReg’s roll-out proposals for new 3.6 GHz spectrum rights have been developed having particular regard to existing levels of base station deployment in the 3.6 GHz band (see Chapter 6 for further details);
- in that connection, ComReg notes for existing FWA providers obtaining new 3.6 GHz rights some costs, such as site establishment costs for existing

¹³⁹ See Chapter 3.

sites, have already been incurred and may not, therefore, be required to be incurred in the context of new 3.6 GHz rights at all or the same extent; and

- this duration is supported by a FWA respondent who has considered the duration in the context of achieving a return on investment.

4.126 ComReg also notes that its proposal is supported by relevant international practice and experience.

4.127 First, ComReg observes that other Member States are proposing or have recently carried out awards of 3.6 GHz spectrum. These awards, similarly, are carried out in accordance with the 3.6 GHz EC Decision which emphasises the use of the 3.6 GHz band for the provision of wireless broadband services to end-users. The durations for spectrum rights of use granted under these award processes has ranged from between 7 years and 15 years. For example, in Poland licences are of 7 years duration, Belgium, Romania and Slovakia have chosen 10 years and the Czech Republic has chosen 15 years. ComReg notes that its proposal of 15 years duration is at the upper end of this range.

4.128 Second, ComReg further observes that a number of proposed or recently completed awards of spectrum rights by Member States in bands other than 3.6 GHz – which are likely to require long term large scale investments - have been on the basis of 15 years. For example, Germany recently awarded rights of use for 15 years duration in core mobile bands (700 MHz, 900 MHz, 1800 MHz and 1.5 GHz bands) and ComReg observes that such rights of use in such bands normally entail large scale national investment. Equally, spectrum in similar bands in Ireland have been successfully released for the same duration.

4.129 In relation to the suggestion that a duration of 20 years would be more appropriate given the need to migrate existing services, ComReg firstly clearly recognises that some time will be required to facilitate an orderly transition to the outcome of the award process. ComReg further notes that it is proposing steps to promote a timely transition to the new licensing scheme, including, as appropriate, the commencement of transition activities in advance of 31 July 2017 and applying liquidated damages to operators that fail to meet their obligations under the proposed transition plan. In addition, in light of the fact that a 15 year duration is at the higher end of the range for durations of 3.6 GHz rights adopted by other Member States, ComReg considers that a 15 year period would be sufficient for both the timely completion of transition activities and for investment amortisation.

4.130 In relation to Eircom's suggestion that ComReg's proposal for a 15 year licence duration is arbitrary in nature, ComReg considers that there is sufficient

justification, including as set out in Document 15/70 and herein to justify a licence duration of 15 years. In addition, ComReg has consulted in Document 14/101¹⁴⁰ and Document 15/70 on the appropriate licence duration and notes that respondents to same, including Eircom, have not provided any persuasive evidence as to why a longer duration would be necessary or appropriate.

4.131 In light of the above, ComReg is of the view that the proposed licence duration of 15 years is:

- in line with its statutory objectives generally;
- an appropriate duration to allow sufficient time for investment amortisation, having regard to the nature of the services/networks concerned;
- at the upper end of the range for licence durations in other Member States in the 3.6 GHz band;
- in line with awards in other spectrum bands that require significant scale and investment (and potentially considerably more so); and
- sufficiently long to take into account transition arrangements.

4.132 In relation to those submissions which raised the alignment of the licence duration with the proposed NBP contract duration, ComReg considers those submissions below.

ComReg's assessment of responses in relation to aligning licence duration of the 3.6 GHz band with the contract duration of the NBP

4.133 A number of respondents suggested that the licence duration for rights of use to be awarded in the 3.6 GHz band should align with the NBP contract duration. Reasons provided in this regard included that:

- some service providers may plan to use the 3.6 GHz spectrum for fixed wireless access as part of the NBP and a 20 year licence term would seem to be compatible given the envisaged commitments (3IHL);
- if the licence duration of the 3.6 GHz band and the NBP term are not synchronised then this would actively discriminate against FWA in an NBP Tender process and lead to other difficulties, including concerns regarding

¹⁴⁰ It is noted that in this consultation a licence duration was proposed in the range 15 to 20 years for the 3.6 GHz, 2.6 GHz, 2.3 GHz, 1.4GHz and 700 MHz bands.

compliance with State Aid Guidelines and mandated EU procurement processes; and

- having a licence duration less than the NBP contract duration could effectively prevent the 3.6 GHz band from being used as part of any NBP tender submission.

4.134 ComReg is grateful for the views of respondent on this issue and welcomes the opportunity to provide clarity on same.

4.135 By way of background, ComReg recalls that:

- all of its award proposals are required to comply with its statutory objectives and duties; and
- in the context of determining an appropriate duration for spectrum rights used for ECS, the Common Regulatory Framework requires, in particular, that where spectrum rights of use are granted for a limited period of time, the duration is to be appropriate for the service concerned in view of the objective pursued taking due account of the need to allow for an appropriate period for investment amortisation.

4.136 ComReg also observes that the DCENR has very recently identified a 25 year contract term for the NBP¹⁴¹.

4.137 Having carefully considered the submissions provided by respondents, ComReg does not believe it would be appropriate for it to adopt a 25 year duration for all new 3.6 GHz rights now, on the basis of the available information and having regard to ComReg's statutory functions, objectives and duties.

4.138 First, ComReg does not believe that the available information before it would objectively justify the approach submitted by respondents. ComReg observes in that regard:

- the NBP project has just commenced its formal procurement stage and has expressly done so on a technology-neutral basis;
- no decisions have been made as to what type of infrastructure will be used to meet the obligations under the NBP contract/s, be it fixed line, wireless or a combination of both;

¹⁴¹ DCENR's NBP Irelands Broadband intervention Strategy – 22 December 2015

- in the event that wireless features in the successful NBP delivery infrastructure/s, there is no certainty, at this stage, as to what spectrum bands will be used by the winning tenderer/s; and
- further, if 3.6 GHz rights or other spectrum rights were to feature in the successful NBP delivery infrastructure/s, it is conceivable that such rights would constitute only part of the relevant spectrum band and, further, that such rights would only need to be used at certain geographic locations for NBP purposes.

4.139 Indeed, in light of the above factors it would not appear either objectively justified or proportionate to extend the proposed 15 year duration to 25 years for (a) the entirety of the 3.6 GHz band and/or (b) for all geographic areas. For instance, it is highly questionable whether a prolongation of all 3.6 GHz rights in dense urban areas which will not feature in the NBP intervention areas would be an objectively justified and proportionate measure to address the issues raised by respondents.

4.140 In addition, and in the context of the above-stated requirements of the Common Regulatory Framework, ComReg:

- observes that the DCENR's determination of 25 years for the NBP may well be informed by factors materially different to those which ComReg is obliged to follow;
- refers to the reasons and other material provided by ComReg above in the context of its 15 year duration proposal; and
- further observes that a 25 year duration would be 2.5 times the average duration of rights in the 3.6 GHz band in other Member States¹⁴² and over 3 times the duration of existing 3.6 GHz licences (i.e. 7 years).

4.141 Furthermore, ComReg notes that practical issues of precise alignment of commencement dates do not appear to have been considered or addressed by respondents' proposals. In particular, whilst the proposed NBP contract term is currently identified as being 25 years, ComReg understands that the precise commencement date of the successful NBP tenders would only be confirmed at the end of the NBP tender stage.

¹⁴² In Poland 3.6 GHz licences are of 7 years duration, Belgium, Romania and Slovakia have chosen 10 years and the Czech Republic has chosen 15 years

4.142 Therefore, for the reasons outlined above, ComReg does not consider it appropriate, in the context of its statutory functions, objectives and duties, to adopt a 25 year duration for all new 3.6 GHz rights of use in light of the NBP.

4.143 In relation to the suggestions that a duration for 3.6 GHz rights of use of less than the NBP contract term “would actively discriminate against FWA” or “could effectively prevent 3.6 GHz rights from being used as part of any NBP tender submission”, ComReg observes that NBP procurement matters are entirely within the remit of the DCENR and not a matter for ComReg.

4.144 For its part as spectrum manager, ComReg would highlight the following:

- ComReg is proposing a 15 year duration for 3.6 GHz rights on the basis of its statutory functions, objectives and duties;
- the duration of spectrum rights in other harmonised frequency bands which may also feature in the NBP procurement process (e.g. 800 MHz, 900 MHz, 1800 MHz and/or 2.1 GHz), have also been determined by ComReg on the basis of its statutory functions, objectives and duties;
- spectrum rights in these other harmonised frequency bands are also of a duration less than the 25 year term identified by the DCENR for the NBP¹⁴³; and
- given the above, and in the context of ensuring that its spectrum award proposals should be neutral vis-v-vis potential participation in the NBP process by all holders of spectrum rights, ComReg considers that spectrum assignment measures that would have the effect of favouring FWA and/or FWA service providers could amount to unauthorised State aid (in addition to raising concerns under ComReg’s spectrum management functions, objectives and duties).

4.145 Finally, to the extent that 3.6 GHz spectrum rights, or indeed any other spectrum rights, did feature in the successful NBP delivery platform/s, then ComReg would make the following observations.

4.146 First, ComReg recognises that, in such circumstances, there could arise a “gap” between the duration of such rights of use and the expiry of the relevant NBP contract to which those rights of use related.

¹⁴³ ComReg notes:

- all of the liberalised 800 MHz, 900 MHz and 1800 MHz rights of use issued by ComReg on foot of its MBSA process in 2012 are due to expire on 12 July 2030; and
- 2.1 GHz spectrum rights are due to expire in 2022 (Vodafone and Three Ireland) and 2027 (Meteor).

4.147 However, the precise particulars of this “gap” (such as in terms of the geographic areas in which those rights of use were actually deployed for NBP-related purposes and the quantum of spectrum used for same) and the appropriate regulatory measure/s (if any) would need to be determined much closer towards the expiry of such rights of use. In that context, ComReg observes that much could affect the extent to which such spectrum rights that may be used in the short-term for the delivery of the NBP would still be required beyond the expiry of those rights. For instance, alternative spectrum rights could be available to the successful NBP tenderer/s, and the NBP services could be delivered via alternative technologies (e.g. fixed line) etc.

4.148 Furthermore, ComReg observes that such matters, if they were to arise, would be more appropriately considered in the process of consultation that ComReg routinely undertakes when considering the future of a spectrum band/s in which existing spectrum rights are due to expire in the near future. See the next section in the context of ComReg’s proposals for the present matter.

Responses related to completing/ consulting on the next licensing scheme five years prior to the licence expiry date.

Views of respondents

4.149 ComReg received 7 responses ¹⁴⁴ from operators that wished to attain assurances that the next licensing scheme would be completed or initiated 5 years prior to licence expiry. The principal comments / reasons expressed by respondents include:

- it would provide clarity, allow operators to make business decisions, and preparations for any potential changes¹⁴⁵;
- It would allow them to prepare for technology upgrades¹⁴⁶; and
- there is, otherwise, no obvious continuation path available (Real BB).

ComReg’s assessment

4.150 ComReg notes that to ensure regulatory predictability and facilitate investment planning, it is its practice to consult on the future release of spectrum bands

¹⁴⁴ Airwave, FWA 4, Real BB, Digital Forge, Carnsore BB, Eurona, Premier BB

¹⁴⁵ Airwave, FWA 4, Digital Forge,

¹⁴⁶ Premier BB

significantly in advance of existing licence expiry. ComReg notes that this approach has, to date, served the electronic communications markets well and sees no reason to deviate from this approach.

- 4.151 When ComReg consults on its draft Spectrum Strategy statements, ComReg identifies rights of use that are due to expire within the following 5-6 years and includes a proposed work plan to identify potential award processes to commence during the next two years. The consultation on the strategy statement provides an opportunity for interested parties to provide submissions on the timing of potential award processes of interest to them.
- 4.152 ComReg aims to manage its workload in a manner that attempts to appropriately and pragmatically address the needs of a diverse range of actual and potential spectrum users. Relevant considerations¹⁴⁷ in this regard include: the capacity within the existing radio spectrum bands to meet spectrum demands; the international harmonisation status of various radio spectrum bands; the potential for including multiple spectrum bands in a single award process; the adoption of legislation (both national and European) which requires ComReg to take certain actions within certain timeframes; and the adoption of national priorities supported by legislation or similar instruments.
- 4.153 Specifically in relation to the above views, ComReg notes that consulting on the next award process or indeed completing the next award process in respect of this spectrum five years in advance of licence expiry could have negative consequences. For example:
- in terms of completing an award process 5 years prior to licence expiry, potential applicants could be deterred from seeking spectrum they would not have access to for a further 5 years; and
 - in deciding to commence a consultation process on the award of spectrum, ComReg takes into account all of the surrounding circumstances, including market dynamics and spectrum availability, at that point in time. This allows ComReg to ensure that the spectrum is awarded in accordance with its statutory objectives. However, committing to a consultation process at a particular point in time and so far into the future fetters ComReg's discretion in that respect.

¹⁴⁷ The extent to which any of these considerations affect ComReg's prioritisation is considered on a case by case basis.

4.154 Accordingly, while ComReg will of course engage with stakeholders in a timely manner, it does not propose to commit to consulting on the next award process or indeed completing the next award process in respect of this spectrum five years in advance of licence expiry.

Chapter 5

5 Award Type and Format

- 5.1 In this chapter, ComReg firstly summarises the proposals made in Document 15/70 that relate to:
- Preferred auction format;
 - Packaging of spectrum;
 - Frequency generic v frequency specific lots;
 - Competition Caps;
 - Unsold lots; and
 - Fees.
- 5.2 Secondly, it sets out the main points made by respondents in relation to matters discussed therein and ComReg's response to each.

5.1 ComReg's position in Document 15/70

5.1.1 Preferred auction format

- 5.3 ComReg described a number of risks¹⁴⁸ as likely to arise in this award process and assessed the extent to which certain auction formats best mitigates those risks while ensuring spectrum is awarded to those users who value it the most.
- 5.4 ComReg was of the preliminary view that a Combinatorial Clock Auction (CCA) format was best suited to deal with these risks because it:
- avoids the aggregation risks associated with the Simultaneous Multi-Round Auction (SMRA)¹⁴⁹ by allowing bidders the opportunity to bid for packages of lots and ensuring that any package is assigned to the bidder that values it the most;
 - allows for the ability to switch across regions without creating an unacceptable risk of gaming or strategic behaviour that weakens competition;

¹⁴⁸ Aggregation risks, Substitution Risks, Gaming, Common Value Uncertainty and Complexity.

¹⁴⁹ This includes other auction formats that do not allow for package bidding.

- can mitigate the problem of inefficiently unsold lots through a supplementary bids stage;
- allows for limited transparency reducing the likelihood of tacit collusion and strategic demand reduction; and
- is flexible and can be adapted to cope with a situation where bidders are competing for different amounts of spectrum and want to deploy different services and technologies.

5.1.2 Packaging of available spectrum

5.5 ComReg was of the preliminary view that spectrum should be offered using lot sizes of 5 MHz because such lot sizes accommodate all likely types of users and technologies since smaller lots can be aggregated to satisfy larger demands. The award would consist of 65 frequency generic lots of 5 MHz between 3,475 – 3,800 MHz.

5.1.3 Frequency generic v frequency specific lots

5.6 The use of spectrum by State Services (3435 – 3475 MHz) fragments the band and creates non-contiguous lots at the point above and below that frequency range (See Figure 2 of Document 15/70). In ComReg's view, the portion of the band below State Services (3410 – 3435) should be offered as a single frequency-specific lot to allow bidders certainty that all bids placed on frequency-generic lots are available on a contiguous basis.

5.1.4 Spectrum competition cap

5.7 ComReg considered DotEcon's advice that if ensuring the possibility of at least three winners, each with a sufficient amount of spectrum to provide a reasonable level of services, was the main objective, a spectrum competition cap of 150 MHz would be required. Alternatively, if the primary objective was to provide the opportunity for acquiring amounts of spectrum greater than 150 MHz so as to allow for greater bandwidth services, then a cap of 240 MHz might be appropriate if there was less concern with ensuring three operators with sufficient spectrum rights.

5.8 Therefore, ComReg was of the preliminary view that a spectrum competition cap for the 3.6 GHz award within the range 150-250 MHz should be considered.

5.1.5 Unsold lots

5.9 ComReg was of the view that it should retain discretion regarding how it might treat any unsold spectrum lots depending on the factual circumstances arising from the award process, save that it proposed that unsold lots would not be assigned for a reasonable period after the process has ended.

5.1.6 Fees

5.10 ComReg was firstly of the view that a minimum price is warranted where there is an opportunity for bidders to obtain access to valuable spectrum at a price below its real economic value.

5.11 In Document 15/70, ComReg noted that a number of factors should inform the setting of the minimum price, including:

- the minimum price should not be set so high as to choke off demand of serious bidders;
- awarding spectrum below the real economic value could lead to an inefficient assignment which would in turn fail to meet ComReg's statutory objectives;
- the minimum price should not be set so low that there is participation by frivolous bidders; and
- the minimum price should not facilitate collusive behaviour (whether tacit or explicit) or measures to coordinate demand amongst potential bidders.

5.12 Secondly, ComReg considered four possible approaches¹⁵⁰ to set the minimum price and was of the preliminary view that it was appropriate to use benchmarking above other approaches to determine a conservative minimum price.

5.13 Thirdly, ComReg outlined its preliminary view that minimum prices should consist of a two-part payment structure composed of an upfront fee ("minimum SAF") and an ongoing stream of indexed Spectrum Usage Fees ("SUFs") apportioned on a 50/50 basis.

5.14 Finally, and taking into account the benchmarking analysis provided by DotEcon, ComReg was of the preliminary view that the range of €0.015 to

¹⁵⁰ Low but non-trivial, Administrative Costs, Business Modelling and Benchmarking.

€0.025 per MHz per capita was an appropriate level for the minimum price. Urban regions were benchmarked at the higher end of the range (€0.025) and rural regions at the lower end (€0.015) to take account of the different population densities. A population adjustment was also proposed to account for commuter flows between rural and urban areas.

5.2 Responses to Document 15/70

5.2.1 Preferred auction format

- 5.15 Eircom and Viatel agreed that a CCA should be the preferred auction format.
- 5.16 3IHL is of the view that:
 1. The complexity of the format might place some bidders at a disadvantage;
 2. There is a small likelihood of gaming to reduce prices in this process; and
 3. With a large number of spectrum blocks to be awarded the aggregation risk is not a significant consideration.
- 5.17 As a result, 3IHL is of the view that ComReg has unnecessarily discounted alternative auction types that could produce an efficient outcome and be significantly less complex.
- 5.18 Vodafone expressed three main concerns:
 1. price setting is becoming more of a risk as operators become more experienced with CCAs, driving up the cost of spectrum;
 2. the auction should be less complex than the previous MBSA and, if a CCA is selected, it needs to keep to a more standard design; and
 3. ARPUUs are not, in its view, increasing in line with increasing usage and as spectrum volumes increase, the value of additional spectrum will be reduced.
- 5.19 In consideration of the above, Vodafone's preferred auction formats are to use either a CCA or SMRA, with a first preference for a SMRA because it would offer greater transparency and certainty about what bidders are going to win and would also it create less risk of price setting behaviour by incumbents against each other.
- 5.20 Real Broadband submits that the auction process is too complex and believes that bidders are likely to be bidding against themselves because of a lack of understanding in the bidding process.

- 5.21 Ripplecom states that it has no prior experience of the different auction formats but, notwithstanding this lack of experience, is of the view that auctions seem to strongly favour larger companies trying to outbid smaller ones.
- 5.22 The remaining respondents did not express any views on auction formats with all preferring some form of administrative assignment.¹⁵¹ The assessment of this award format in comparison to auctions is addressed in Chapter 3.

ComReg's response and position

- 5.23 First, in relation to the suggestion that aggregation risks are small because there is a large number of spectrum blocks, ComReg observes that it is largely the proposed regional nature of the award that gives rise to the aggregation risks rather than the quantum of spectrum in the band. In addition, ComReg notes that certain bidders will need a certain amount of spectrum in order to provide meaningful services.
- 5.24 As described in Document 15/70, ComReg's main concern is that offering lots on a regional basis exposes bidders to aggregation risks across regions, particularly where complementarities exist across those regions. At least one operator (Imagine) has expressed an interest in providing a national service and other bidders (or consortia of bidders) may be interested in providing services across more than one region. Therefore, aggregation risks remain a particular concern for this award.
- 5.25 In relation to the suggestion that there is a small likelihood of gaming to reduce prices in this process, ComReg previously outlined its concerns that the high level of transparency associated with a SMRA-type auction format makes it susceptible to strategic demand reduction. Furthermore, the regional nature of the proposed award can create further gaming opportunities because the possibility of territory sharing is higher under a SMRA. Additionally, under a SMRA bidders seeking smaller coverage areas would have incentives to bid for regions they have no demand for so as to discourage larger bidders from competing in their regions.
- 5.26 Moreover, given the different levels of auction experience present across potential bidders in this award process, inexperienced bidders are more likely to be disadvantaged by formats that encourage complex gaming strategies. In that regard, ComReg considers that a CCA best protects such bidders from gaming by more experienced bidders.

¹⁵¹ Imagine agreed with the use of the CCA for some of the spectrum, subject to awarding another part of it administratively for FWA.

- 5.27 ComReg further observes DotEcon's disagreement with 3IHL's assertion that gaming risks are low and that the large number of available lots reduces aggregation risks, because the regional nature of the award means that gaming and aggregation risks are significant.
- 5.28 In relation to the potential for price setting, DotEcon considers that while a CCA is theoretically susceptible to price driving strategies, Vodafone's concerns appear to be overstated. In particular, ComReg notes DotEcon's observation that price driving is not strictly a feature of a CCA and other formats, such as the SMRA, are also susceptible. Furthermore, price driving requires sufficient information about other bidder's likely demands, otherwise it may prove risky. DotEcon notes that the likelihood of such strategies being used would depend less on the auction format, and more on the degree of information certain bidders have about other bidders' demand and the perceived benefits of increasing the prices paid by other winners.
- 5.29 DotEcon also outlines that a strategy of bidding untruthfully in the clock rounds, in order to artificially raise revealed preference constraints to permit price driving bids in the supplementary bids round, is theoretically possible but in practice risky. It relies on unrealistic assumptions about the information that one bidder has about the likely valuations and bidding strategy of other bidders. There is a risk that a bidder undertaking such a strategy would end up unable to win its preferred package if the expectations about rivals' valuations and strategy proved incorrect. DotEcon also notes that for the 3.6 GHz band it is not particularly clear if there would be substantial perceived benefits from raising the prices paid by other bidders, given that the spectrum rights permit multiple uses and other bidders may make a different use of the spectrum.
- 5.30 In conclusion, DotEcon notes that the scope for and likelihood of price driving in the proposed award appear limited. Furthermore, since opportunities for price driving are not specific to the CCA (and in particular are also possible with the SMRA), DotEcon do not see any need to change its recommendations on auction format. For this reason and for the reasons stated above ComReg considers the risk of price driving to be low and, in any event, observes that such risk would also arise in other auction formats.
- 5.31 In relation to Vodafone's submission that as spectrum volumes increase, the value of additional spectrum will be reduced, ComReg notes that there are various demand and supply factors that might affect spectrum value, including increasing demand for bandwidth and increasing supply of spectrum for mobile applications. ComReg is mindful of these uncertainties when setting minimum prices. However, it is for the auction to determine market value through

competition between bidders. The extent to which additional spectrum may be more or less valuable in light of increasing data usage is a matter for individual bidders and can be reflected in their bids for lots in the award process.

- 5.32 ComReg notes that the complexity of the proposed award format has been raised by a number of respondents (Vodafone, 3IHL, Ripplecom, Real BB). Given the different nature of potential bidders in the present award process, ComReg notes that complexity is an important consideration for this award process and this issue is discussed separately in Annex 8.

5.2.2 Spectrum Competition Caps

- 5.33 Responses to Document 15/70 in relation to ComReg's spectrum competition cap proposal include the following.
- 5.34 Eircom is of the view that a competition cap in the region of 250 MHz could lead to an extremely asymmetric outcome giving such an operator substantial advantages that cannot be replicated in terms of quality of service offered and cost of network rollout. In Eircom's view the final cap should be set in the range 150 MHz – 200 MHz.
- 5.35 In its submission, FWA16 submission rejects competition caps "*for the simple reason that even if licences have to be surrendered after a number of years for non-use the damage to the FWA sector will have been done already.*"¹⁵²
- 5.36 3IHL is of the view that the competition cap should be large enough to ensure that no valid application or type of use is eliminated. It believes that the competition cap should not be set below the maximum value that would be useful and valuable for each type of user. 3IHL believes that the spectrum competition cap should not be set below 150 MHz or 30 channel blocks in any region.
- 5.37 Aptus believes that a competition cap should be set and does not comment on the cap for urban regions but believes that for the 4 rural regions the competition cap should be set in the region of 100 MHz.
- 5.38 Digital Forge contends that in order to ensure adequate competition and to curtail spectrum hoarding, a spectrum limit of 100 MHz per operator per region for an unspecified initial period should be adopted.
- 5.39 Imagine does not see how it is possible to discuss imposing spectrum competition caps without having first identified the relevant downstream markets. Notwithstanding, Imagine is of the view that a competition cap of at

¹⁵² FWA 16, p25.

least 160 MHz is required in order to ensure that at least one operator has a sufficient amount of spectrum to provide a reasonable level of service not just in the short term but over the full term of the licence.

- 5.40 BBnet, FWA 4, KerNet and Ripplecom recommend a cap of 100 MHz in an initial phase (2 years) with opportunities to acquire additional spectrum, at a later date, provided defined criteria are met.
- 5.41 Viatel supports a 150 MHz spectrum competition cap that is at the lower bound of ComReg's proposal in Document 15/70 and considers a spectrum competition cap allowing for 3 operators to be a minimum requirement.
- 5.42 Vodafone does not agree with ComReg's assertion that spectrum caps for this band can be assessed separately to mobile assignments. Rather it contends that the overall spectrum holdings of potential bidders should be considered.

ComReg's Response and Position

- 5.43 ComReg is grateful for the views of respondents on this issue and has carefully considered this material and other material before it including the analysis of DotEcon (as set out in pages 107 to 113 of their analysis of responses document)
- 5.44 ComReg reaffirms that the purpose of a competition cap is to guard against the risks of an extreme asymmetric outcome that has the potential to harm downstream competition.
- 5.45 ComReg does not believe that this implies that competition caps can only be contemplated when the terms of the award precisely specify the downstream markets in which the spectrum must be used. In that regard, ComReg recalls that:
 - in accordance with ComReg's statutory obligations spectrum awards must be conducted in a manner which respects the principles and obligations of service and technology neutrality; so it will often be the case that there will be significant uncertainty about how spectrum will be used after it has been assigned; and
 - in the present case, ComReg recalls that the 3.6 GHz EC Decision is service- and technology-neutral, but recognises that this band offers significant potential for the provision of wireless broadband networks and services, including fixed wireless, small cells (i.e mobile) and backhaul links in wireless broadband access networks or combinations thereof.

- 5.46 ComReg confirms that in considering competition caps, it has regard to the competitive impact of the range of uses to which the spectrum might foreseeably be put, particularly when there is uncertainty about how the spectrum will actually be used.
- 5.47 In light of considerable submissions from FWA operators, ComReg sets out its considerations primarily in the context of fixed wireless services.

Fixed Wireless Services

- 5.48 By way of background, ComReg recalls that:
- The 3.6 GHz band is one of three licensed bands used to provide fixed wireless services – the other two being the 10.5 GHz and 26 GHz bands¹⁵³; and
 - In addition, fixed wireless services are also provided using spectrum in the licence-exempt 2.4 GHz and 5.8 GHz frequency bands (approximately 14,500 fixed wireless subscriptions);
 - Based on ComReg's quarterly report, fixed wireless subscribers accounted for 3.3% of total active broadband subscribers¹⁵⁴.

- 5.49 ComReg notes that the spectrum competition cap proposals put forward by respondents included: 100 MHz, 150 MHz, a minimum of 160 MHz, and 150-200 MHz.

Potential spectrum competition cap at higher end of range identified in Document 15/70 (i.e. 200 MHz – 250 MHz)

- 5.50 Before setting out ComReg's consideration of these proposals, ComReg notes that there was no support for a spectrum competition cap towards the higher end of the range indicated by ComReg in Document 15/70 (i.e. 250 MHz).
- 5.51 In that regard, ComReg recalls the following from Document 15/70:

- *"[i]f the key objective was to enable bidders to acquire amounts of spectrum greater than 150 MHz so as to provide even higher bandwidth services (for example, 240 MHz as identified by Imagine in its response to Document 14/101), then a cap at this level (i.e. 240 MHz) would provide for one additional operator with 110 MHz, marginally above the level identified in the Plum report, or multiple operators with lower bandwidths.*

¹⁵³ Based on currently available information: 26,825 fixed wireless subscriptions are serviced using the 3.6 GHz band, and nearly 5,000 fixed wireless subscriptions are serviced using the 10.5 and 26 GHz bands combined.

¹⁵⁴ ComReg Quarterly Review Q3

In that regard, DotEcon notes that if there was less concern with ensuring three operators with sufficient spectrum, and the focus instead was on ensuring that there is the possibility of an operator obtaining sufficient spectrum to provide enhanced services, then a cap at 240 MHz might be appropriate” (para 5.80); and

- *“the upper bound would provide for one bidder to obtain up to 250 MHz, while also allowing the potential for another bidder to obtain at least 100 MHz (being the level identified by Plum as sufficient to provide a download speed of 30 Mbps). However, such a cap also allows two bidders to obtain the entire 3.6 GHz band, potentially harming competition. Further, a cap greater than 250 MHz would only allow one operator to be capable of providing download speeds of 30 Mbps which may not sufficiently safeguard short-term and longer-term competition” (para 5.81).*
- 5.52 In light of the reasons provided by ComReg in Document 15/70, including those identified above, and by respondents to Document 15/70¹⁵⁵, ComReg is of the view that the spectrum competition cap should not be set at the higher end of the range identified in Document 15/70 (i.e. 200MHz- 250MHz).
- Potential spectrum competition cap of 100 MHz*
- 5.53 ComReg notes that the majority of FWA operators suggest that a competition cap of 100 MHz should apply in this award process. ComReg considers that a 100 MHz cap would be inappropriate for two reasons. First, it would be tighter than is necessary to prevent an extreme outcome that would harm competition. Second, and as identified by ComReg's consultants, Plum, it could limit bidders providing speeds considerably greater than 30 Mbps¹⁵⁶. This has the consequent disadvantage noted by DotEcon of restricting the range of demand that could be expressed in the proposed auction. For example, ComReg observes Imagine’s view that a minimum of 160 MHz is required to roll out its preferred fixed wireless services and that certain FWA operators (FWA4, KerNet, Ripplecom, and BBnet) also indicate that additional spectrum could be required above 100 MHz in years to come.
- 5.54 In relation to the specific proposal for a competition cap that would allow operators to acquire additional spectrum beyond the cap at some later point, DotEcon notes that this would only be possible if there happened to be unsold

¹⁵⁵ See, for example, the submissions of Imagine and Eircom.

¹⁵⁶ Some respondents (Ripplecom) noted that 30 mbps could be delivered using less than 100 MHz using alternative technologies.

lots from the auction that could subsequently be assigned, or alternatively if some spectrum had deliberately been set aside for that purpose. The first scenario creates difficulty because bidders would not know how much spectrum would be available until after the auction and if all lots are sold certain bidders may not have acquired sufficient spectrum for future use. Setting aside spectrum¹⁵⁷ also raises concerns about how much to set aside and bidders are still exposed to the possibility of not obtaining sufficient spectrum at a later date.

Potential spectrum competition cap of 150 MHz, 160 MHz or 170 MHz

- 5.55 ComReg firstly observes that a spectrum competition cap of 150 MHz, 160 MHz and 170 MHz would each allow for three winning bidders.
- 5.56 One means by which to evaluate the appropriateness of these different levels is the extent to which they would permit one or two bidders to acquire so much of the available 3.6 GHz spectrum that there was insufficient spectrum remaining for the third operator. For example, smaller operators wishing to provide NGA-type fixed wireless services to a customer base in specific local areas. In ComReg's view, such an outcome could be unduly harmful to competition and consumer outcomes by effectively limiting the provision of higher bandwidth fixed wireless services using the 3.6 GHz band to one or two larger operators.
- 5.57 In that context, ComReg observes that a spectrum competition cap of 170 MHz would only ensure a minimum of three winning bidders who win at least 10 MHz each and for the reasons identified above, such a level would not appear appropriate.
- 5.58 In relation to a spectrum competition cap of 160 MHz, ComReg firstly observes that such a cap would ensure a minimum of three winners who win at least 30 MHz each. At the same time, however, ComReg notes that such a cap:
- would entail the disadvantage identified by DotEcon¹⁵⁸ - being that it would allow two winners to win a total of 320 MHz above the position currently occupied by State Services, leaving a single residual 5 MHz lot that is unlikely to be desirable for a third bidder;¹⁵⁹
 - may not ensure the efficient use of spectrum because that 5 MHz residual lot may be left unused; and

¹⁵⁷ Spectrum reservations and the problems associated for this award are already discussed in Chapter 3 and will not be repeated here.

¹⁵⁸ See page 33 and 34 of DotEcon's report Document 15/140a.

¹⁵⁹ The third winning bidder in this scenario is assigned the 25 MHz frequency lot below State Services and the remaining 5 MHz lot above state services would offer no additional value given the fragmentation of the band.

- could therefore result in a winning bidder only acquiring 25 MHz which, based on Plum's analysis¹⁶⁰, may limit the extent to which a meaningful and competitive fixed wireless service using the 3.6 GHz band could be provided.
- 5.59 In light of the previous discussion, ComReg considers that a spectrum competition cap of 150 MHz would be a more proportionate and balanced response having regard to ComReg's functions, objectives and duties, and to the matters raised by respondents¹⁶¹, because:
- compared to a cap of 100 MHz, it would better allow bidders to obtain sufficiently large contiguous blocks of spectrum to meet likely future requirements¹⁶² and would not unduly restrict the range of demand that could be expressed in the proposed auction;
 - compared to a cap of 160 MHz and 170 MHz, it would ensure a minimum of three winners who win at least 50 MHz each; and
 - compared to a cap of 160 MHz, it would better ensure the efficient use of spectrum by minimising the potential for lots to be stranded and therefore unused.
- 5.60 Whilst a cap of 150 MHz is slightly below the 160 MHz that Imagine suggests is the minimum it requires to rollout NGA services, ComReg additionally observes that its proposed spectrum competition cap would apply for the competition only, meaning that bidders may be able to subsequently acquire additional spectrum through spectrum trading or through acquiring other companies that hold spectrum rights of use.¹⁶³
- 5.61 ComReg notes Imagine's suggestion that Eircom could (a) acquire large amounts of 3.6 GHz spectrum (i.e. more than 250 MHz of the 350 MHz available), (b) "effectively hoard" the spectrum by not using it or under-utilising it so as to avoid cannibalising revenues from its fixed line services and (c) reduce or eliminate the impact of fixed wireless services that compete with

¹⁶⁰ Document 15/140d, Plum updated report 3

¹⁶¹ ComReg notes that a cap of 150 MHz would accord with 3IHL's and Eircom's views.

¹⁶² Plum estimate that with 100 MHz in total and an infrastructure density comparable to one of today's mobile cellular networks, LTE-A could serve up to 30% of all broadband subscribers in a typical suburban area and up to 50% of all subscribers in more rural areas.

¹⁶³ The competition assessments involved in such transactions would, among other things, take into account the specific circumstances of the transaction, including the identity of the holders of the spectrum rights, so that it would be possible for a bidder to assemble a larger holding in the 3.6 GHz band after the proposed award provided that the specific circumstances did not cause competition concerns. See ComReg's spectrum transfer procedures and guidelines for further details (ComReg Document 14/11).

Eircom's fixed line services. In that connection, ComReg firstly observes the potential for Eircom to acquire more than 250 MHz is addressed by a spectrum competition cap of 150 MHz.

- 5.62 In relation to the issue of spectrum hoarding more generally, ComReg clearly recognises that spectrum hoarding is undesirable, harmful to competition and an inefficient use of spectrum. ComReg also notes that its award proposals contain several proposed measures which should guard against this outcome one of which is the proposed spectrum competition cap of 150 MHz.¹⁶⁴

Other issues

- 5.63 In relation to Vodafone's concerns, DotEcon notes that there is no justification for imposing bidder specific-caps based on existing spectrum holdings. The 3.6 GHz band is not currently a core mobile band and under a 150 MHz cap there is no reason why any particular outcome should cause a material distortion in the downstream mobile market. Any spectrum that is used to provide mobile services could only be used to deliver incremental improvements to existing networks. ComReg is of the view that the 3.6 GHz band is unlikely to be substitutable to existing holdings of the MNOs and therefore should not count towards any spectrum competition cap in this particular award process.
- 5.64 ComReg received no views, with regard to the extent to which other spectrum bands may become more substitutable with the 3.6 GHz band and may be worthy of consideration in a competition cap in the future. ComReg therefore reserves its position but reiterates that any 3.6 GHz holdings obtained under this award may be taken into account for a competition cap for the award of sufficiently substitutable spectrum bands in the future. Additionally, ComReg notes Vodafone's concerns regarding its perceived uncertainty with regard to future spectrum releases. ComReg notes that its draft Radio Spectrum Strategy Statement was subsequently published on 14 December¹⁶⁵ and should provide interested parties with full visibility on ComReg's current position regarding future spectrum releases. ComReg has already discussed Vodafone's concerns in respect of price setting in para 5.28 onwards and does not repeat them here.
- 5.65 ComReg notes that the FWA16 submission fails to recognise that a competition cap is an *ex-ante* measure that ensures that the distribution of spectrum is determined by competition amongst the bidders, subject to ensuring that

¹⁶⁴ For example: ComReg's minimum price proposals, including the obligation to pay both upfront and ongoing spectrum fees; proposed roll-out obligations and proposed obligation to comply with any rules to prevent spectrum hoarding which may be laid down by ComReg.

¹⁶⁵ http://www.comreg.ie/_fileupload/publications/ComReg15131.pdf

extreme outcomes which could harm downstream competition do not emerge from the proposed auction. In essence, the cap prevents a bidder from being assigned amounts of spectrum which are harmful to competition in the first place.

5.2.3 Packaging of available spectrum¹⁶⁶

- 5.66 Eircom agrees that frequency generic blocks of 5 MHz may be appropriate as this is the minimum size of the building blocks for service delivery. However, Eircom suggests that consideration should be given to lot sizes of 20 MHz for the frequency generic lots. Eircom, however, agrees that the spectrum below state services should be released as a single 25 MHz block.
- 5.67 Aptus agrees that a single frequency-specific lot be adopted for the spectrum below State Services and agrees that 65 frequency-generic lots of 5 MHz should be adopted for remaining spectrum.
- 5.68 Viatel agrees that a single 25 MHz frequency-specific lot appears to be the easiest solution to avoid a situation where a bidder would be awarded two non-contiguous lots.
- 5.69 Vodafone agrees that the spectrum above State Services should be divided into 65 frequency generic lots. Vodafone also agrees with the adoption of a single frequency-specific lot below State Services, noting that otherwise a segment of spectrum could end up stranded, but queries how this may affect the assignment round.
- 5.70 Ripplecom confirms its understanding of the rationale for adopting a frequency-specific lot below State Services but does not offer any further opinion. Ripplecom would prefer a minimum lot size of 20 MHz to be used.
- 5.71 Eurona submits that in order to have manageable blocks of spectrum, the block size should not be less than 50 MHz.
- 5.72 3IHL suggests that ComReg should include 70 generic frequency blocks of 5 MHz each in the award process. 3IHL submits that, as an alternative, ComReg could consider whether it would be possible to re-tune the existing users (State Services) to either end of the band so that 70 contiguous lots are available at auction.
- 5.73 Imagine does not agree that a single 25 MHz frequency-specific lot should be adopted for the spectrum below State Services and suggests that this portion of

¹⁶⁶ Packaging and frequency generic or specific lots are considered together in this section.

the band should be assigned in the same way as the remainder of the band. Imagine does, however, agree that it is necessary to assign in lots of 5 MHz each to ensure that it is possible to assign the entire band with no unused 5 MHz blocks.

ComReg's response and position

- 5.74 In relation to submissions suggesting larger lot sizes be adopted, ComReg firstly observes that no specific reasoning was presented as to why this would be required or would result in the more efficient assignment or use of spectrum. In any event, and as noted by ComReg in Documents 14/101 and 15/70 a CCA auction format allows for aggregation of lots by bidders into packages of spectrum rights that would constitute larger blocks in line with their own demand. Therefore, a lot size of 5 MHz would offer all potential bidders full flexibility and would accommodate all types of potential users including those suggesting that larger lot sizes be adopted.
- 5.75 In relation to Vodafone's query regarding the assignment round, ComReg notes that an assignment round is not necessary for the frequency specific lot as the winning bidder for that lot in the main stage of the proposed auction would be automatically assigned the spectrum rights for that specific frequency range. The remaining 65 frequency-generic lots would, however, be subject to an assignment stage where the winners in the main stage would bid for specific frequency positions between 3 475 – 3 800 MHz.
- 5.76 In relation to the suggestion that a larger lot size would reduce complexity, ComReg recalls DotEcon's observation, in Document 15/72, that any reduction in complexity would be modest relative to the loss of flexibility for bidders in determining the amount of spectrum required. DotEcon also noted that increasing the lot size may be reasonable as a measure to limit complexity if a finer regional structure was to be adopted. For instance, if ten or more regions were defined. In light of the previous discussion and noting that its preferred regional structure consists of nine regions, ComReg does not, on balance, consider there to be compelling reasons to increase the lot size to reduce complexity.
- 5.77 In relation to Imagine's suggestion that spectrum in the 25 MHz frequency specific lot should be assigned in the same way as the rest of available spectrum in the band, ComReg recalls its reasoning as set out in Document 15/70, namely that the 3410 – 3435 MHz portion of the band should be offered as a single frequency specific block so as to provide bidders certainty that all bids placed

on frequency generic lots would be available on a contiguous basis in the assignment stage.

- 5.78 ComReg also considers 3IHL's suggestion that any issues regarding the aggregation of channels can be decided in the assignment round is not feasible for the same reasons. As noted by ComReg in Document 15/70, in the case where all lots are sold it is possible that one or more winners would be assigned lots that are non-contiguous. An assignment round would not be able to provide all winning bidders with contiguous lots in the event of all lots being sold. Bidders may not bid in the main award for lots if there was a risk that any lots would be non-contiguous.

5.2.4 Unsold lots

- 5.79 No respondents commented on ComReg's proposals in relation to unsold lots.

ComReg's response and position

- 5.80 ComReg considers that it should not incentivise a 'wait and see' approach from interested parties and should retain its discretion regarding how it might treat any unsold lots depending on the factual circumstances arising from the award process, save that unsold lots should not be considered for assignment for a reasonable period after the process (and, in any event, would not be considered for a minimum period of 2 years).

5.2.5 Fees

Minimum Price Structure and Split

- 5.81 Whilst concerns were not expressed by respondents to the principle of the spectrum fee consisting of a two-part payment structure (namely an upfront minimum SAF and ongoing SUFs), respondents did suggest a range of different approaches in terms of the balance of the split.
- 5.82 Vodafone and 3IHL agreed with ComReg's proposal that a 50/50 split was appropriate for this award process. The remaining respondents, FWA operators in the main, suggested that the split should be weighted more in favour of annual SUFs so as to encourage participation and to lower the upfront costs for winning bidders.
- 5.83 Imagine and Ripplecom suggested that a 20/80 split should be used. Imagine claims that such a split would support rapid deployment and maximise early investment in fixed NGA to support the NBP. Imagine claims that ComReg's

50/50 proposal is flawed because capital should be concentrated on the delivery of services which a lower minimum SAF would better facilitate. Ripplecom claims that a 20/80 split would align payments for the use of spectrum with the anticipated income stream to be received from customers using the spectrum.

- 5.84 Airwave, Aptus, BBNet, Digital Forge, FWA 4 and KerNet consider that a 25/75 split should be adopted to encourage FWA operators to participate in the auction.
- 5.85 Eurona submits that a 40/60 split should be used to lower initial capex requirements and encourage participation.
- 5.86 Viatel claims that, based on the current discount rate, it is clearly in operators' best interests to reduce the share of ongoing annual payments. Viatel also sought a detailed example of the SUF to aid its understanding of the minimum price structure.

ComReg's response and position on SAF/SUF split

- 5.87 As ComReg observed in Document 15/70, there is balance to be found between the respective levels of an upfront minimum SAF that deters frivolous bidding, which could compromise the award process, and annual payments which would provide on-going incentives for the return of unused or underutilised spectrum.
- 5.88 In relation to the suggestions that greater weight should be placed on the annual SUFs, ComReg recalls its previous observations that SUFs should be set at an appropriate level as to:
 - incentivise licensees to hand back part or all of their spectrum holdings in the event that they no longer have use for the spectrum;
 - ensure that the risks of default associated with deferring too much of the minimum price into the future in the form of SUFs are mitigated; and
 - ensure that participation in the auction would be limited to serious, credible bidders.
- 5.89 In consideration of the above, ComReg is of the view that a SAF/SUF split of 20/80 or 25/75 would not be appropriate because either scenario would unduly reduce the costs of acquiring too many lots in the short term. In particular, bidders could be assigned a large amount of spectrum at a low upfront cost (compared to a situation where a greater portion of the minimum price is allocated to the minimum SAF), and could return some spectrum at a later date avoiding any outstanding SUFs. This may create incentives for a bidder to

acquire a large amount of spectrum at low cost in order to maximise rents in the short term and perhaps prevent more efficient long-term use over the entire licence duration. Furthermore, these scenarios would provide greater incentives for speculative bidders to win spectrum rights in the expectation of on-selling or sub-leasing to other parties, rather than deploying services.

- 5.90 In relation to the suggestion of a 40/60 split, DotEcon firstly observes that for this award there is likely to be a greater range of bidders of significantly different size and financial strength and there may be a case for adjusting the split proposed in Document 15/70. In particular, DotEcon considers that for this award a 40/60 split between the SAF and SUFs could be more appropriate to encourage smaller bidders without creating significant additional risk of speculative entry.
- 5.91 Having considered the views of respondents and the recommendation of DotEcon, ComReg believes it appropriate to revise its position on the split between the minimum SAF and SUFs from 50/50 to 40/60 so as to better encourage participation by smaller bidders without creating significant additional risk of speculative entry.
- 5.92 In relation to Viatel's request for the exact workings used for a SUF calculation, DotEcon provides such an example and for convenience this is set out in Figure 5 below. The example in Figure 5 refers to the Galway and Suburbs region using the minimum price of €0.015/MHz/pop and a 40/60 SAF/SUF split. It is calculated as the SUF split (0.6* €7,000) divided by the sum of discount factors for the licence duration of 15 years.

A constant real annual fee, SUF, needs to satisfy

$$\sum_{t=0}^{14} \frac{SUF}{(1+d)^t} = 0.6 \times \text{Min price},$$

where d is the real discount rate.

In this example, we have $d = 0.0863 - 0.015 = 0.0713$ and $\text{Min price} = €7,000$

This gives $\text{Annual SUF} = \frac{0.6 \times €7,000}{9.6777} = €434$,

where $\frac{1}{9.6777}$ is the annual discount factor

Figure 5: SUF Calculation

- 5.93 In relation to Viatel's view that the mobile discount rate used by ComReg is unlikely to be the same for fixed wireless operators, ComReg notes that it is important that bidders have certainty over the real value of future SUFs so that these can be reflected in individual operator's valuations. Additionally, while the discount rate may vary between bidders, and the use of operator specific data would be preferable to calculate the discounted SUFs, such information is not available and DotEcon has therefore used the nominal WACC that corresponds to mobile as outlined in Document 14/136¹⁶⁷.
- 5.94 There is no discount rate available for fixed wireless operators. Whilst FWA operators are smaller and generally regional in nature, ComReg does not have evidence (including any evidence from respondents) that would suggest that the cost of capital associated with fixed wireless operators is lower than mobile operators. Accordingly, there is no reason to believe that fixed wireless operators would be placed at any disadvantage regarding the calculation of SUFs. Finally, for the purposes of discounting, ComReg has taken account of inflation (1.5%) and as a result uses a real discount rate of 7.13%, reflecting that annual SUFs would be increased with inflation (and so remain constant in real terms)¹⁶⁸.

Benchmarking

- 5.95 ComReg received a number of responses relating to its proposed use of benchmarking to set a conservative estimate of the market values of the 3.6 GHz band and these are outlined below.
- 5.96 3IHL suggests that the use of benchmarking is unreliable and runs a serious risk of choking off what it terms "*valid demand*". 3IHL claims that there is no reliable benchmark data available that could indicate the value of this band in Ireland resulting in significant uncertainty. 3IHL therefore suggests that the minimum price should be adjusted downwards by a factor to eliminate this perceived risk. 3IHL further submits that ComReg should instead set a low but non-trivial value to the licence. 3IHL also expresses dissatisfaction with regard to what ComReg terms the 'real economic value' and claims that ComReg seems to be anticipating some potential future change.
- 5.97 Imagine considers that the benchmarking analysis is flawed as it is based on bands used for mobile broadband when there is uncertainty over the use of the

¹⁶⁷ http://www.comreg.ie/_fileupload/publications/ComReg14136.pdf .

¹⁶⁸ The assumption that SUFs will be indexed with inflation has the effect of lowering that part of the minimum price reflected in the minimum SAF.

band. Imagine contends that the proposed auction approach might result in MNO's over-valuing spectrum rights to the detriment of FWA operators which in its view could then ultimately lead to spectrum lying fallow.

- 5.98 Ripplecom submits that the benchmarking approach should not be used as Ireland is unique in terms of the distribution of the rural population and in light of the proposed government intervention via NBP. Consequently, Ripplecom contends that international benchmarks are not appropriate in these circumstances.
- 5.99 Viatel suggests that reserve prices should take into account unsuccessful awards such as the 3.8 GHz band award in Moldova and other awards from Belgium and France. Notwithstanding, Viatel agrees it is appropriate to complete a benchmark with European awards excluding outliers.
- 5.100 Vodafone states that the band will be principally used by FWA type services and therefore the benchmark should be driven by this usage rather than comparison with other frequency bands capable of supporting wide area mobile coverage. Vodafone also suggests that the proposed adjustment for commuter flows should be dropped as the auction itself should reflect any differences in value.
- 5.101 Eircom submits that the benchmark appears to be skewed upwards due to the inclusion of certain outliers. Eircom further submits that the proposal concerning commuter flows should be dropped as this appears to run against the principle of service and technology neutrality given that, in its view, ComReg is in effect making an adjustment on the assumption that the spectrum will be used for mobile purposes.

ComReg's response and position on benchmarking

- 5.102 In response to 3IHL's suggestion that the minimum price should be set by reference to a low but non-trivial approach, ComReg notes that 3IHL does not engage with any of the reasoning set out in Document 15/70 for discounting such an approach but rather focuses on its claim that a lack of reliable data makes benchmarking unreliable. ComReg remains of the view that a low but non-trivial approach is not suitable for this award process for each of the reasons set out in Document 15/70. ComReg previously set out that the minimum price should not be so high as to choke off demand from serious bidders. ComReg is of the view that it is not necessary to adopt to a low but non-trivial approach in order to achieve that objective as the benchmarking approach already seeks to prevent any such choking off. As noted by DotEcon, the currently proposed approach to setting minimum prices is based on a conservative estimate of

market value, which already seeks to ensure that the risk of choking off demand is addressed.¹⁶⁹

- 5.103 In addition, and as described by DotEcon, minimum prices should not be set so low that the award attracts speculative bidders who may gamble on spectrum rights subsequently having greater resale value in the secondary market. Allowing certain bidders to be assigned spectrum where the intention is to engage in arbitrage at a later date would not be a good outcome, nor would it be in line with ComReg's statutory obligations or duties. The risks of such a possibility is likely to be much higher through the use of a low but non-trivial approach.
- 5.104 Benchmarking offers the advantage of revealing information about the actual willingness to pay for spectrum. The advantage of the benchmarking approach for this award is that the value of the 2.3 GHz and 2.6 GHz bands, given their better propagation characteristics, likely higher value, and more numerous data points, allow for a ceiling above which demand would likely be choked off. Additionally, the value of non-harmonised 3.6 GHz spectrum provides a floor below which the spectrum rights would be under-valued. DotEcon's updated benchmarking report, published in parallel with this document, acknowledges that there may be some uncertainty¹⁷⁰ within the Irish market regarding the value of 3.6GHz spectrum but notably recommends a benchmark estimated conservatively to address any uncertainty.
- 5.105 In response to the 3IHL's unfounded contention that ComReg would rather see spectrum unsold and unused than have it awarded at what ComReg considers is below the 'real economic value', ComReg simply notes that the real economic value is not determined by ComReg but rather is determined by the interaction between bidders in an auction. The source of 3IHLs confusion appears to be in its claim that "*the real economic value is to be determined by way of benchmark of historical awards rather than the auction itself*"¹⁷¹. For the avoidance of any doubt, the real economic value of the spectrum is not being determined by way of benchmark but through the outcome of the award process. ComReg has repeatedly stated that benchmarking does not set out to predict the final winning price but simply derives a conservative estimate of the minimum price (a factor 3IHL should be familiar with given its previous participation in spectrum awards). In this way, the benchmarking approach minimises the risk of setting a minimum

¹⁶⁹ DotEcon Report Document 15/140b, p6.

¹⁷⁰ DotEcon Report Document 15/140b, p8.

¹⁷¹ 3IHL, p8.

price that chokes off efficient demand and the final price will be determined solely by the competitive interaction of bidders in the proposed award process even where such benchmarking is based on limited data points.

5.106 ComReg observes that spectrum rights will only be released at a value below its real economic value where bidders collude to keep the price artificially low. That is, a price lower than what would have been the case under normal competitive conditions. As noted by DotEcon, the aim of the benchmarking exercise is not to estimate final prices likely to be established in the auction, but rather to choose a starting point that is likely to be below final prices, yet high enough to discourage speculative bidding and reduce gaming incentives. Therefore, ComReg remains of the view that the minimum price should be set using a benchmark approach by reference to a conservative estimate of the market value of the spectrum that is likely to be below final prices.

5.107 In relation to Ripplecom's claim that international benchmarking does not apply to the Irish market, ComReg notes that Ripplecom has not provided any specific evidence that would support its claim that the Irish market is a particular exception to the countries benchmarked. As outlined by DotEcon there are a number of reasons why Ripplecom's claims do not withstand scrutiny:

- The minimum price proposal already takes into account urban and rural regions;
- The use of PPP exchange rates provides a correction for local economic conditions (Income and Consumer spending); and
- It is appropriate to include non-European benchmarks provided they are properly interpreted¹⁷².

5.108 DotEcon also considers Imagine's claim that the justification for comparing the value of 3.6GHz spectrum to mobile bands to not be convincing given uncertainty about mobile broadband use in the 3.6GHz band. DotEcon notes that, in the long run, all three bands (2.3 GHz, 2.6 GHz and 3.6 GHz) are likely to become similarly effective in delivering mobile data as equipment availability differences lessen. Furthermore, anticipated data growth¹⁷³ may mean that the

¹⁷² ComReg considers the use of an objective criteria to determine outliers as important in this respect.

¹⁷³ For example, in a report commissioned by ComReg, Frontier Economics estimated that user demand for mobile data could be 33 times its current level by 2035

2.3 GHz and 2.6 GHz bands may become insufficient to meet capacity needs in the future especially for urban areas.

5.109 In relation to outliers within the benchmarking exercise, ComReg notes that DotEcon excluded outliers using standard definitions of outliers 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.

5.110 As suggested by Eircom, Switzerland, Jordan and Bahrain should be treated as outliers, and this is reflected in the original benchmarking report using the criteria identified above. Spain is excluded from the benchmarking analysis when considering the overall European sample (although it is very close to the threshold), while Bulgaria qualifies as an outlier when considering European 3.6 GHz awards only. ComReg agrees with the approach adopted by DotEcon and, in particular, the use of objective criteria for defining such outliers which avoids the need for outliers to be considered in an arbitrary way. In this way, the inclusion or exclusion of certain benchmarks is determined by the standard definition as described above.

5.111 In response to Viatel's submission, ComReg concurs with DotEcon's approach of only considering competitive award processes using auctions. None of the awards referred to by Viatel were conducted using an auction process and an administrative award only gives an indication of market value if prices were set entirely in keeping with estimates of market value. Therefore, their inclusion would not be indicative of market value and could be subject to the same problems as described in Chapter 3.

5.112 Having considered the views of respondents and the recommendations of DotEcon, ComReg's position is that it is appropriate to use benchmarking as an approach to determine a conservative minimum price in the stand-alone 3.6 GHz award process. It is acknowledged that the benchmarking analysis should be updated in light of the latest available data, and the level of uncertainty around the value of the 3.6GHz spectrum should be assessed as part of that process. Therefore, the minimum prices determined by the proposed benchmarking approach will kept under review until the finalisation of the award process.

Minimum Prices

5.113 3IHL is of the view that the benchmark is unreliable and, as a result the range proposed is excessive and risks choking off demand. 3IHL further believes that the population adjustment is not appropriate as it presupposes a particular type of use.

5.114 Eircom considers that the proposed range cannot be considered conservative as the 3.6GHz data used is old and the 2.6GHz data is not comparable. In its view, Eircom contends that the proposed approach appears to be skewed upwards and is entirely arbitrary in its opinion. Eircom maintains that a single price per MHz per capita should be used. The adjustment for urban/rural areas should be dropped as it appears to run against the principle of technology and service neutrality. According to Eircom, ComReg is assuming spectrum will be used for mobile purposes when it can be used for fixed and mobile uses.

5.115 Vodafone believes that the minimum price is too high by a factor of about 2, and should be €0.007 to €0.015 as the band, in its view, will be principally used for FWA type services. According to Vodafone, the high minimum price is likely to lead to unassigned spectrum even though there may be demand for it. Vodafone states that in order to maximise use and hence support the government objectives of supplying services to these areas at minimum cost it is imperative that this spectrum is effectively utilised. Vodafone also contend that a downwards adjustment to the minimum price should be made in rural regions.

5.116 Airwave welcomes the cost per head of population approach but submits that assuming the entire area can be covered from a base station and that all population will take up the service is not possible.

5.117 Aptus, BBNet, Carnsore Broadband, Digital Forge, Eurona, FWA 4, KerNet, Premier BB, Rapid BB and Ripplecom suggest that setting minimum prices based on full coverage within rural area is false as rural areas will have pockets of dense areas (towns) served by FTTX and NBP in the future. Additionally, many of the FWA operators argue that minimum prices should:

- be lower in towns with NGA;
- be lower for operators who indicate an intention to deliver NGA services in rural areas;
- take into account that FWA can only aim to supply businesses or households, rather than all individuals; and

- not be based on full coverage of the population in any area as realistic coverage will be much lower.

5.118 Viatel contends that the proposal is not applicable should the spectrum band be primarily used at a fixed location, and therefore solely in households. Viatel also believes the benchmarking analysis should amount to a maximum price of €0.0064 across all regions.

5.119 Imagine maintains that the approach is flawed given that the benchmarking includes fees for other bands and uses other than fixed NGA. Imagine further claims that €0.015 per MHz per capita is double the European average for urban areas and four times that for rural areas. Imagine observes that the Romanian award process does not appear to have been considered as part of the benchmark exercise. Imagine also contends that the urban/rural adjustment proposal is flawed as in its view it is a mobile-centric concept.

5.120 The FWA 16 respondents contend the award should be an administrative award with fees that are affordable to the FWA sector.

5.121 Munster Wireless requests that one third of the spectrum award should be made available exclusively to existing FWA providers at a minimal price and with smaller coverage areas.

5.122 Vodafone and Ripplecom also disagree with the comparison of the proposed minimum prices to existing FWALA licences. Vodafone argues that operators will, in practice, cherry pick locations with higher population density rather than serve the whole country. Similarly, Ripplecom questions the coverage area calculation, claiming that new base stations would be less economical than existing ones.

ComReg's response and position on minimum prices

5.123 ComReg notes that respondents concerns in relation to minimum prices can be grouped into three categories, namely:

- Comparison with FWA prices; and
- Adjustment for urban and rural areas; and
- Level of minimum prices.

5.124 ComReg addresses each of these categories in turn below. However, before doing so, ComReg would highlight that, having regard to submissions made by respondents and recommendations made by DotEcon, it is now proposing a lower minimum price for this award than that proposed in Document 15/70.

Comparison with current FWA licences

- 5.125 In relation to the claims regarding current FWALA fees, it is important to note that the calculation of a hypothetical national licence with existing FWALA fees does not feed into the minimum price calculations. The benchmarking report compares existing FWALA licence fees to the proposed minimum prices only as a cross-check, to provide an indication of whether there is likely to be demand for at least some of these licences at the proposed prices.
- 5.126 Since the band in this award process is being offered on a regional and national basis across all of the State, it is appropriate to consider the comparison with current FWA licences taking account of 100% of population in order to provide a meaningful comparison with the proposed minimum prices. ComReg, therefore considers that the comparison with the current FWA licences may offer useful information for bidders in coming to a determination on their valuation for the award spectrum. In that regard, ComReg notes that this information may provide bidders with useful information on the extent to which prices grow in excess of current applicable fees for the band.

Adjustment to minimum price for urban and rural areas

Population density adjustment

- 5.127 In relation to the suggestion that a similar “down-lift” in price should be applied to the minimum price in rural areas. ComReg notes that this is precisely what is outlined in Document 15/70. As illustrated in Annex 6 of Document 15/70, the adjustment to account for population inflows to the urban regions meant that the adjusted population was also reduced in rural regions. Additionally, and as noted by DotEcon, the minimum price per capita for rural regions is at the lower end of the proposed range. Therefore, in terms of the price per capita the actual minimum price has been adjusted downwards for non-urban regions.

Commuter flows

- 5.128 In relation to the suggestion that commuter flows be dropped as it appears to run against the principle of service and technology neutrality, ComReg notes that it is not making any assumption that the spectrum will be used for mobile or any other use. The population adjustment is to reflect the fact that experience from international auctions¹⁷⁴ suggest that urban regions command a higher spectrum price per capita than less populated regions. DotEcon advised that this was likely due to the higher population density in those regions, and

¹⁷⁴ As set out in Annex 2 of the DotEcon Report (Document 15/72).

commuter flows into urban regions that effectively increase population density in those areas. As noted by DotEcon, the correction is made to better estimate the potential size of the user base. Additionally, it should be noted that there is a corresponding downward population adjustment made to the rural regions so that the national population remains unchanged.

5.129 ComReg does not share Vodafone's view that the population adjustment lends complexity. The population flows consider the movement of commuters from the areas outside each of the urban regions into five urban regions, and the flows from the urban regions to areas outside the urban regions. This information was disseminated by the Central Statistics Office (CSO). ComReg accepts that the proposed auction will ultimately determine the final outcome. However, the minimum price should, where possible, also reflect any value differences across regions. Setting the same minimum price across urban and rural regions would not adequately reflect the additional value in urban areas and render the benchmark relatively more conservative in urban areas.

Level of minimum prices

5.130 In relation to suggestions that minimum prices should take account of households and businesses rather than individuals on a capita basis, ComReg notes that a per capita basis is simply the metric by which the value of spectrum is expressed. The value itself is determined by bidders competing in an auction process in each specific country benchmarked. Changing the metric to households, businesses or any other alternative does not affect the inherent value of the spectrum rights. In that regard, ComReg observes that population is the standard metric used in benchmarking because it is easily accessible across all countries and allows for ready comparison. As noted by DotEcon, calculating benchmarks on a per capita basis is a standard approach and there is no reason why this should not apply to Ireland. Therefore, ComReg considers that calculating benchmarks on a per capita basis remains appropriate.

5.131 In relation to the suggestion that minimum prices should be lower for towns where fixed NGA services are already provided, ComReg reiterates that this award will be conducted on a service and technology neutral basis and fees will not be set with a particular use or user in mind. In any event, such a scenario would artificially reduce prices in certain regions purely based on the extent to which certain operators face competition rather than ensuring the efficient use of spectrum.

5.132 The minimum prices are being set at a conservative level to take account of the uncertainty surrounding the value of the 3.6 GHz spectrum in light of the

demographics of the Irish market and the potential differences in value for different uses. As such, there should be no need to make further reductions in the minimum price for particular areas or for specific users, which may be seen as inconsistent with ComReg's aim for a technology and service neutral award. As described by DotEcon, for the purposes of designing this award process, it is assumed that the NBP process will correct identified market failures and there is no future need for intervention within the process of spectrum assignment if the NBP is expected to mitigate those market failures.

- 5.133 In relation to Imagine's comment that the Romanian award does not appear to have been considered, ComReg notes that a 3.4 – 3.8 GHz award was completed in October 2015, and this is reflected in DotEcon's updated benchmarking report. Furthermore, the lots sold at just above the minimum prices, at around €0.012/MHz/pop adjusted for a 15-year duration in Ireland, which is within the new minimum price range set out below.
- 5.134 ComReg notes Viatel's suggestion that the "maximum" price per capita be set at €0.0064, which corresponds to the average 3.6 GHz licence price per MHz per capita for European awards only. Firstly, ComReg notes that a maximum price would not work in the context of an auction since more than one bidder may wish to bid at that level or higher depending on each bidder's valuation. To the extent that a similar level is used as a minimum price, ComReg notes that the level referenced by Viatel pre-dates harmonisation of the band and the advent of TDD-LTE. Therefore, a minimum price set at this level would likely result in a minimum price set significantly below the likely market value of the spectrum creating the potential for unwanted incentives. For similar reasons, ComReg rejects Imagine's claim that the minimum price level is double the European average for urban areas and four times that for rural areas.
- 5.135 DotEcon identifies that no compelling evidence has been provided by respondents to suggest that the minimum prices set out in Document 15/70 are too high with the attached risk that demand would be choked off and spectrum rights remain unsold. Additionally, the minimum prices were proposed at a conservative level to take account of the uncertainty surrounding the value of the 3.6 GHz spectrum in Ireland. ComReg notes the views of Viatel and DotEcon's observation that while it is possible that expectations about the value of WiMAX at the time of earlier 3.6 GHz awards may have been overly optimistic it is difficult to estimate the impact, if any. However, DotEcon notes that this does not mean that the minimum prices set in Document 15/70 are too high for two reasons.

- 5.136 Firstly, expectations at the time of earlier awards were not necessarily irrational and could have factored in a number of possibilities including WiMAX. Secondly, the harmonisation measures for the 3.6 GHz band are now in place and the impact of LTE is likely to have a stronger effect than any potential over-estimate caused by expectations over WiMAX. ComReg also notes that the minimum prices suggested in Document 15/72 are close to the current FWALA fees set on a comparable basis.
- 5.137 Notwithstanding, DotEcon accepts that there is a high level of uncertainty associated with the benchmark estimates and concerns about the valuation placed on 3.6 GHz spectrum in the past adds to this uncertainty. DotEcon is therefore of the view that such factors should be further reflected in the minimum price. DotEcon recommends lowering the proposed minimum price range to reflect the uncertainty around the value of 3.6GHz spectrum. DotEcon now recommends lowering the minimum price on a price per MHz per capita basis from €0.015 to €0.01 in rural areas and €0.025 to €0.015 in urban areas; a reduction of €0.05 and €0.01, respectively.
- 5.138 ComReg agrees with DotEcon that while no compelling evidence was presented to show that the minimum prices would choke off demand, there is sufficient uncertainty surrounding the value of the 3.6 GHz spectrum to warrant a lower minimum price for this award. ComReg does not consider that minimum prices set at this level would encourage gaming or speculative bidding and emphasises that the final price for spectrum rights would be determined by the interaction of bidders in the proposed auction.
- 5.139 Finally, ComReg agrees with DotEcon's recommendation that the benchmarking analysis should be updated in light of the latest available data and minimum prices should be kept under review until the finalisation of the award process.
- 5.140 There was no response received in relation to the use of an inflation rate of 1.5% in order to calculate the real discount rate. Therefore, ComReg will continue to apply a real discount rate of 7.13% to adjust the Net Present Value (NPV) for a 3.6 GHz licence with a duration of 15 years. The SUFs will remain subject to indexation in line with the Consumer Price Index (CPI).
- 5.141 The adjusted fees take account of the lower per capita minimum price and the adjusted minimum price split is shown in Table 1 below.
- 5.142 As a result of the reduced price per capita and the move to a 40/60 split, the minimum SAFs are, on average, between 45% (South East) and 54% (Waterford City and Suburbs) lower than those set out in Document 15/70.

5.143 Finally, as described in Document 15/70, the single 25 MHz frequency specific lot using the frequency 3410 – 3435 MHz will have the same minimum fees (minimum SAF and SUF) but a multiple of 5 to reflect the size of this lot.

Table 1: Minimum Price, (5 MHz block) minimum SAF & Annual SUF per each region (2)

Regions	Pop per Region	Adjusted Pop	Minimum Price, €	Minimum SAF, €	SUF, €
East	693,529	632,133	32,000	12,800	1,984
Border, Midlands & West	1,165,879	1,136,093	57,000	22,800	3,534
South-East	446,059	432,824	22,000	8,800	1,364
South-West	753,825	711,786	36,000	14,400	2,232
Dublin City & Suburbs	1,110,627	1,192,531	89,000	35,600	5,518
Galway City & Suburbs	76,778	92,623	7,000	2,800	434
Limerick City & Suburbs	91,454	105,135	8,000	3,200	496
Cork City & Suburbs	198,582	225,086	17,000	6,800	1,054
Waterford City & Suburbs	51,519	59,519	4,000	1,600	248

Chapter 6

6 Licence Conditions

6.1 Introduction and Background

- 6.1 In Chapter 6 of Document 15/70, ComReg proposed various licence conditions that, in its view, should be attached to the rights that would be awarded on foot of the proposed 3.6 GHz award process.
- 6.2 These proposals were guided and informed by, among other things:
- ComReg's statutory functions, objectives and duties including, in particular, its powers and obligations under the Authorisation Regulations;
 - the licence conditions, and rationale for same, proposed in Document 14/101 and the submissions received to this consultation;
 - the licence conditions, and rationale for same, used previously by ComReg for this band or bands used for similar purposes (e.g. the licence conditions used in the MBSA, FWALA, BWALA, etc.); and
 - other relevant information (e.g. the 3.6 GHz EC Decision, the Plum Reports, international practice, etc.).
- 6.3 The following licence conditions were proposed in Chapter 6 of Document 15/70:
- technology and service neutrality;
 - non-exclusive assignment of spectrum;
 - notification of the termination of a technology;
 - coverage and rollout;
 - quality of service; and
 - technical conditions.
- 6.4 This chapter:
- summarises ComReg's position set out in Document 15/70;

- summarises the relevant views expressed by respondents to Document 15/70; and
- sets out ComReg's current views on licence conditions and other relevant issues raised by respondents.

6.2 Technology and Service Neutrality

Summary of ComReg's position in Document 15/70

6.5 In Document 15/70, ComReg proposed that a service and technology neutral¹⁷⁵ approach should be applied to the licensing of the 3.6 GHz band, such that all technologies and services that comply with the 3.6 GHz EC Decision would be permitted. In addition, ComReg stated that it did not see any compelling reasons to require the provision of a particular technology or service.

Views of respondents to Document 15/70

6.6 ComReg received eight responses on this issue. Those who responded generally supported ComReg's technology and service neutrality proposal. Notwithstanding, there were suggestions by respondents that ComReg would "favour" FWA networks over, for example, mobile networks. However, these suggestions have already been addressed earlier, where ComReg outlines that it is not appropriate to set aside 3.6 GHz spectrum for only one type of service or subset of services, e.g. a fixed service. ComReg does not intend to again address these suggestions here.

ComReg's assessment

6.7 ComReg notes that the principle of service and technology neutrality is reflected in the 3.6 GHz EC Decision. In particular, technologies that comply with the technical conditions set out in the Annex to the 3.6 GHz EC Decision can be deployed in the band, and these technologies can be used to deploy different types of electronic communications services. Further,

- Article 3 requires member states to "*allow the use of the 3 400-3 800 MHz band in accordance with Article 2 for fixed, nomadic and mobile electronic communications networks.*"; and

¹⁷⁵ Technology and service neutrality is the principle that spectrum rights of use, and the conditions applied thereto, should not preclude the provision of any specific service and/or the use of any technology.

- Recital 2 of the 2008 3.6 GHz EC Decision states that “[T]he designation of the 3 400-3800 MHz band for fixed, nomadic and mobile applications is an important element addressing the convergence of the mobile, fixed and broadcasting sectors and reflecting technical innovation. The services provided in this frequency band should mainly target end-user access to broadband communication”.
- 6.8 In light of the above and for the reasons set out in detail earlier in this document, ComReg considers it appropriate to adopt a service and technology-neutral approach to the release of this band.

ComReg's position

- 6.9 Accordingly, ComReg's position remains unchanged with regard to the proposal that licences in the 3.6 GHz band would be awarded on the service and technology neutrality basis, such that all technologies and services that comply with the 3.6 GHz EC Decision would be permitted. In addition, said licences would not require the provision of any particular technology or service.

6.3 Non-exclusive assignment of 3.6 GHz rights

Summary of ComReg's position in Document 15/70

- 6.10 In Document 15/70, ComReg confirmed that 3.6 GHz rights issued on foot of the proposed award would be assigned on a non-exclusive basis, observing that Article 2(1) of the 3.6 GHz EC Decision obliges Member States to make available the 3.6 GHz band on a non-exclusive basis and that this decision is binding on Member States.
- 6.11 ComReg noted that the only remaining issue to be determined is defining the scope of spectrum assignments for other uses of the 3.6 GHz band. ComReg proposed that it would be appropriate to permit spectrum in the 3.6 GHz band to be used for other uses on a non-interference and non-protected basis. In this regard, and in the interests of appropriate regulatory consistency, ComReg proposed that the non-exclusivity condition that would be attached to 3.6 GHz licences would be substantively the same as the non-exclusive provision included in the Liberalised Use Licences issued under S.I. 251 of 2012.

Views of respondents to Document 15/70

- 6.12 Respondents who addressed this issue supported ComReg's proposal, and the following additional comments were provided:

- the question was irrelevant given the binding 3.6 GHz EC Decision (Viatel);
- ComReg proposal is mandated by EU policy: Article 4 of Directive 2002/77/EC (Competition Directive) (Imagine);
- Ripplecom agreed with ComReg's proposal subject to interference conditions being met;
- other uses would have to be on a non-protected and non-interference basis and some degree of certainty would be required before alternative licences would be granted (3IHL).

ComReg's assessment

6.13 ComReg notes that all respondents agreed with the proposal of awarding licences on a non-exclusive basis and that the additional comments submitted generally sought clarification on ComReg's proposal.

6.14 In relation to Ripplecom and 3IHL's comments, ComReg notes that:

- licensees are obliged to comply with their licence obligations including any technical conditions to mitigate interference. Should ComReg become aware that a licensee is potentially not complying with its licence conditions, ComReg will investigate and take any appropriate action in line with its statutory objectives and duties; and
- its proposal in Document 15/70 provides a degree of certainty to prospective licensees, as it proposes that ComReg would apply substantively the same non-exclusive provision as that set out in the Liberalised Use Licences issued under S.I. 251 of 2012.

ComReg's position

6.15 Observing that Article 2(1) of the 3.6 GHz EC Decision obliges Member States to make available the 3.6 GHz band on a non-exclusive basis and that the decision is binding on Member States, ComReg confirms that 3.6 GHz rights issued on foot of the proposed award will be assigned on a non-exclusive basis.

6.16 In relation to the scope of this provision, ComReg remains of the view that its proposal as set out in Document 15/70 is appropriate because, among other things, this would promote appropriate regulatory consistency. Accordingly, ComReg considers that the non-exclusivity provision would be substantively the

same as that included in the Liberalised Use Licences issued under S.I. 251 of 2012¹⁷⁶.

6.4 The notification of the termination of a technology

Summary of ComReg's position in Document 15/70

- 6.17 As the cessation of a technology can result in “consumer disruption” issues, ComReg proposed a licence condition which would require a licensee to give six months’ notice to ComReg of its intention to terminate the provision of services using one technology in favour of another technology.
- 6.18 ComReg stated that its proposal was substantively on the same terms as that imposed on Liberalised Use Licences issued under S.I. 251 of 2012.

Views of respondents to Document 15/70

- 6.19 ComReg received eight responses on this topic and all eight respondents supported ComReg’s proposal to set a notification of the termination of a technology licence condition.
- 6.20 In addition, the following comments were provided:
 - Imagine suggested that the notice period for services on pre-existing technology that transition to new licences should be based on existing service contracts offered to customers by licensees. It suggested that the notice period could thereby be shortened to 30 days if the operator is able to transition customers to an equal or better service, and that at most three months is the maximum period that should be required;
 - Ripplecom suggested that a six month obligation should apply at a minimum; and

¹⁷⁶ The following definitions are included in [S.I 251 of 2012](#)

“Non-exclusive”, in relation to a Licence, means that the Commission is not precluded from authorising the keeping and possession by other persons of other apparatus for wireless telegraphy on a Non-Interference and Non-Protected Basis in one or more of the 800 MHz, the 900 MHz and the 1800 MHz bands;

“Non-Interference and Non-Protected Basis” means that the use is subject to no harmful interference being caused to any Radiocommunication Service, and on which no claim may be made for the protection of apparatus used on this basis against harmful interference originating from Radiocommunication Services;

- Eircom agreed on the understanding that the obligation would substantively be on the same terms as that imposed on Liberalised Use Licences issued under S.I. 251 of 2012.

ComReg's assessment

- 6.21 Firstly, ComReg notes that all respondents agreed with the proposal to set a notification of the termination of a technology licence condition.
- 6.22 In considering Imagine's suggestion, ComReg recalls that minimising the potential for significant disruption to consumer services and providing appropriate regulatory consistency were two considerations informing ComReg's proposed obligation as set out in Document 15/70. While ComReg notes Imagine's suggestion that it may be possible for operators to transition customers to an equal or better service within a time period of 30 days and at most 3 months, and ComReg would not prevent this from happening should it be appropriate to do so, ComReg also notes that there remain considerations in favour of maintaining the proposed 6 month time period. These include that:
- other respondents agreed with ComReg's proposal, thus suggesting that other existing or potential new licensees may require a longer time period than 3 months to transition from one technology to another;
 - a notification period of less than 6 months provides less time to interested parties to consider and take appropriate steps to minimise consumer disruption issues should these arise; and
 - a notification to ComReg would not seem to place an onerous burden on licensees.
- 6.23 Furthermore, ComReg notes that a 6 month notification period would promote appropriate regulatory consistency, given that a similar obligation is included in the Liberalised Use Licences issued under S.I 251 of 2012.
- 6.24 Noting the above, ComReg remains of the view that it is appropriate to propose a six month notification time period, but adds that should a licensee in the future notify ComReg that it could cease using one technology in favour of another in a time period of less than 6 months, then ComReg would assess that proposal at that time in light of its statutory functions, objectives and duties, considering, among other things, how consumer disruption would be minimised.

ComReg's position

6.25 In light of the above, ComReg's position is that:

- a licence condition would be attached which would require a licensee to give six months' notice to ComReg of its intention to terminate the provision of services using one technology in favour of another technology;
- this condition would be substantively the same as that imposed on Liberalised Use Licences issued under S.I 251 of 2012¹⁷⁷; and
- should a licensee notify ComReg that it could cease using one technology in favour of another in a time period of less than 6 months, then such a proposal would be assessed by ComReg at the relevant time in light of its statutory functions, objectives and duties, considering, among other things, how consumer disruption would be minimised.

6.5 Spectrum transfers and spectrum leasing

6.26 This section sets out ComReg's assessment of the submissions received to Document 15/70 in relation to:

- spectrum transfers in relation to liberalised 3.6 GHz rights of use; and
- spectrum leasing in relation to liberalised 3.6 GHz rights of use (including potential conditions relating to mandatory spectrum leasing proposed by certain respondents);

6.27 ComReg also sets out a proposed obligation on licensees to comply with any rules which ComReg may lay down to prevent spectrum hoarding.

6.5.1 Spectrum transfers

Summary of ComReg's position in Consultation 15/70

6.28 In section 7.2 of Consultation 15/70, ComReg stated that:

"In relation to a potential spectrum transfer, ComReg observes that the 3.6 GHz band is a band to which Spectrum Transfer

¹⁷⁷ The following licence condition is included in [S.I 251 of 2012](#)

6. It shall be a condition of any Licence to which these Regulations apply, that the Licensee shall:
(12) (a) notify the Commission, not less than 6 months prior to the proposed cessation of use of any terrestrial system listed in Schedule 1 to which the Liberalised Use Licence relates and;
(b) use all reasonable endeavours, to ensure that any adverse effects on users from the cessation of use of a terrestrial system are minimised;

Regulations apply and therefore regulatory mechanisms already exist to facilitate a transfer.” (para 7.35).

Views of respondents to Document 15/70

- 6.29 Two respondents (BBNet and KerNet) submitted the following same comment concerning whether spectrum trading would be permitted for liberalised 3.6 GHz rights:

“BBNet [and KerNet by way of separate submission] support the option 2 boundaries. But, we believe that it is imperative that an efficient process for spectrum trading be created alongside this process. There are many well established smaller/medium size WISP’s, who are interested in using 3.6ghz to deliver NGA services, especially in rural areas. In practical terms, spectrum trading is the only way in which this can happen. The pricing model for such trading needs to be clearly set out and transparent.”

ComReg's assessment

- 6.30 ComReg firstly reiterates that spectrum transfers¹⁷⁸ in the RSPP bands, including the 3.6 GHz band, are permitted in line with the existing Framework for Spectrum Transfers¹⁷⁹ and the Spectrum Transfer Regulations¹⁸⁰.
- 6.31 Accordingly, and for the avoidance of doubt, winners of liberalised 3.6 GHz rights¹⁸¹ will be permitted to transfer all, or part of their respective 3.6 GHz rights in accordance with the provisions set out in the above documents.
- 6.32 In relation to the view that the pricing model for such transfers/trading “needs to be clearly set out and transparent”, ComReg notes that spectrum trading regimes, by their nature, provide the opportunity for the market to determine the price of, and efficiently re-assign, spectrum rights.
- 6.33 ComReg's position, as set out in Document 15/70 therefore remains unchanged.

¹⁷⁸ “transfer” means the assignment by a licensee (“the transferor”) of some or all of a right of use granted under a licence to another party (“the transferee”).(S.I. 34 of 2014)

¹⁷⁹ See ComReg Documents 14/10 and 14/11.

¹⁸⁰ [Statutory Instrument No. 34 of 2014](#). Wireless Telegraphy (Transfer of spectrum rights of use) Regulations 2014. See, in particular, the Schedule to this S.I.

¹⁸¹ ComReg also observes that spectrum transfers in relation to existing 3.6 GHz rights of use are, by virtue of the Spectrum Transfer Regulations, already permitted.

6.5.2 Spectrum leasing

Summary of ComReg's position in Consultation 15/70

6.34 In section 7.2 of Consultation 15/70, ComReg stated that:

"In relation to spectrum leasing, ComReg notes that spectrum leasing will be permitted in the 3.6 GHz band subject to procedures that ComReg intends to put in place prior to the expiry of existing licences in July 2017. ComReg will consult on its spectrum leasing procedures in due course and would, of course, welcome the views of all interested parties on same.¹⁸²"

Views of respondents to Document 15/70

6.35 Several responses were made relating to the issue of potential leasing of liberalised 3.6 GHz rights of use. Specifically:

- *"We note ComReg's comments regarding the potential for market forces to assist in resolving transitional issues and look forward to ComReg's proposals in respect of establishing a framework for spectrum leasing. We believe that a spectrum leasing framework should be designed to encourage market led solutions and as noted by ComReg such features could include allowing the use of leased spectrum to count towards the lessor's coverage for the purpose of assessing compliance with coverage obligations." (Eircom);*
- *"In order to ensure that the spectrum is actually used, and to involve the smaller FWA operators, the license holder should be obliged to sub-let channels that are not being used within a reasonable time-frame. The cost of sub-letting must be regulated (based on the initial cost of spectrum) in order to avoid opportunism. ComReg must involve itself in this process in order to ensure that unused spectrum is sub-let to smaller operators at a reasonable cost. Has ComReg put any thought into how this sub-letting will work? The license holder will have ultimate responsibility for his spectrum, but disputes will arise if for example technical issues arise?" (Airwave);*

¹⁸² ComReg notes that spectrum leasing will be the subject of a separate consultation and that accordingly, comments in relation to same may, or may not, be responded to in the response to this consultation. All interested parties will have an opportunity to submit comments in relation to spectrum leasing in a further consultation and no party will be disadvantaged in relation to that consultation by not responding to this consultation.

- “*Subject to interference conditions being met, there should be an obligation on license holders to sub-lease (at viable commercial rates) to other operators in areas where they not plan to provide coverage within a specified time limit. The pricing model should be determined in advance of the spectrum award process.*” (*Eurona, FWA 4, KerNet*);
- “*Holders should be obliged, as part of the contract, to sublease the spectrum to smaller operators if they do not have concrete plans to rollout NGA services in an area.*” (*Premier BB*) *The cost and mark-up of spectrum should also be defined by ComReg/regulator as part of the process and should not be prohibitive in allowing smaller operators gain access to the spectrum*” (*Premier BB*);
- “*Care must be taken to ensure that the spectrum is not awarded to large operators for use purely for capacity planning or for anticompetitive reasons. If large ranges of spectrum are awarded to MNO’s then it is incumbent on ComReg to ensure that the frequencies are used and that a system for sub-leasing the frequencies at commercially viable rates is mandated*” (*Rapid BB*);
- “*Requirements for in-building capacity spectrum by MNOs could and should be met through an obligatory system of sub leasing of spectrum for these purposes.*” (*FWA 4*);
- “*The obligation to sub-lease spectrum should also apply in situations where a transmitter in one region may be used by another operator to serve a population in an adjacent region, where it can be shown, to the satisfaction of ComReg, that the leasee’s frequency plan does not impact on the main operator.*” (*Eurona, FWA 4*);
- “*The pricing model for such sub-leasing should be determined in advance of the spectrum award process but we propose that the pricing should be based on a similar population model as ComReg propose and should discourage opportunism.*” (*KerNet*);
- “*Subletting of spectrum will be cost prohibitive to small providers*” (*Munster Wireless*);
- “*In the licence conditions we would like an obligation on large providers to sub-liscence unused spectrum in an area at an affordable rate in keeping with costs*” (*Real BB*);
- “*Sub-leasing of portion of regions should be made available. For example, the operator holding the North-East region under Option 2 may find an*

issue to cover the north-western tip of Cavan. It may be on everybody's best interest to amend the region boundaries at ED level in order to take account of local conditions (position of elevated transmitter, town split between two regions)" (Viatel).

ComReg's assessment

- 6.36 ComReg welcomes the views of respondents on this issue and sets out its consideration of and response to those views below.
- 6.37 ComReg firstly notes those responses proposing that obligations should be imposed on liberalised 3.6 GHz rights holders to lease 3.6 GHz rights with various specified conditions. ComReg recalls that Regulation 10(1) of the Authorisation Regulations provides that ComReg may only attach those conditions listed in Part B of the Schedule to the Authorisation Regulations to spectrum rights for the provision of ECN and ECS. There appears to be only one condition listed in Part B that relates to spectrum transfers and condition 5 provides as follows: "*Transfer of rights at the initiative of the rights holder and conditions of such transfers in conformity with the Framework Directive*". (emphasis added).
- 6.38 It is apparent from this that any licence conditions imposed in respect of spectrum transfers can only apply to voluntary transfers. Accordingly, it would not appear open to ComReg to attach a licence condition which mandates the transfer or lease of spectrum.
- 6.39 That being said, ComReg would highlight that some of its proposed measures may incentivise and/or better facilitate the leasing by 3.6 GHz rights holders to interested parties, including:
- allowing a 3.6 GHz licensee to meet some or all of its rollout obligations via leasing arrangement/s (see ComReg's rollout proposals below);
 - the SUF will be an on-going cost which licensees will need to meet and should, therefore, incentivise licensees to lease or transfer rights of use, where they have no requirement for same; and
 - its regional area licence proposal and, in particular, using established boundaries for the identification of borders between regions (see Chapter 4), may assist potential leasing parties in determining an appropriate valuation of any transfer or lease.

- 6.40 ComReg also observes that a substantive concern which appears to underpin some of the proposals submitted by respondents, being non-use by the rights holder in a specific area/s, are matters particularly relevant in the context of (a) what should be appropriate coverage and/or rollout obligations on 3.6 GHz rights holders by which to ensure the efficient use of their respective rights, (b) rules to prevent “spectrum hoarding” (see further below), (c) the consequences for licensees for non-compliance with such obligations¹⁸³ and (d) ComReg’s transition proposals.
- 6.41 In relation to those submissions proposing that ComReg should determine the pricing of any potential lease of liberalised 3.6 GHz rights of use (including the view that “*subletting of spectrum will be cost prohibitive to small providers*”), ComReg has addressed the pricing of spectrum transfers and leases above.

Proposed obligation on winners of liberalised 3.6 GHz rights to comply with rules to prevent spectrum hoarding

- 6.42 By way of background, Regulation 17(10) of the Framework Regulations provides that:

“(10) [ComReg] may, having regard to its objectives under section 12 of the Act of 2002 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 paragraph shall be applied in a proportionate, non-discriminatory and transparent manner.”

- 6.43 ComReg also observes that the notion of “*spectrum hoarding*” can be better understood by reference to recital 71 of the 2009 Amending Directive¹⁸⁴ which provides:

“Competent national authorities should have the power to ensure effective use of spectrum and, where spectrum resources are left

¹⁸³ In relation to (b) and (c), ComReg would draw particular attention to:

- regulation 17(10) of the Framework Regulations; and
- regulations 16 and 17 of the Authorisation Regulations relating to enforcement – compliance with obligations and suspension or withdrawal of authorisation, rights of use for radio frequencies or rights of use for numbers, respectively.

¹⁸⁴ [Directive 2009/140/EC](#)

unused, to take action to prevent anti-competitive hoarding, which can prevent new entry.”

- 6.44 Whilst it is not possible, at this stage, to anticipate the likelihood of spectrum hoarding occurring in respect of liberalised 3.6 GHz rights of use, ComReg considers it appropriate, in the context of ensuring the efficient use of liberalised 3.6 GHz rights, to impose an obligation on winners of liberalised 3.6 GHz rights to comply with any rules to prevent spectrum hoarding as may be laid down by ComReg under Regulation 17(10) of the Framework Regulations.
- 6.45 In that regard, ComReg observes that such an obligation currently exists in respect of liberalised 800 MHz, 900 MHz and 1800 MHz rights of use issued under S.I 251 of 2012¹⁸⁵.
- 6.46 While no such rules have been laid down by ComReg to date, ComReg reserves the right to specify such rules in the future.

6.6 Coverage and rollout conditions

Summary of ComReg's position in Document 15/70

- 6.47 Given the recent adoption of “use-it” or rollout-type obligations in other Member States, and that the deployment of base stations at cell sites (be that at a high site, a small cell or other cell site type) is likely to be common to both likely potential uses for this band, in Document 15/70 ComReg considered that it would be more appropriate to design a rollout metric based on the number of base stations deployed rather than using the more typical population- or geographic-based coverage measures.
- 6.48 ComReg’s base station rollout proposal consisted of two elements:
 - the extent of the rollout obligation; and
 - a minimum base station capability requirement.

The extent of any rollout obligation

- 6.49 Given ComReg’s preference to set obligations at the minimum necessary to ensure the timely and efficient use of radio spectrum, bearing in mind the potential adverse effects on competition and spectrum use inherent in setting too

¹⁸⁵ Regulation 6(5) states that “6. It shall be a condition of any Licence to which these Regulations apply, that the Licensee shall:” “(5) comply with any rules to prevent spectrum hoarding as may be laid down by the Commission under the Framework Regulations”,

high an obligation, and having considered the existing infrastructure deployment in the 3.6 GHz band,¹⁸⁶ ComReg stated that it would seem appropriate to set a relatively low level rollout obligation.

6.50 Further, to encourage the efficient use of radio spectrum across various parts of a licensed area (i.e. a licence region identified by ComReg) and having regard to the infrastructure deployment across a number of different locations¹⁸⁷, ComReg outlined that it may be appropriate to add a geographic element to any base station rollout obligation.

6.51 Given the above, and in order to provide a proposal which interested parties could comment upon, ComReg's proposal for the extent of any base station rollout obligation was as follows:

- for each of the non-urban regions: the deployment of network controlled base stations¹⁸⁸ at 15 to 25 sites and that these sites should be located in 3 to 5 different counties within the region;
- for the Dublin region: the deployment of network controlled base stations at 15-25 sites; and
- for all other urban regions: the deployment of network controlled base stations at 2-4 sites.

The minimum base station capability requirements

6.52 To encourage licensees to use more spectrally efficient equipment and technologies, ComReg also proposed to set a minimum base station capability requirement.

6.53 Observing that the potential uses of the band are migrating towards the use of equipment with similar technologies, ComReg proposed to base this obligation on the capabilities of a LTE base station and, in doing, so proposed to use Plum's observation in Document 15/75 that the deployment of LTE-A equipment

¹⁸⁶ Region (No of BS in region): North East(43 – 49), South West (33 – 40), North West (28 – 54), South East (16 – 27), Dublin CSO boundary (59 – 63), Waterford CSO boundary (3 – 5), Galway CSO (2 – 8), Limerick CSO (2 – 4), Cork CSO (2 – 4).

¹⁸⁷ See Figure 5 in Document 15/70.

¹⁸⁸ Network controlled base stations are those under the ownership of the operator and which have backhaul capability over a network connection under the control of the operator. Therefore plug and play type base stations (such as femto cells) or repeaters will not count toward this obligation.

could result in an overall “technical spectrum efficient rate” of 4 bps/Hz per sector¹⁸⁹ as the basis for determining a base station’s capability criteria.

6.54 ComReg observed that the technical capability of a base station would also depend on the quantum of spectrum assigned to it. Given this, ComReg considered that it would seem appropriate to vary the base station capability requirements applicable to a licensee according to:

- (a) the amount of spectrum assigned to the licensee; or
- (b) the amount of spectrum deployed by the licensee at each base station.

The timing of any rollout obligation

6.55 ComReg firstly noted that the proposed rollout obligation is linked to the provision of services based on the capability of a LTE base station (or a technology of a similar capability), and that the timeframe for the widespread availability of LTE equipment in this band is expected to be somewhere around 2020¹⁹⁰. ComReg therefore considered that a roll-out period of between 3 to 5 years would appear appropriate.

The application of the above rollout obligations to a national licence

6.56 The rollout obligations above were presented in terms of the obligations in each licence area. Accordingly, ComReg proposed that where a bidder obtained a national licence (or a multi-region licence) the rollout obligation should comprise the aggregate of the individual rollout obligations within each specific licence area.

Views of respondents to Document 15/70

6.57 KerNet, Net1, Premier BB, Digital Forge, and FWA 4 agreed with ComReg’s proposal with no substantive qualification.

6.58 Vodafone agreed with an obligation to roll out a number of base stations, but suggests that this should be a low number.

6.59 3IHL stated that:

“ComReg should only impose the minimum obligation to ensure that spectrum is used by each licensee. At its simplest, this is a requirement that each licensee brings their licensed spectrum into

¹⁸⁹ 4 bps/Hz is achievable with LTE-A using 16QAM modulation (See section 3.2.1 of Plum Report 3 Document 15/75). Other technologies could achieve this throughput rate utilising 64QAM

¹⁹⁰ See Plum Report 2 Document 15/74

use. It is not appropriate to specify the number of base stations per region, as this might eliminate some valid use types.”

6.60 Viatel submitted that the proposed base station figures for all regions apart from Dublin appeared sensible. In respect of Dublin, it noted that it has been able to maintain a large customer base with a fraction of the proposed minimum number of base stations. Viatel further suggests that there be several milestones to meet a roll-out condition.

6.61 In its submission, Imagine:

- agrees with a rollout proposal based on base station deployment;
- states that there is sufficient FWA LTE Advanced equipment available to enable a rapid rollout of a fixed NGA service and that the 2020 suggestion of LTE-A becoming mainstream does not affect an operator's ability to commit to a more rapid deployment. However, on the other hand Imagine also states that there is a complete lack of mobile equipment and handset vendors and that this undermines the view of mobile demand and actual usage in the coming years;
- proposed rollout obligations for its type A and type B spectrum assignment proposal. As discussed in chapter 3, ComReg does not propose to adopt this proposal and, given this, the details of Imagine's proposed rollout obligations are not discussed further here;
- does not agree with the need for a base station capability metric. It queried whether this metric would be based on the basic capability of the technology, or measurements from the actual network deployment. If the latter, Imainge noted that many factors would need to be taken into account in its view (e.g. customer activity, spread in location of customers, etc.);
- suggests that the figure of 4bps/Hz is optimistic as a network-wide metric;
- suggests that minimum base station capability metric is very difficult to define or measure and is not appropriate;
- proposes that if a metric is to be adopted then it should be a simple obligation to rollout base stations that have the capability to deliver a NGA compliant service as defined in footnote 71 of the SAG;

- suggests that the minimum rollout obligation is so low that they do not act as a disincentive to hoarding and could lead to market stagnation to the detriment of FWA NGA;
- suggests that running an auction without more stringent rollout obligations could be an incentive to acquire spectrum rights of use with a view to preventing competition; and
- suggests that ComReg's proposed rollout conditions have little meaning when applied to two very different applications: FWA and mobile capacity. The coverage conditions should reference Fixed NGA but with alternative uses permitted. ComReg's rollout proposals are minimal and given the long rollout period could lead to market stagnation. In its opinion, rollout conditions need to be more aggressive and measured on a much shorter (annual basis).

6.62 Ripplecom agreed in principle with ComReg's rollout proposal but sought further details. Ripplecom also suggested a “use it or lose it” or “use it or lease it” type condition and expressed the view that any count of base stations needs to exclude small cells as these provide no outdoor coverage and only benefit a small percentage of the population.

6.63 Eircom agrees that it is appropriate to define a rollout obligation in terms of minimum coverage requirements. To guard against the risk of hoarding, Eircom proposes a sliding scale obligation.

- For spectrum holdings <=100 MHz: the number of sites proposed by ComReg applies;
- For spectrum holdings of 250 MHz: the number of sites is 4x times the basic level; and
- For spectrum holdings of 100 MHz to 250 MHz: a sliding scale between basic and high.

6.64 Eircom agrees with a 3-5 year rollout target and that a multi-region obligation should be expressed as the aggregate of the individual regions.

Plum report

6.65 ComReg also notes the contents of Plum's updated report (Document 15/140d) published alongside this response to consultation. This report considers, among other things, the number of base stations required to provide NGA-type FWA

services in urban and rural areas with varying amounts of bandwidth, and includes an observation that “*we estimate that the overall spectrum efficiency likely to be achieved in a fixed wireless network is approximately 4 bps/Hz.*”¹⁹¹ ComReg has taken account of Plum’s observations and recommendations in its assessment below.

ComReg’s assessment and position

- 6.66 ComReg’s assessment of the respondents’ views to Document 15/70 and its updated rollout proposals are set out below.
- 6.67 ComReg has also carried out a draft RIA of various rollout obligation levels, which is set out in Annex 9
- 6.68 In considering the view of respondents, ComReg firstly notes that there is broad support for a rollout obligation among respondents to Document 15/70, although respondents differ in terms of the level at which this obligation should be set.

Small cells

- 6.69 ComReg notes Ripplecom’s view that small cells should not count towards fulfilling a rollout obligation as they provide no outdoor coverage.
- 6.70 While Ripplecom’s definition of a small cell is not clear, and for the avoidance of doubt, ComReg recalls that in Document 15/70 it proposed excluding femto cells (which are small cells most likely to be used for indoor only coverage in domestic and similar properties) from counting towards the proposed rollout obligation given that a femto cell would not be a network controlled base station.¹⁹²
- 6.71 That said, ComReg observes that one of the key attractions of the 3.6 GHz band is its ability to deliver high throughput services. Given that that, for a given generation of technology and bandwidth there is a maximum throughput per base station, ComReg further observes that the network throughput per square kilometre is directly related to the density of the deployment of base stations. Accordingly, ComReg believes that certain operators may wish to deploy network controlled small cells (e.g. microcells or picocells) particularly in urban areas, which can provide capacity to serve a material number of users. On this basis, ComReg considers that network controlled small cells should count towards rollout targets.

¹⁹¹ Section 3.3.2 of Document 15/140d published alongside this response to consultation.

¹⁹² See footnote 163 in Document 15/70.

Requirement to deploy base stations

- 6.72 In relation to 3IHL's comment that an obligation be set only to ensure that the spectrum is brought into use, ComReg notes that this is unlikely to promote the efficient use of spectrum as the deployment of only one piece of equipment might be sufficient to meet such a criterion.
- 6.73 ComReg notes 3IHL's comment that specifying a number of base stations could exclude some technologies. ComReg acknowledges that the 3.6 GHz band could be used to provide services other than FWA or mobile and, in particular, for backhaul.¹⁹³ In line with the principle of technology- and service-neutrality, ComReg proposes to allow infrastructure for backhaul to count towards the rollout obligation. In that regard, ComReg proposes that a point-to-point link forming part of the network infrastructure¹⁹⁴, even if it comprises multiple hops to the network, would count as one base station.
- 6.74 Moreover, if a licensee proposes to deploy apparatus not explicitly discussed under the base station proposal above, ComReg would consider whether such apparatus should also count towards the base station rollout condition in the context of its statutory functions, objectives and duties and, in particular, in the context of its obligation to ensure that spectrum is efficiently used.

Dependency on quantum of spectrum

- 6.75 ComReg notes Eircom's suggestion that rollout obligations should vary depending on the amount of spectrum rights held by a licensee. ComReg also notes that having access to more spectrum at any given point in time would, in general, allow operators to roll out fewer base station sites to support the same volume of mobile data, and that this can lead to lower network costs. In this regard, ComReg notes the methodology used in modelling avoided costs when determining the appropriate economic choice for operators¹⁹⁵ in balancing:

- the cost of using of additional spectrum;
- against the cost of deploying base stations more densely.

¹⁹³ See, for example: http://www.gsma.com/spectrum/wp-content/uploads/2015/10/GSMA_C-Band_Report.pdf and 3.6 GHz EC Decision.

¹⁹⁴ Defined to be links, such as backhaul links, which carry data originating from, or destined for multiple customer premises. This excludes links forming the final connection to individual customer premises equipment as, the level of rollout obligation proposed would not, in ComReg's view, be sufficient to ensure the timely and efficient use of spectrum, if such links counted towards the obligation.

¹⁹⁵ http://www.gsma.com/spectrum/wp-content/uploads/2015/10/GSMA_C-Band_Report.pdf.

- 6.76 If the rollout obligation was imposed at a uniform level, irrespective of the quantum of spectrum that an operator has access to, there would potentially be an economic incentive for those with access to the greatest amount of spectrum to deploy the least spectrally efficient networks by deploying fewer base stations. The analysis of the number of base station equivalents required for the Dublin region below is informative in this regard.
- 6.77 Accordingly, as the rollout conditions proposed in Document 15/70 do not appear likely, of themselves, to entirely address the above issue, ComReg considers there to be some merit in Eircom's proposal.
- 6.78 Having regard to the spectrum competition cap proposal of 150 MHz identified in Chapter 5, ComReg proposes to simplify Eircom's proposal and impose a higher rollout obligation on licensees holding more than 100 MHz of spectrum rights compared to those holding up to 100 MHz.

Number of base stations for Dublin and other regions

- 6.79 ComReg notes Viatel's submission that it is currently serving a large customer base in the Dublin area with a fraction of the proposed number of base stations.
- 6.80 ComReg also notes Plum's estimates of a requirement for 45 base stations, each using 100 MHz of spectrum, to provide NGA-type FWA coverage to 4% of households in the Dublin region.¹⁹⁶ Such a level of coverage could be achieved by two FWA operators with 150 MHz of spectrum each deploying 15 base stations, or 3 FWA operators with 100 MHz deploying 10 base stations.
- 6.81 In light of this material, ComReg proposes to reduce the minimum number of base stations required in the Dublin region slightly from those proposed in Document 15/70.
- 6.82 Having considered the views of respondents to Document 15/70, Plum's expert advice, ComReg is minded to impose the rollout obligations set out in the table below.

¹⁹⁶ See figure 4.2 of Document 15/140d published alongside this response to consultation.

Table 2: Proposed base station rollout obligation by region

Region Type*	Licensee holding up to and including 100 MHz in the 3.6 GHz band	Licensee holding over 100 MHz in the 3.6 GHz band
Non-urban	15	25
Urban (other than Dublin)	2	4
Dublin	10	15
*See Table 3 –Regions below		

**Table 3: The details of each region
(as per the regions proposed in Chapter 4)**

Reference Number of Region	Region Type	Name of Region	Description of Region
1	Non-urban	Borders, Midlands and West	Counties Donegal, Leitrim, Sligo, Mayo, Roscommon, Cavan, Monaghan, Louth, Longford, Westmeath, Offaly, Laois, Galway excluding Region 8
2	Non-urban	East:	Counties Meath, Kildare, Wicklow and Dublin excluding Region 5
3	Non-urban	South East:	Counties Kilkenny, Carlow, Wexford, Waterford, excluding Region 9, and the legal boundary of South Tipperary
4	Non-urban	South West	Counties Clare, Limerick excluding Region 7, Kerry, Cork excluding Region, and the legal boundary for North Tipperary
5	Dublin	Dublin city and suburbs	Dublin CSO boundary for City and Suburbs
6	Urban	Cork city and suburbs	Cork CSO boundary for City and Suburbs
7	Urban	Limerick city and suburbs	Limerick CSO boundary for City and Suburbs
8	Urban	Galway city and suburbs	Galway CSO boundary for City and Suburbs
9	Urban	Waterford city and suburbs	Waterford CSO boundary for City and Suburbs.

- 6.83 ComReg considers that the proposed base station rollout obligations above are unlikely to place an undue burden on potential licensees given, among other

things, the existing levels of base station deployment under the current FWALA licences, and the potential deployment of base stations for other services, such as mobile services, where the likely smaller size of mobile cells may result in mobile operators deploying a large number of base stations.

Geographic deployment of base stations in non-urban regions

- 6.84 ComReg notes that no significant concerns were raised in relation to its proposal that base stations would be required to be deployed in between 3 to 5 counties in each non-urban region. Accordingly, ComReg's position is that base stations should be required to be deployed in at least 4 counties in each non-urban region.
- 6.85 For potential licensees who may not wish to deploy base stations in 4 or more counties, as discussed further below, ComReg proposes to allow the deployment of base stations pursuant to a spectrum leasing arrangement to count towards the rollout obligation.

The ability for base stations deployed via a leasing arrangement to count towards the rollout obligation

- 6.86 ComReg notes the responses that services provided by lessees should count towards the rollout obligations of the relevant licensee.
- 6.87 ComReg is of the view that it would be appropriate to permit this because, among other things:
- the leasing of rights of use can increase the efficient use of spectrum, and may be particularly relevant to the 3.6 GHz band given the:
 - multiple potential uses (e.g. mobile, FWA, backhaul);
 - timing differences in the availability of equipment for the different potential uses;
 - multiple potential licensees (national and regional); and
 - existing licensees some of which have a local area footprint.
 - the leasing of rights of use to radio spectrum used for the provision of ECS is provided for as part of the RSPP Decision and the Common Regulatory Framework; and
 - ComReg's draft radio spectrum management strategy for 2016 to 2018 proposes setting out a regulatory framework for the leasing of spectrum

rights in the RSPP bands (which includes the 3.6 GHz band) in advance of 31 July 2017.¹⁹⁷

Joint base stations

- 6.88 ComReg notes that the use of shared infrastructure, including shared base stations, may occur in practice. For the avoidance of doubt and subject to competition law, there is no prohibition on operators using shared base stations. However, for such base stations to count towards the rollout obligation of a licensee, the base station must be utilising the spectrum assigned to that licensee.

High Sites

- 6.89 ComReg notes that some potential licensees may wish to use high sites in counties adjoining its licensed region to provide a service. ComReg is of the view that if a licensee agrees an appropriate leasing arrangement with a licensee in an adjoining region to utilise a high site in that adjoining region, or utilises a high site in one of the counties in its region to serve a county in another region, the base station should be counted as being deployed in the county it serves, not the region where it is located, for the purpose of meeting rollout targets.

Timing of rollout obligations

- 6.90 ComReg notes and agrees with Imagine's view that there is sufficient equipment available today to enable rapid deployment of NGA-type FWA systems, and there is likely to be a lack of such equipment for mobile at this time. ComReg also notes the suggestions that its proposed rollout obligations are not sufficiently aggressive and that interim milestones should be added.
- 6.91 In relation to the appropriate timeframe for a rollout obligation, ComReg also notes the advice of Plum in Document 15/74 that the timeframe for the widespread availability of LTE equipment in this band is expected to be somewhere around 2020. This is a period of 3 years from the envisaged commencement date of new licences in this band of 1 August 2017.
- 6.92 Having considered the above, ComReg is of the view that the base station rollout obligations should be achieved and maintained within 3 years of the licence commencement date, and that it would be inappropriate to propose interim milestones given this proposed duration. While this is the lower bound

¹⁹⁷ See section 6.2.2 of [ComReg Document 15/131](#), "Draft Radio Spectrum Management Strategy 2016 to 2018", Consultation, published 14 December 2015.

proposed in Document 15/70, ComReg considers that this timing is unlikely to place an undue burden on potential licensees given, among other things:

- the current availability and deployment of equipment for certain uses;
- the expected widespread availability of LTE equipment for this band being somewhere around 2020;
- the level of the base station rollout obligation proposed for the different regions; and
- ComReg's proposal to allow base stations deployed via a leasing arrangement to count towards a base station rollout obligation.

Base station capability requirements and timing

- 6.93 ComReg notes and agrees with the comments to the effect that it would be difficult to measure spectrum efficiency across operators' networks. ComReg's proposal in Document 15/70 was to assess whether a base station was capable of delivering 4 bits/Hz¹⁹⁸ in some area in each sector. ComReg envisaged this obligation being assessed in a desktop study on the capability of the equipment as opposed to field measurements.
- 6.94 Noting the above and that equipment is available that can deliver better than 4 bits/Hz, albeit not at the fringes of coverage, ComReg considers it appropriate to maintain a base station capability requirement in relation to the base stations that count towards the rollout obligation.
- 6.95 For the avoidance of doubt, the proposed obligation does not prevent equipment which does not meet the minimum capability requirement from being used in the 3.6 GHz band¹⁹⁹. However, such equipment would not count towards the rollout obligation or the maintenance of this obligation over the duration of the licence.

The application of the above rollout obligations to a national licence

- 6.96 ComReg remains of the view that where a bidder obtains a national licence (or a multi-region licence), the rollout obligation applicable to that bidder should comprise the sum of the individual rollout obligations within each specific licensed region.

¹⁹⁸ This corresponds to a CQI level of 10, or above and should be readily achievable with current LTE-A, PMP450 or WIMAX, see section 3.2.1 of Document 15/140d published alongside this response to consultation.

¹⁹⁹ Subject to compliance with all other conditions, including without limitation, BEMs.

Other comments

- 6.97 In relation to the comments suggesting that the minimum rollout obligations do not act as a sufficient disincentive to hoarding or other anti-competitive behaviour, ComReg notes that its award proposals contain a number of additional measures aimed at ensuring the efficient use of spectrum which should, in turn, minimise the potential for spectrum hoarding, including:
- the requirement on winners to pay both upfront spectrum access fees and ongoing spectrum usage fees;
 - a spectrum competition cap; and
 - an obligation on licensees to comply with any rules that ComReg lays down in relation to spectrum hoarding.

6.7 Quality of Service (“QoS”)

Summary of ComReg’s position in Document 15/70

- 6.98 In Document 15/70, ComReg proposed the inclusion of Quality of Service (QoS) conditions which consisted of a network availability obligation and a voice call standard obligation.

Network Availability

- 6.99 The aim of the network availability obligation was to protect end users against unreasonable levels of disruption to their service, and safeguard the interests of consumers against operators who might otherwise have unacceptably high levels of network unavailability. For this obligation, ComReg proposed to attach QoS licence conditions similar to those attached to licences awarded under the MBSA process.

- 6.100 Specifically ComReg proposed the following:

- each licensee would keep a log of network availability, available for inspection by ComReg;
- each licensee would ensure that network unavailability is less than 35 minutes per six month period; and
- the calculation of network unavailability would be subject to weighting factors that take account of traffic load variations.

6.101 ComReg further proposed that all relevant services provided to a licensee's customers and provided to third party customers by a licensee (e.g. in the case of mobile virtual network operator (MVNO) or other forms of wholesale arrangements) would be captured under this QoS obligation. ComReg also proposed that its assessment of this obligation would be made against the aggregate total.

Voice Call Standard

6.102 The aim of the voice call standard obligation was to safeguard the interests of consumers against operators who might not otherwise maintain acceptable quality levels for voice calls in line with current expectations.

6.103 Specifically ComReg proposed that each licensee would ensure that for each 6 month period:

- the maximum Permissible Blocking Rates are not exceeded;
- the maximum Permissible Dropped Call Rates are not exceeded; and
- the speech transmission quality meets or exceeds the appropriate standard.

6.104 ComReg proposed that all relevant non-VoIP 'voice call' services provided to a licensee's customers and third party customers by a licensee, are to be captured under this QoS obligation.

6.105 ComReg further proposed that managed VOIP call services would also be captured under this QoS obligation as such services are considered to be substitutable with traditional voice call services²⁰⁰ and are increasingly used by consumers.

6.106 ComReg also proposed that any assessment of this obligation would be made against the aggregate total.

Views of respondents

6.107 ComReg received seven responses on its proposed QoS obligation. Of these, six (Imagine, Vodafone, Net1, Ripplecom, Digital Forge, Eircom) were in favour of including a QoS obligation and one respondent (3IHL) disagreed with the proposal.

²⁰⁰ See, for example, paragraph 2.6 of Market Review: Retail Access to the Public Telephone Network at a Fixed Location for Residential and Non Residential Customers – Document 14/89.

6.108 3IHL stated that this type of obligation is more appropriate to a “core” mobile band and is not appropriate to mixed use or service- and technology-neutral licences. Ripplecom, while agreeing with a QoS obligation, stated that it should not be more onerous than NBP requirements.

ComReg's assessment

6.109 ComReg firstly notes that the majority of respondents were in favour of including a QoS obligation.

6.110 In relation to 3IHL’s comment that the proposed QoS obligation is not appropriate to mixed use or service- and technology-neutral licences, ComReg firstly notes that 3IHL did not provide supporting rationale for its suggestion and further observes that the consumer detriment risks noted above, which both the minimum network availability obligation and the voice call obligation are intended to address, can equally arise in respect of voice services²⁰¹ provided under mixed use and service and technology neutral licences relating to a core mobile band. ComReg further observes that this proposed obligation would only apply to those operators choosing to deliver voice services using 3.6 GHz spectrum rights.

6.111 In relation to Ripplecom’s comment that the proposed QoS obligation should not be more onerous than the NBP requirements, ComReg firstly observes that at this point in time, and as the outcome of the NBP project is not yet complete, there is no certainty that 3.6 GHz spectrum rights would actually be used for the provision of NBP services. It is therefore unclear to ComReg whether the likely NBP requirements would be an appropriate consideration for the setting of a QoS obligation.

6.112 Furthermore ComReg observes that it has different objectives to those of the DCENR under the NBP. In this regard, it is important to note that ComReg is, under Irish and EU law, the independent national regulator responsible for, among other things, the management of the radio frequency spectrum. Accordingly, it must be guided by its own statutory functions, objectives and duties in the design of its spectrum award proposals.

6.113 Notwithstanding, should it be appropriate to consider the NBP requirements, ComReg observes that, the draft Broadband Intervention Strategy²⁰² of the NBP

²⁰¹ ComReg notes that fixed wireless operators in this band have previously provided voice services using the 3.6 GHz spectrum, and may wish to offer a managed VoIP service in the future, in order to compete with dual play competitors.

²⁰² See section 8.2 of the DCENR Document – Ireland’s Broadband Intervention Strategy – Published 22 December 2015

proposed the following minimum technical standards for high-speed broadband services:

- A minimum of 30Mbps download;
- A minimum of 6Mbps upload or twice the maximum upload speed of existing broadband in the intervention area, whichever is greater;
- Latency (one way) – no more than 25 milliseconds;
- Jitter – no more than 25 milliseconds;
- Packet loss – not more than 0.1%; and
- Service availability – at least 99.95% of the time.

6.114 At this juncture, it is difficult to assess whether ComReg's proposed obligation would be directly comparable to the relevant proposed NBP minimum standard (service availability standard) because details such as how exactly the NBP metric would be measured would need to be assessed.

6.115 In addition, noting that services provided using the 3.6 GHz spectrum band could be done so in combination with other spectrum bands, such as the 800 MHz, 900 MHz, 1800 MHz spectrum bands, ComReg observes that its network availability obligation proposal promotes regulatory consistency as this proposal is substantively similar to the licence condition currently attached to the Liberalised Use licences for the 800 MHz 900 MHz and 1800 MHz spectrum bands.

ComReg's position

6.116 In light of the above, and ComReg's draft RIA assessment as set out in Annex 9, ComReg remains of the view that it is appropriate to impose a minimum QoS licence obligation as detailed in Document 15/70 (and as summarised above) covering both network availability and voice call standards.

6.8 Technical conditions

6.117 In Document 15/70, ComReg proposed technical conditions for the 3.6 GHz band. In considering these technical conditions, ComReg assumed that the

band would be released on an exclusively TDD basis as proposed in Chapter 4 of Document 15/70. In particular, the proposals considered were with regard to:

- technical conditions set out in the 3.6 GHz EC Decision;
- TDD inter-network synchronisation; and
- technical conditions required to ensure co-channel co-existence across regional borders.

6.8.1 Technical conditions set out in the 3.6 GHz EC Decision

Summary of ComReg's position in Document 15/70

6.118 The 3.6 GHz EC Decision sets out the technical conditions which are applicable for any new rights of use in the 3.6 GHz band. In Document 15/70, ComReg consulted on the technical parameters that relate to a block edge mask (BEM) defined in part B and C of the Annex to the 3.6 GHz EC Decision. These technical parameters included:

- in-block power limits;
- transitional region power limits;
- baseline power limits;
- guard band power limits;
- base station additional baseline power limits for country specific cases; and
- terminal station BEM in-block power limit.

In-block power limits

6.119 As stated in the 3.6 GHz EC Decision, if a Member State wishes to apply an upper bound power limit then such a limit must not exceed 68 dBm/5 MHz per antenna. And if a limit is set, it would be applicable to all base stations within the operator's assigned blocks. ComReg therefore proposed in Document 15/70 an in-block power limit of 68 dBm/5 MHz per antenna, given that this limit is considered to be of a magnitude sufficient for the provision of likely services in the band. It was also noted that all existing FWA base stations currently operate well below the proposed in-band limit.

Transitional region power limits

6.120 These limits are applicable to synchronised adjacent TDD blocks and in-between adjacent TDD blocks that are separated by 5 or 10 MHz. In Document 15/70, ComReg proposed the following transitional limits as set out in the 3.6 GHz EC Decision:

- for – 5 to 0 MHz offset from lower block edge or 0 to 5 MHz offset from upper block edge a limit of $\text{Min}(\text{PMax}-40,21)$ dBm/5 MHz EIRP per antenna shall apply; and
- for – 10 to – 5 MHz offset from lower block edge or 5 to 10 MHz offset from upper block edge a limit of $\text{Min}(\text{PMax} - 43,15)$ dBm/5 MHz EIRP per antenna shall apply.

Baseline power limits

6.121 As set out in 3.6 GHz EC Decision, there are two TDD baseline power limit values- one is for synchronised TDD blocks and the other for unsynchronised TDD blocks. ComReg proposed in Document 15/70 a limit of $\text{Min}(\text{PMax}-43, 13)$ dBm/5 MHz per antenna for synchronised TDD blocks and -34 dBm/5 MHz EIRP per cell for unsynchronised TDD blocks.

Guard band emission limits

6.122 As set out in the 3.6 GHz EC Decision, the guard band emission limits apply only to the FDD band plan. ComReg set out in Document 15/70 that it was proposing that the band would be released on a TDD only basis and, as such, these limits would not apply.

Base station additional baseline power limits for country specific cases

6.123 In order to protect military radiolocation systems operating below 3400 MHz, the 3.6 GHz EC Decision set out three options for additional baseline power limits. However, in Document 15/70, ComReg proposed to not implement any further power limits below 3400 MHz given that there is already a 10 MHz guard band between 3400 – 3410 MHz. It was therefore not envisaged that extra protection would be required for any military radiolocation systems operating below 3400 MHz.

Terminal station BEM in-block power limit

6.124 The maximum in-block power limit for terminal stations is 25 dBm as set out in the 3.6 GHz EC Decision. However, the Decision allows for Member States to

relax the limit under certain circumstances, particularly for fixed terminal stations. Furthermore, Plum, in its Report 1 Document 15/73 also recommended considering a more relaxed limit for fixed and nomadic user terminals with directional antennas. In light of the above, ComReg, therefore proposed a limit of 37 dBm/5 MHz EIRP (i.e. 25 dBm/5 MHz +12 dBi) for fixed outdoor terminal equipment.

Views of respondents to Document 15/70

6.125 ComReg received no comments on the technical parameters set out above except with regard to the terminal station BEM in-block power limit. Six operators (Vodafone, Net1, Ripplecom, Eircom, Imagine, 3IHL) were in general agreement with the in-block power limit of 37 dBm/5 MHz EIRP proposed by ComReg. One respondent, Imagine, while agreeing with ComReg's maximum limit of 37 dBm/5 MHz EIRP, stated that the calculations in section 6.108 of ComReg Document 15/70 rely on a figure of 12 dBi for the antenna gain but there are now 16 dBi devices available.

ComReg's assessment

6.126 In addition to the maximum in-block power limit set by the 3.6 GHz EC Decision i.e. 25 dBm, in Document 15/70 ComReg considered an additional 12 dBi of antenna gain, thereby allowing a maximum terminal station in-block power limit of 37 dBm/5 MHz EIRP for fixed outdoor terminal equipment.

6.127 ComReg notes Imagine's point that there may be devices with 16 dBi antenna gain and is of the view that operators could use such devices provided the overall EIRP limit does not exceed 37 dBm/5 MHz, which can be achieved by decreasing the transmission power to 21 dBm/5 MHz (i.e. EIRP = 21 dBm/5 MHz +16 dBi).

6.128 Furthermore, it should be noted that in the event that such a higher limit results in unacceptable levels of interference it remains the responsibility of the network operator to address these cases rather than the end user.

6.129 Taking into account the responses received, ComReg remains of the view that a maximum fixed outdoor terminal station in-block power limit of 37 dBm/5 MHz EIRP should be allowed provided it does not cause any harmful interference to other users.

ComReg's position

6.130 The technical conditions set out in 3.6 GHz EC Decision and as proposed in Document 15/70 therefore remain unchanged.

6.8.2 TDD inter-network synchronisation

Summary of ComReg's position in Document 15/70

Internal guard bands, permissive BEM, restrictive BEM, Default Frame Structure

6.131 In Document 15/70, ComReg emphasised the importance of synchronisation across networks. In particular for TDD technologies, synchronisation helps minimise intra-network interference and maximise frequency re-use. The benefits of synchronisation were also highlighted both in ECC Report 216²⁰³ and Plum Report 1 (Document 15/73) ²⁰⁴. In principal, the advantages of synchronisation include:

- Spectrum efficiency- Synchronised TDD networks require no guard bands in cases where such networks are being operated in the same area on adjacent channels. Furthermore, the BEMs set out in the 3.6 GHz EC Decision are more permissive for synchronised TDD networks and more restrictive for unsynchronised networks; and
- Synchronisation can be used as an interference mitigation measure for cross border co-ordination. For example, with the use of synchronisation, TDD networks can co-exist thereby eliminating any BS to BS adjacent channel interference, potentially allowing services to be provided closer to either side of the regional border than with unsynchronised networks.

6.132 In order to achieve synchronisation, ECC Report 216 states that operators must have compatible frame structures. These frame structures define the timeslots for uplink and downlink. Compatible frame structures not only help achieve synchronisation but also:

²⁰³ ECC Report 216 - Practical guidance for TDD networks synchronisation - Published August 2014 - <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP216.PDF>

²⁰⁴ ComReg Document 15/73 - Technical advice from Plum Consulting concerning potential rights of use in the 3.6 GHz band - Report 1: Co-existence recommendations - Published 9 July 2015- http://www.comreg.ie/_fileupload/publications/ComReg1573.pdf

- allow for regulatory certainty for the first operator to roll out in an area;
- promote speed to market; and
- eliminate lengthy inter-operator negotiations.

6.133 In Document 15/70, ComReg outlined that there are currently seven TD-LTE uplink - downlink frame configurations defined by 3GPP (as illustrated below in Table 4) and that the most widely used is configuration 2. This is widely supported by both ECC Report 216 and Plum Report 3 (Document 15/75)²⁰⁵.

Table 4: TD-LTE frame structure options

UL-DL Configuration	Subframe number										DL:UL Ratio
	0	1	2	3	4	5	6	7	8	9	
0	D	S	U	U	U	D	S	U	U	U	1:3
1	D	S	U	U	D	D	S	U	U	D	1:1
2	D	S	U	D	D	D	S	U	D	D	3:1
3	D	S	U	U	U	D	D	D	D	D	2:1
4	D	S	U	U	D	D	D	D	D	D	7:2
5	D	S	U	D	D	D	D	D	D	D	8:1
6	D	S	U	U	U	D	S	U	U	D	3:5

*where U is for uplink transmission, D is for downlink transmission and S is a "special" subframe used to provide a guard interval between downlink and uplink transmissions.

6.134 ComReg proposed in Document 15/70 the following:

- not setting guard bands between assignments. This meant that unsynchronised networks require guard bands and that these guard bands are internalised within the block of spectrum assigned. As mentioned earlier, by default, synchronised networks require no guard bands;
- setting a TD-LTE frame configuration 2 (i.e. a downlink / uplink ratio of 3:1) or compatible frame structure as the default one for TDD networks; and

²⁰⁵ ComReg Document 15/75 - Technical advice from Plum Consulting concerning potential rights of use in the 3.6 GHz band - Report 3: Analysis of the potential spectrum requirements for NGA services - Published 9 July 2015 - http://www.comreg.ie/_fileupload/publications/ComReg1575.pdf

- as set out in the 3.6 GHz EC Decision, setting a permissive BEM for synchronised TDD networks and a restrictive BEM for unsynchronised networks.

Views of respondents to Document 15/70

Internal guard bands, permissive BEM and restrictive BEM

6.135 ComReg received six responses (Vodafone, Net 1, Ripplecom, Eircom, Imagine, 3IHL). All respondents agreed with ComReg's proposal that spectrum should be assigned without guard bands and that a permissive BEM should apply to synchronised networks and a restrictive BEM should apply to unsynchronised networks

Default Frame Structure

6.136 In relation to setting a default frame structure based on TD-LTE configuration 2, ComReg received eight responses. Of these, five were in favour of setting a default frame structure, while the remaining three disagreed with the proposal. Those respondents who disagreed stated that:

- a default frame structure is incompatible with a service and technology neutral licence, and could prevent some legitimate use types (3IHL); and
- synchronisation should be encouraged but nothing should be enforced that places non-LTE solutions at a disadvantage and that there are other solutions in the market place other than TD-LTE, for example Cambium Networks PMP 450. Furthermore, if enough operators subscribe to a different synchronisation solution e.g. if they require symmetrical services with equal UL:DL ratio then that should be acceptable also (Aptus Ltd, Ripplecom);

6.137 One respondent (Imagine) who was in favour of setting a default frame structure added that TD-LTE configuration 2 may not be the optimal configuration in the future to meet the high 6 Mbps target for uplink specified in the NBP. In addition, Imagine stated that within 3GPP there are ongoing developments for implementation of dynamic TDD ratio assignments in the future. Imagine also pointed out that in order to fully synchronise networks, it is also necessary to agree many other parameters including, the specific Special Sub-Frame configuration and that this was not referenced in ComReg consultation Document 15/70. Finally, Imagine concluded that it would support

synchronisation provided that a full set of procedures, as described in the Ofcom document²⁰⁶, were laid out and agreed that sufficient flexibility remains for operators to choose alternative frame structures if required to meet (for example) NBP requirements.

ComReg's assessment

6.138 With a band plan that uses a Time Division Duplex (TDD) mode there is the potential for significant spectrum efficiencies to be achieved where so called “adjacent networks”²⁰⁷ operate synchronously²⁰⁸. Adjacent networks can be said to be synchronised if they operate in lockstep such that uplink and downlink transmissions never overlap. This eliminates the potential for interference between the base station transmitter of one operator and the base station receiver of another operator.

6.139 As stated in ComReg Document 15/70 and ECC Report 216, in order to achieve synchronisation between networks (and to make use of permissive masks) operators must:

- use a common reference phase clock to ensure the alignment of the start of frame (UTC is mostly used as a common time reference); and
- use compatible frame structures which must specify the length of the frame, the TDD uplink/downlink ratio and the guard period in order to align UL/DL switching points.

6.140 ComReg is of the view that in the absence of a default set of the technical parameters specified above there could be significant drawbacks, including:

- potential delays to network deployments due to lengthy negotiations between operators²⁰⁹;
- potential regulatory uncertainty with regard to technical parameters of the award process, particularly in relation to which BEM an operator may need

²⁰⁶“Public Sector Spectrum Release: Award of the 2.3 and 3.4 GHz spectrum bands, 7th November 2014”, Figure 13: Proposals for key criteria in Inter-operator Synchronisation Procedure.
<http://stakeholders.ofcom.org.uk/binaries/consultations/2.3-3.4-ghz-auction-design/statement/statement.pdf>

²⁰⁷ Two networks are adjacent if they operate at the same frequency but in adjacent geographical areas or if they operate in the same area in adjacent frequency blocks.

²⁰⁸ By synchronising adjacent networks the requirements for guard bands or the use of the restrictive mask is eliminated hence increasing the utilisation of the available spectrum

²⁰⁹ For example section 9.14 of Ofcom’s PSSR consultation Document noted that a lack of suitable synchronisation rules effectively caused a delay for nearly 2 years in India.

to apply (restrictive or permissive). To mitigate this uncertainty operators may feel the need to assume the worst case and acquire additional spectrum blocks (in the order of 10 MHz) to meet restrictive masks thereby resulting in inefficient use of spectrum;

- the potential risk that the first operator to market may incur additional costs to retrofit external filtering to meet the restrictive mask if the adjacent operator chooses a different UL/DL pattern or if the first operator to market rolls out with expensive filtering to learn later that the adjacent operator chooses the same UL/DL pattern. This could therefore result in additional and unnecessary costs; and
- the potential that the first operator to market could have undue influence in any negotiations on the frame structure or UL/DL patterns to be used compared to operators later to the market.

6.141 In order to mitigate the above drawbacks, ComReg is of the view that it should put in place a framework to encourage synchronisation, which will facilitate the efficient use of spectrum, provide certainty to operators and allow a prompt rollout of services.

6.142 When considering these default technical parameters, it is important for ComReg to ensure that these parameters do not represent a significant constraint to any one operator and that the principle of service and technology neutrality is maintained. Therefore with this in mind, the default parameters for the use of permissive masks were chosen based on TD-LTE due to:

- TD-LTE being an open standard;
- TD-LTE being the preferred choice for many operators worldwide²¹⁰;
- the availability of cost-effective equipment providing economies of scale; and
- the possibility of co-existence with other technologies with compatible frame structures, such as WiMAX.

6.143 As mentioned earlier, the 3GPP defines a total of seven possible frame structures for TD-LTE, listed in Table 1. Of these seven frame structures, only configurations 1 and 2 are compatible with WiMAX. TD-LTE configuration 1 has

²¹⁰ Plum in the Analysis of Responses Document 15/140c states that TD-LTE already having been deployed in the 3.6 GHz band in Belgium, Slovakia, Croatia, Japan, Spain and the UK.

an equal DL:UL ratio (1:1), while configuration 2 has a 3:1 DL:UL ratio. Plum in its Report 3 cited research by Sandvine and Nokia Siemens Networks (NSN) suggesting that global internet traffic patterns have DL:UL ratios in the range of 3:1 to 5:1, with 3:1 configuration being the most widely used. Based on careful analysis of the above, ComReg therefore proposed in Document 15/70 TD-LTE configuration 2 (or equivalent) as the default frame structure for synchronisation purposes i.e. for networks using permissive BEMs. If a frame structure other than TD-LTE configuration 2 (or equivalent from another technology) is to be used, then a restrictive BEM would be applied to prevent any interference due to uplink or downlink overlaps.

6.144 Document 15/70 noted that inter-network synchronisation can only be achieved through co-ordination between operators and encouraged operators to refer to ECC Report 216 for guidance in coming to any synchronisation arrangements. In addition to a default frame structure as proposed in Document 15/70, the following discusses ComReg's consideration of:

- a Special Sub-Frame (SSF) default, which is required to establish the duration of the guard period²¹¹; and
- the detailed procedures for inter-operator synchronisation agreement beyond those set out in ECC Report 216.

Special Sub-Frame

6.145 The TD-LTE Special Sub-Frame (SSF) consists of a downlink pilot signal, a guard period and an uplink pilot signal. The pilot signals can also be used to provide additional downlink or uplink capacity. There are ten SSF configurations available for TD-LTE. As noted in Plum Document 15/140c and ECC Report 216, of these ten, only four SSF configurations (0, 1, 5 and 6) within TD-LTE configuration 2 are compatible with WiMAX. Of these four SSF configurations, configuration 6 offers the shortest guard period and therefore the highest overall throughput.

6.146 SSF configuration 6 is compatible with WiMAX frame configuration 35:12 (downlink / uplink ratio). Other SSF options 0 and 5 also provide compatibility with four other WiMAX configurations (34:13, 33:14, 32:15 and 31:16 downlink/uplink ratios). However, SSF options 0 and 5 have a longer guard period resulting in a downlink throughput reduction of approximately 10%.

²¹¹Imagine in its response pointed out that in order to fully synchronise networks, it is also necessary to agree many other parameters including, the specific Special Sub-Frame configuration.

Noting these benefits, ComReg is of the preliminary opinion that SSF configuration 6 (which provides the highest throughput) should be set as the default for TD-LTE networks in the 3.6 GHz band.

Procedures for Inter-operator Synchronisation Agreement

6.147 In relation to an inter-network synchronisation procedure, ECC Report 216 states that in order to deploy synchronised TDD networks in a multi-operator context (without guard bands), agreement needs to be reached on a common phase clock and a compatible frame structure. Operators must also make commitments not to cause interference and to comply with cross-operator synchronisation requirements where these restrictions apply. Finally, the procedure for updating or amending inter-operator agreements must be clear.

6.148 In order to provide certainty to operators in advance of the award process, ComReg proposes the following inter-network synchronisation procedure for the use of permissive masks:

- a common phase clock reference (e.g. UTC) must be adopted in order to align the start of the frame, with phase alignment to the reference clock within +/- 1.5 µs;
- a frame structure based on TD-LTE configuration 2 (3:1) or a compatible frame structure if a different technology must be used;
- TD-LTE Special sub frame configuration 6 is assumed as the default frame structure. Where other frame structures or technologies are used, the uplink and downlink transmit periods must be synchronised and not exceed those of TD-LTE SSF configuration 6;
- a commitment must be made by all operators not to cause interference on other operators' networks; and
- indoor small cells within an EIRP of less than or equal to 24 dBm per carrier are exempted from synchronisation and may use permissive masks²¹² provided that these do not cause interference to any other operators.

²¹²ComReg in Document 15/70 stated that exempting small cells (with an EIRP not exceeding 24 dBm) in indoor domestic and other indoor locations from synchronisation restrictions would represent a prudent approach in its award process. ComReg received no comments on this proposal. Therefore, ComReg is of the view that indoor small cells within an EIRP of less than or equal to 24 dBm may use permissive masks.

Updating Inter-operator Synchronisation Agreements

- 6.149 In the event that licensees wish to change any of the parameters above, parties to an existing inter-operator agreement should first discuss and agree the exact parameters they wish to change. They should then notify ComReg of their desire to make these changes.
- 6.150 ComReg will then review the proposed changes. Provided the proposed changes do not cause interference to other operators, ComReg will revise the inter-operator synchronisation procedure and notify all licensees of the change. It should be noted that ECC report 216 states that the frame structures are software parameters and can be reconfigured relatively quickly without causing any significant delays or major disruption to customers.

Other matters raised

- 6.151 In the Analysis of Responses Document 15/140c, Plum analysed the compatibility of Cambium Networks PMP 450 with TD-LTE. As a result of this analysis, Plum noted that the latest implementations of Cambium PMP-450 provides a 5ms frame length option. Given that the frame length for WiMAX technologies is also 5 msec, Cambium PMP 450 can be considered compatible with WiMAX and therefore by implication with TD-LTE systems using frame configuration 2. It should be noted that certain frame structures of Cambium PMP 450 (e.g. DL:UL 4:1) appear to be compatible with TD-LTE configuration 2 and as a result they have the potential to use permissive masks, provided DL/UL transmissions are aligned with TD-LTE configuration 2 and special sub frame configuration 6.
- 6.152 In relation to specific comments from 3IHL, Ripplecom and Aptus Ltd, ComReg proposed in Document 15/70 to award licences on a service and technology neutral basis. As synchronisation offers a wide range of benefits including spectrum efficiency and mitigating interference issues, ComReg encourages operators to synchronise their networks. However, it should be noted that ComReg does not oblige operators to use TD-LTE configuration 2. If operators wish to use a different frame structure other than TD-LTE configuration 2 (3:1) or equivalent, or do not wish to synchronise with adjacent channel networks, then they will be subject to the restrictive BEM. ComReg is of the view that such an arrangement would allow different technologies to co-exist while at the same time providing a framework for operators to synchronise their networks, thereby achieving spectrum efficiency and avoiding interference or regulatory uncertainty issues.

ComReg's position

6.153 As proposed in Document 15/70, and given that respondents were in favour of encouraging synchronisation, ComReg remains of the view that it should put in place a framework to encourage inter-network synchronisation, which will facilitate the efficient use of spectrum, provide certainty to operators and allow a prompt rollout of services. ComReg therefore proposes:

- not setting guard bands between assignments: This would require unsynchronised networks to internalise guard bands to meet the relevant technical conditions;
- setting a permissive BEM for synchronised networks and restrictive BEM for unsynchronised networks, where the restrictive BEM would assume the internalising of guard bands; and
- setting a default frame structure.

6.154 In addition ComReg recognises that default technical parameters for synchronisation should not represent a significant constraint for any one operator. Therefore, based on its analysis above, ComReg considers TD-LTE configuration 2 (3:1) with special sub frame (SSF) option 6 to be the optimal default frame structure for use with permissive masks. Alternative frame structures whose transmit and receive periods are aligned with this configuration would also be permitted to use the permissive mask.

6.155 Any other configuration that is not compatible with TD-LTE configuration 2 SSF option 6 would still be permitted, however its implementation would be subject to the restrictive BEM and would be obliged to not cause interference to those networks that use the default frame structure (or equivalent).

6.156 Due to the significant challenges of synchronisation and the lower potential for interference of indoor low power small cells, ComReg intends to take a pragmatic approach whereby indoor small cells that operate with an EIRP of less than or equal to 24 dBm per carrier would be exempted from the requirement to synchronise and may use the permissive mask. However if these small cells cause interference to other users, then the responsible operators would be required to rectify the interference issues, which may include ensuring synchronisation or EIRP reduction.

6.157 Furthermore, ComReg recognises that with advancements in technology or changes in consumer behaviour, the default set of technical parameters set out above and in particular the frame structures may need to change over time. In

the event that sufficient demand from operators exists to change any of the parameters above, operators should first agree on which parameters they wish to change, before notifying ComReg of their desire to make changes.

6.158 ComReg would then carry out a review of the proposed changes. Provided the proposed changes do not cause interference to other operators, ComReg would revise the inter-operator synchronisation procedure and notify all licensees of the change. The inter-operator synchronisation procedure forms part of the conditions for all licences. Any changes to this procedure will be reflected in operators' licences for the 3.6 GHz band.

6.8.3 Technical conditions required to ensure co-channel co-existence across regional borders

Summary of ComReg's position in Document 15/70

6.159 Given the proposal to release the 3.6 GHz band on a sub-national basis, it is necessary to ensure co-channel co-existence technical conditions are established at both borders between licence regions and international borders with the UK. Therefore, ComReg proposed in Document 15/70 that all operators operating in border regions would be subject to the co-ordination thresholds and corresponding procedures as set out in the memorandum of understanding (MOU) on the 3.6 GHz band²¹³.

6.160 Furthermore, ComReg also commissioned Plum to carry out co-channel co-existence studies for the 3.6 GHz band. Results of these studies and recommendations were published in Document 15/73²¹⁴. The Plum study recommended a co-ordination threshold level of 32 dB μ V/m/5 MHz for 90% of the time and 90% of the locations.

6.161 ComReg agreed with the findings of the Plum report and noted that the recommendations were of a similar magnitude to the lower co-ordination value set out in ECC (15)01²¹⁵ and the current FWALA licence signal level limit.

²¹³ There is an existing MOU on frequency co-ordination between Republic of Ireland and the United Kingdom for wireless access services in the frequency band 3 400 - 3 800 MHz - See Annex 3 of ComReg Guidelines: http://www.comreg.ie/_fileupload/publications/ComReg0617R6.pdf

²¹⁴ See ComReg Document 15/73 - Technical advice from Plum Consulting concerning potential rights of use in the 3.6 GHz band, Report 1: Co-existence recommendations - http://www.comreg.ie/_fileupload/publications/ComReg1573.pdf

²¹⁵ ECC Recommendation (15) 01 sets out recommendations for cross-border co-ordination for mobile/fixed communications networks (MFCN) in the frequency 3 400 - 3 600 MHz bands.

6.162 Based on these recommendations ComReg proposed to adopt a co-ordination threshold level of 32 dB μ V/m/5 MHz for 90% of the time and 90% of the locations for new rights of use in the 3.6 GHz band.

6.163 Given that co-ordination agreements offer the potential for operators to operate with cross border field strengths of a considerably higher magnitude than the proposed level, ComReg also proposed to establish co-ordination procedures which would facilitate inter-operator co-ordination agreements. Such procedures would be guided by ECC Recommendation (15)01, the MOU co-ordination procedures and the FWALA Domestic Co-ordination – Code of Practice. If however, no co-ordination agreement could be reached between operators then ComReg proposed that the co-ordination threshold would become a binding field strength limit on licensees at licence region borders.

Views of respondents to Document 15/70

6.164 ComReg received six responses (Vodafone, Net 1, Ripplecom, Eircom, Imagine, 3IHL) in relation to technical conditions at regional and national borders. All respondents agreed with ComReg's view as outlined in Document 15/70.

ComReg's position

6.165 ComReg's position remains unchanged with regard to technical conditions at regional and national borders i.e.

- all operators operating in the border regions would be subject to the coordination thresholds and corresponding procedures as set out in the (MOU) on the 3.6 GHz band²¹⁶;
- at regional borders a co-ordination threshold of 32 dB μ V/m/5 MHz for 90% of the time and 90% of the locations will be applied; and
- coordination procedures to facilitate inter-operator coordination agreements are to be established to allow operators to operate with cross-border field strengths higher than the proposed threshold limit of 32 dB μ V/m/5MHz. However if no coordination agreement can be reached between operators, the proposed co-ordination threshold remains a binding licence condition.

²¹⁶ There is an existing MOU on frequency co-ordination between Republic of Ireland and the United Kingdom for wireless access services in the frequency band 3 400 - 3 800 MHz - See Annex 3 of ComReg Guidelines: http://www.comreg.ie/_fileupload/publications/ComReg0617R6.pdf

6.9 Other Matters Raised

6.9.1 Responses relating to ComReg conducting a review of the spectrum to ensure efficient use every 5 years

Views of respondents

6.166 Two respondents (Eurona, Premier BB) proposed that a review of the assigned spectrum should be undertaken every 5 years to ensure efficient use of the spectrum and the delivery of services to end users.

ComReg's assessment and position

6.167 ComReg observes that a number of proposals are already included in the proposed 3.6 GHz band award with the aim of ensuring the efficient use of spectrum. For example, ComReg proposes rollout obligations to be met within certain timeframes including the potential for leasing arrangements to count towards this obligation and the proposals for upfront spectrum access fees and ongoing spectrum usage fees.

6.168 Further Regulation 16 of the Authorisation Regulations obliges ComReg to monitor and supervise compliance with the licence conditions, including those identified above. In addition, ComReg continues to monitor and supervise compliance in accordance with the provisions of the Regulatory Framework.

6.169 In that light, ComReg does not consider it appropriate to commit to conducting periodic reviews regarding spectrum efficiency of the kind proposed by the above respondents.

6.9.2 Responses relating to Plum Document 15/75

6.170 Two respondents (Imagine and Ripplecom) raised a number of comments in respect to Plum's report on analysis of the potential spectrum requirements for NGA services, Document 15/75. Specific issues raised by these respondents include:

- Assumptions used to assess spectrum requirements are based on a pessimistic view of the FWA market.
- Inter-sector interference has not been accounted for in the calculations
- Report is strongly biased towards exclusive use of LTE-TDD technology

- Incorrect reference in the network planning section - it should be ITU-R P.1410-07

6.171 ComReg notes that Plum has updated the report²¹⁷ to take account of comments received above. A detailed analysis of these responses is published in ComReg Document 15/140c – Plum Analysis of Responses Document.

²¹⁷ See updated Plum Document 15/140d

Chapter 7

7 Transitional issues and Preparatory Licences

- 7.1 This chapter sets out ComReg's updated views on its transition proposals for the proposed 3.6 GHz band award. Before doing so, it:
- summarises ComReg's transition proposals as set out in Document 15/70;
 - summarises the relevant views expressed by respondents to Document 15/70 on each of ComReg's proposals; and
 - sets out ComReg's position in relation to issues raised by respondents.
- 7.2 In addition, this chapter sets out ComReg's preparatory licence proposals.

7.1 Summary of ComReg's transition proposals in Document 15/70

- 7.3 Chapter 7 of Consultation 15/70 recognised that some, or all, of the current holders of rights of use in the 3.6 GHz band (the "Existing Licensees") will be required to make adjustments to their existing networks to comply with the outcome of the proposed award process (both as regards geographical areas and frequency assignments) and align their use of spectrum with the rights of use that they obtain, if any (i.e. "transition").
- 7.4 Among other things, ComReg noted that:
- the 3.6 GHz EC Decision provides for the harmonisation of the 3.6 GHz band from 30 June 2015 onwards. Following this date, EU Member States are required to apply the technical conditions set out in the Annex to that Decision to any new 3.6 GHz rights of use issued;
 - it would not be appropriate to issue new 3.6 GHz rights of use based on the existing FWALA licensing scheme because:
 - the existing 3.6 GHz FWALA band plan does not comply with the harmonised band plan channelling arrangements as set out in the 3.6 GHz EC Decision; and

- more generally, the FWALA licensing scheme is no longer suitable to efficiently facilitate the full suite of wireless services that could be provided under the terms of the 3.6 GHz EC Decision;
 - the FWALA licensing scheme expires on 31 July 2017²¹⁸ and it would not be appropriate to renew or extend existing FWALA licences in the 3.6 GHz band generally;²¹⁹ and
 - irrespective of whether an Existing Licensee wins rights of use in respect of more or less 3.6 GHz spectrum than it currently holds, or wins no rights of use, some or all of the Existing Licensees will be required to carry out transition activities. These transition activities will be necessary in order to comply with the outcome of the proposed award process should the Existing Licensees wish to continue to provide services following the cessation of the FWALA licensing scheme on 31 July 2017.
- 7.5 Noting that the potential for transitional issues to arise in respect of existing 3.6 GHz rights is recognised in the 3.6 GHz EC Decision²²⁰, and that this allows Member States to define arrangements for same provided two conditions²²¹ are met, ComReg then considered a number of potential issues that could arise in relation to the transition activities, including:
- minimising the potential for disruption to existing consumer services;
 - introducing liberalised licences as soon as possible and not unnecessarily delaying the delivery of future liberalised service;

²¹⁸ See ComReg Information Notice Document 10/29 on Fixed Wireless Access Local Area Licensing: End date of the FWALA licensing scheme in the 3.6 GHz band.

²¹⁹ This view is without prejudice to any objectively justified and proportionate short term continuation of existing rights of use to address transitional issues arising from the proposed award, including those as proposed in this chapter.

²²⁰ Specifically, Article 2(1) of 2008 3.6 GHz EC Decision (as amended by Article 1 of the 2014 3.6 GHz EC Decision) states that:

"Moreover, Member States need not apply the parameters laid down in the Annex in respect of rights of use for terrestrial electronic communications networks in the 3400-3800 MHz frequency band existing at the date of adoption of this decision, to the extent that the exercise of those rights does not prevent the use of that band according to the Annex."

²²¹ Namely that:

- only existing 3.6 GHz rights of use, that is existing FWALA Licensees, at the date of adoption of the 2014 3.6 GHz EC Decision (i.e. 2 May 2014) would qualify for any transition arrangement; and
- any transition arrangement does not prevent the use of the 3.6 GHz band in line with the technical conditions as set out in the Annex to the 3.6 GHz EC Decision.

- maximising benefits to end users; and
- ensuring the efficient use of spectrum during the transition period.

7.6 Amongst other things, ComReg also noted that:

- as of April 2015, there were 199 FWALA licences which had been issued to 15 separate Existing Licensees. While there are certain areas of Ireland where spectrum in the 3.6 GHz band remains unassigned, in general spectrum rights across the band have been assigned on a local area basis to these Existing Licensees. The locations of the licence areas are spread throughout the country; and
- approximately 27,000²²² fixed wireless broadband customers are served via the 3.6 GHz band and in some areas the Existing Licensee may be the only provider of fixed wireless broadband services, or the provider of the best available broadband service, as other service providers (e.g. satellite broadband providers) may not be able to provide a sufficiently comparable service in terms of download/upload speeds, latency, price etc. These areas are likely to be in the more sparsely populated areas of Ireland and this characteristic increases the potential impact of disruption to existing consumer services in the 3.6 GHz band in these areas.

7.7 Noting the potential for transition issues to arise and its view that market mechanisms may not entirely resolve such issues, ComReg made a transition proposal in Document 15/70 consisting of three parts:

- the formulation of a transition plan (“**Transition Proposal 1**”), based on transition rules, to facilitate an orderly and timely transition to the outcome of the proposed award process. ComReg put forward some possible general principles and tools intended to facilitate the development of a well-informed and robust transition plan, which would be determined by ComReg with input from the Existing Licensees and new licensees;
- assigning a Transition Protected Licence (“**TPL**”) for a short-term to winning bidders in the proposed award (“**Transition Proposal 2**”) should transition activities be required post 31 July 2017. For transition activities prior to 31

²²² Since Document 15/70 was published, ComReg has updated its subscriber information, and now estimates that there are 25,258 customers being served using spectrum in the 3.6 GHz band.

July 2017, suitable amendments to existing FWALA licences may be sufficient; and

- assigning a Transition Unprotected Licence (“TUL”) (“**Transition Proposal 3**”) to Existing Licenses for a transitional period of 2-5 years.
- 7.8 ComReg envisaged that the proposed transition tools would work alongside the existing FWALA licences and market mechanisms, such as spectrum transfer or leasing arrangements, as well as the proposed new 3.6 GHz licences, and that some combination of these transition tools might be appropriate to address the transition issues that may arise. Each of these transition tools was envisaged as addressing different needs and applying to a different time period as set out in Figure 6 below.

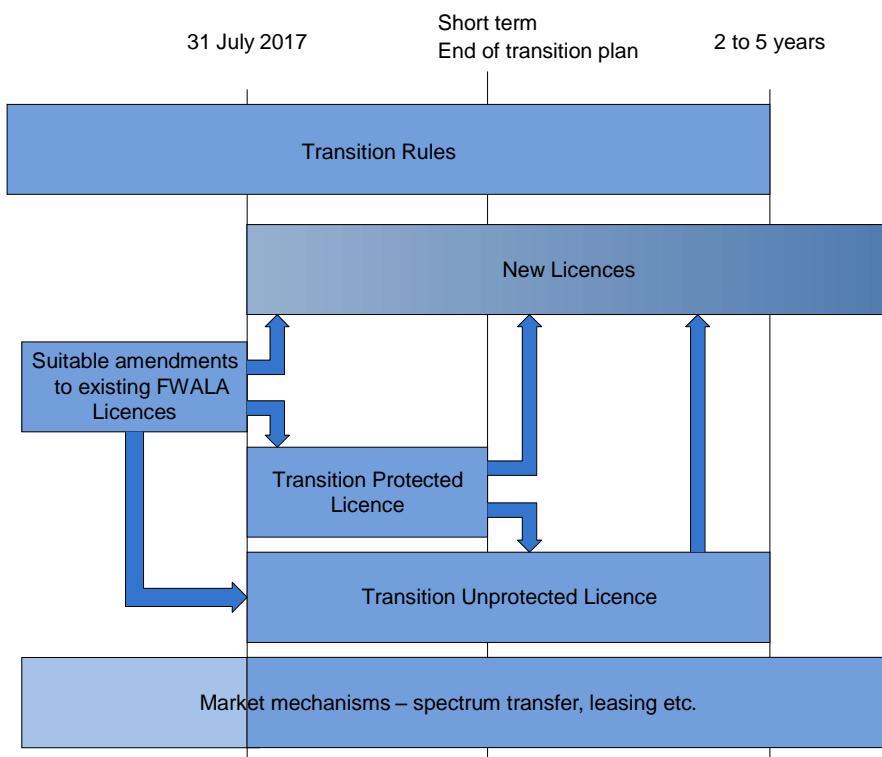


Figure 6: ComReg's 15/70 Transition proposals and other key tools and the time periods to which they apply

7.2 Transition Proposal 1: The formulation of a Transition plan

Summary of ComReg's position in Document 15/70

- 7.9 To facilitate a timely and orderly transition to the outcome of the proposed award process, in Transition Proposal 1 ComReg proposed to formulate a transition plan based on transition rules, and it proposed some possible general principles and tools.
- 7.10 ComReg expressed the view that it is important that all Existing Licensees are involved in the process to determine a 3.6 GHz transition plan as this would allow each Existing Licensee the opportunity of providing transition proposals to ComReg that reflect the specifics of its transition activities. This, in turn, would enable the formulation and implementation of a well-informed and robust transition plan, with input from the Existing Licensees and winners of rights of use in the award process.
- 7.11 ComReg then outlined the high level steps for establishing the transition rules and plan. This included:
- the collection of information from Existing Licensees and analysis and verification of the information provided;
 - the setting of transition rules in advance of the award process; and
 - the determination and implementation of the transition plan.
- 7.12 With regard to the collection of information, ComReg noted that whilst the precise nature and extent of transition activities would only be known until the outcome of the proposed award process, it was nevertheless important to collect information from Existing Licensees in advance of the award process so as to inform ComReg's transition proposals and rules.
- 7.13 With regard to the setting of transition rules in advance of the award process, ComReg proposed that the transition rules would define:
- the parties who would be obliged to comply with the rules;
 - the elements of a transition plan, such as the requirement to set milestone dates for each transition activity identified and the attribution and acceptance of liability for liquidated damages;

- the process for defining a transition plan which would involve providing the Existing Licensees and winning bidders an opportunity of collectively formulating an industry transition project proposal for ComReg to consider, followed by the formulation of a final transition plan by ComReg; and
 - consequential outcomes such as the delayed commencement of a new licence.
- 7.14 In relation to the parties that would be obliged to accept the transition rules, ComReg proposed that this would be:
- a condition of participation in the proposed 3.6 GHz award process and therefore any participant in the 3.6 GHz award process would be obliged to comply with the rules; and
 - a pre-condition necessary for an Existing Licensee to be eligible to apply for a TUL licence.
- 7.15 ComReg also clarified that if an Existing Licensee is not a bidder in the award process and further chooses not to accept the transition rules, then it would not be in a position to avail of the transition plan proposals but, for the avoidance of doubt, such an Existing Licensee would remain entitled to fully enjoy its existing 3.6 GHz rights of use until licence expiry.

7.3 Submissions in relation to Transition Proposal 1

- 7.16 Imagine acknowledged "*the fact that a transition will be required*" but then went on to state that it did not agree with the "*the views set out in Chapter 7*".
- 7.17 In its response to the general transitional issues, Imagine also made a licensing proposal that ComReg should make an administrative allocation of 160 MHz to it in the form of what it referred to as a "*type A national licence*" which it considered would "*minimise the effect of transitions required*". Imagine also proposed a type "*B Licence*" for other FWA operators in the remaining 190 MHz of spectrum in the 3.6 GHz band. ComReg's consideration of administrative assignment proposals is dealt with in Chapter 3 and this proposal is not considered further in this chapter.
- 7.18 Imagine also expressed the view that, in adopting the principles used in the MBSA transition plan, ComReg is persisting "*in conflating these markets together in implying that there are similarities when in fact there is none*".

- 7.19 Imagine set out a number of factors which it considers “*make the potential transition scenarios vastly different from the MBSA process*” as follows:
- “*In the MBSA process the transitions were between similar if not identical technology and services.*
 - *In the GSM/3G networks to which MBSA process related there would have existed already for most customers coverage if not from the same operator in multiple bands then from an alternative operator and the likelihood of a customer facing total loss of service was very remote.*
 - *The majority of transitions were frequency changes within the same band.*
 - *The equipment deployed at both base stations and customer devices was based on a single common set of GSM and 3G technology standards and would have been similar, if not identical among the operators affected.”*
- 7.20 Imagine argues that “*ComReg persists in characterising the issues of continuing to supply customers with their existing services post an award process as being 'of a short term transitory nature' yet it provides no evidence whatsoever to support this view*”.
- 7.21 Imagine stated that ComReg “*has for some reason significantly reduced the number of customers that may be affected by the loss of service*”. ComReg notes that updated subscriber figures for the 3.6 GHz band now indicate that there are 25,258 customers²²³, and ComReg does not propose to address this issue further in this chapter.
- 7.22 Finally, Imagine asserted that ComReg was assuming that existing FWALA operators would have an interest in continuing to provide their existing services if they fail to acquire sufficient rights of use of spectrum in the proposed award process. Imagine indicated that it regarded its existing services as a strategic investment and implied that it would have no interest in continuing to provide services in such circumstances.
- 7.23 The FWA 16 response did not specifically address Chapter 7 of Document 15/70 but, in relation to “Consumer Disruption”, questioned whether ComReg

²²³ This estimate is based on data from ComReg’s latest Q3 2015 Quarterly Report and a questionnaire circulated to all 3.6 GHz licensees in February 2015. This figure only includes subscriber figures for 10 of the 14 3.6 GHz FWALA operators because some of the 3.6 GHz FWALA licensees did not respond to the questionnaire.

ComReg notes that certain responses to Document 15/70 raised issues relating to FWA subscriber numbers and these matters are addressed in Annex 6 of this document.

accepted that “*consumers of WBB services in rural areas (often the only WBB service) will for a time be even worse off than at present for the period between such FWA operator’s shutdown and the realisation of political promises to replace the same with FTTH*” and this is something they state that ComReg “should do all in its power to avoid”.

- 7.24 The FWA 4 operators’ response sought to distinguish the likely transition process from that in the MBSA noting that:

“transition issues for Fixed wireless services are significantly different to mobile services. In the case of mobile services it may be presumed that the CPE devices (handsets) will incrementally be changed by the subscriber base over time to avail of the new services or bandwidth provided by the operator. In the case of FWA truck rolls may be required to each subscriber premises. In a situation where an operator is planning to upgrade equipment in a certain sector and where there may be several hundred subscribers in that sector then in order to provide continuity of service the operator would have to

1. *Upgrade the BS with the new equipment, transmitting in alternative "turning space" spectrum.*
2. *Implement a plan to replace equipment at each CPE premises, requiring truck rolls to each location*
3. *Once all CPE equipment had been replaced then turn off the "old" BS transmitter for that sector and retune the "new" BS equipment to the final frequency assignment.*
4. *The operator would have to continue steps 1-3 for all other sector transmitters at the BS.”*

- 7.25 Ripplecom agreed that all existing licensees should be involved in the process to determine a 3.6 GHz transition plan.

- 7.26 3IHL observed that: “*the outcome of the award process is unknown and difficult to anticipate and obviously it will be easier to develop a transition plan after the award is complete*” and that “*ComReg should not overburden the process of transition planning in advance of the award*”.

- 7.27 3IHL further noted that the two transitions involved in the MBSA transition process have shown that licensees can cooperate and act in good faith.

- 7.28 Eircom stated that it saw “*no reason why the principles should not be appropriate for any transition activities arising from the 3.6 GHz award process*”.

- 7.29 Vodafone agreed with the development of a transition project plan but expressed the view that the proposed award process should take place as soon as possible to enable transition activities to take place before the end date of the existing FWALA licences. It also stated that:

"Having a strict cut-off for current licences will ensure that Comreg do not generate incentive for current operators not to take part in the upcoming auction. There is also a risk that uncertainty in the position of current player's post 2017 would influence new bidders or even prevent them from bidding".

7.4 ComReg's analysis of submissions in relation to Transition Proposal 1

- 7.30 In relation to respondents' arguments that it is not appropriate to utilise the principles adopted in the MBSA transition plan for the development of a 3.6 GHz transition plan, ComReg notes that it is proposing to manage what could be a complex transition by adopting principles from what proved to be a successful mechanism. The transition issues to be overcome in both the MBSA and 3.6 GHz band award process are similar in that in both cases there is a need to transition to the outcome of the respective award process while minimising consumer disruption and not unnecessarily delaying the entry of new services.
- 7.31 ComReg is, however, aware that the specifics of a transition plan for the present award need to be determined having regard to the circumstances applicable to the 3.6 GHz band. In this regard, ComReg is cognisant of the differing legacy technology in this band and this will be a specific issue that will need to be considered when any transition plan is formulated. ComReg proposes that the specific details of any transition plan would be finalised after the outcome of the proposed award process is known, and that input from the Existing Licensees and winning bidders would form part of ComReg's considerations. Accordingly, ComReg is of the view that its transition proposals are designed having regard to the particular circumstances of the 3.6 GHz band.
- 7.32 In relation to Imagine's suggestion that ComReg provides no evidence as to the *"short term and transitory nature"* of existing FWA services post award, ComReg acknowledges that, until the award process is complete, it is unable to fully quantify the duration of any transition plan. That said, in formulating a transition plan, ComReg is aware of the need to transition to the outcome of the award process while minimising consumer disruption and not unnecessarily delaying the entry of new services. Further, ComReg notes that it has proposed TUL

licences of a longer duration than those required for the completion of the transition plan, potentially with a duration of 5 years from 1 August 2017.

- 7.33 In response to Imagine's suggestion that ComReg has assumed that Imagine or other Existing Licensees will continue to provide their existing services even if it does not win new rights of use, ComReg would point out that it has not made such an assumption and acknowledges that some Existing Licensees may choose not to continue to provide existing services post-award. Notwithstanding, ComReg notes that, in light of responses to Document 15/70 and, in particular Chapter 7 of same, it appears that at least some Existing Licensees are interested in how the TPL and TUL proposals are intended to work.
- 7.34 In relation to the view of the FWA 16 response regarding consumer disruption, ComReg is cognisant of this risk²²⁴ and notes that this is one of the reasons behind its suite of transition proposals.
- 7.35 In relation to the FWA 4 response regarding the transition process, ComReg is aware that customer premises equipment in use in the 3.6 GHz band is likely to be operator installed and may need to be modified or replaced by operators as part of their transition activities. Such considerations can impact the transition timeframes required and would need to be considered in combination with other factors such as minimising delays to the commencement of new spectrum rights and mitigating consumer disruption. ComReg cannot fully determine the extent of these issues at this time, but notes that such issues would likely form part of the discussions in forming the transition plan.
- 7.36 ComReg agrees with 3IHL's statement that the outcome of the award process is unknown and difficult to anticipate and obviously it will be easier to develop a transition plan after the award process is complete. In relation to 3IHL's contention regarding any overburdening of the process in advance of the award process, ComReg reiterates that it only proposed to collect information from Existing Licensees and set out the transition rules in advance of the award process. This should not, therefore, overburden the process of transition planning prior to the proposed award. Otherwise, ComReg notes 3IHL's support

²²⁴ For example, paragraph 7.8 of Document 15/70 noted that "[a]pproximately 27,000 broadband customers are served via the 3.6 GHz band and in some areas of Ireland the Existing Licensee may be the only provider of fixed wireless broadband services, or the provider of the best available broadband service, as other service providers (e.g. satellite broadband providers) may not be able to provide a sufficiently comparable service in terms of download/upload speeds, latency, price etc. These areas are likely to be in the more sparsely populated areas of Ireland and this characteristic increases the potential impact of disruption to existing consumer services in the 3.6 GHz band in these areas.'

for the transition plan, which is in line with support from Eircom and Vodafone in this regard.

- 7.37 In relation to Vodafone's view that transition activities should take place before the end date of the existing FWALA licences on 31 July 2017, ComReg notes that this depends on multiple factors including the timing of the award process in advance of the expiry date of FWALA licences. As soon as possible following the outcome of the award process it is ComReg's intention to commence the process to determine the transition plan and, in this regard, ComReg's notes that its transition proposals include provisions to facilitate transition activities in advance of 31 July 2017 should it be appropriate to do so. However, ComReg is also aware that some Existing Licensees may not wish to avail of ComReg's transition proposals and, for the avoidance of doubt, such Existing Licensees would remain entitled to enjoy their existing 3.6 GHz rights until licence expiry.
- 7.38 Finally, ComReg notes Vodafone's view in highlighting the risks involving any proposals which could create a perverse incentive by rewarding an Existing Licensee who did not take part in the award process. ComReg is of the view that an appropriate balance needs to be struck between enabling operators to carry out transition activities in a reasonable timeframe and the risk of creating such a perverse incentive. This should, largely, be addressed by the conditions being proposed for the transition (i.e. TPL or TUL) licences (e.g. duration, fees, etc.) and the fact that such licences cannot be used to deploy new, or enhanced, services.

7.5 Transitional Proposal 2: Transition Protected Licence (“TPL”)

Summary of ComReg's position in Document 15/70

- 7.39 As discussed in Chapter 7 of Document 15/70, where the transition plan activities of an Existing Licensee are likely to occur after the end date of the FWALA licensing scheme on 31 July 2017, ComReg proposed to allow Existing Licensees to apply for a TPL in order to facilitate the timely and orderly completion of their transition plan activities.
- 7.40 While ComReg stated that it would not know the extent of the transition plan activities at that point in time, ComReg believed that any TPL issued would be of a short-term nature in order to not unnecessarily delay the introduction of new licences. In addition, ComReg believed that the terms and conditions associated with a TPL would be the same as those in the existing licence with the exception

of the duration and the frequency assignment, which if needs be could be modified to facilitate the completion of the 3.6 GHz transition plan.

Submissions in relation to Transition Proposal 2

- 7.41 Imagine reiterated its points discussed under Transition Proposal 1 above.
- 7.42 Ripplecom supported the proposal for a TPL but stated that they presumed “*that under a transition license (protected or unprotected) that an operator will be authorised to continue to provide services using the current FWALA band plan, equipment and conditions of use*”.
- 7.43 3IHL supported the proposal for a TPL.
- 7.44 Eircom stated that:

“Clearly it will be necessary to ensure that the duration of such licences is the minimum necessary period reasonably required to undertake and complete transition activities. ComReg proposes that the terms and conditions of the Transition Protected Licences should be the same as existing licences with the exception of the duration and potentially amendment to frequency assignments. In eircom’s view consideration should also be given to amending the licence fees. Increased licence fees would incentivise the timely completion of the transition activities.”
- 7.45 Vodafone suggested that a TPL may be required but expressed the view that it should be for no longer than 6 months.

7.6 ComReg's analysis of responses to Transition Proposal 2

- 7.46 In response to Ripplecom’s point as outlined above, ComReg reiterates the position set out in paragraph 7.56 of Document 15/70 that the terms and conditions of the TPL “*would be the same as those in the existing licence with the exception of the duration*” and “*the frequency assignment which could be modified to facilitate the completion of the 3.6GHz transition plan*”. ComReg notes that, prior to knowing the outcome of the proposed award process and the determination of transition plan, it is unable to comment on the frequency assignment for a transition (TPL or TUL) licence. In addition, and given among other things the regional nature of licences being proposed for this award process, ComReg notes that it could also be appropriate to modify the footprint of an existing licence in any transition licence issued.

- 7.47 ComReg notes the MNOs' general support for the TPL and the varying views on the timescales proposed for the transition plan. In relation to Vodafone's suggestion that a TPL should be no longer than 6 months, ComReg notes that Vodafone has not provided any reasoning to support its view. ComReg reiterates its view, as outlined above, that until the award process is complete, it is unable to fully quantify the duration of any transition plan. However, ComReg is aware of the transition plan should not unnecessarily delay the commencement of new spectrum rights.
- 7.48 In relation to Eircom's view "*that increased licence fees would incentivise the timely completion of the transition activities*", ComReg notes that this is a different approach to that proposed by ComReg (i.e. liquidated damages) and that this proposal could have a similar effect. However, ComReg is of the view that its proposed approach of setting the TPL and TUL fees on the existing FWALA fees (noting that the TUL fees would be updated to present day prices), and utilising liquidated damages to take account of delays attributable to the TPL or TUL licensee as per the transition plan, is more appropriate and proportionate, as amongst other things:
- the setting of the TPL and TUL licence fees on the existing FWALA fees recognises that the terms and conditions proposed for both the TPL and TUL would be largely the same as that of the existing FWALA licences with some exceptions such as the duration, frequency assignment and potentially the licence footprint; and
 - the use of liquidated damages ensures that ComReg recovers its pre-estimated loss of licence fees from the party(s) causing the delay.
- 7.49 Finally, given the submissions generally received on Transition Proposal 2, and noting that TPLs are intended to facilitate operators adjusting to new spectrum assignments, ComReg clarifies that the TPL would only be made available to Existing Licensees who win new rights of use in a region that contains the service area of its existing licence. For Existing Licensees who do not win rights of use in a region that contains the service area of its existing licence, ComReg's Transition Proposal 3, a TUL, would be available. In addition, ComReg recognises that in certain circumstances it can be appropriate to allow a holder of a TPL to also apply for a TUL to commence at the expiry of its TPL (e.g. the amount of spectrum in the new spectrum rights of use is less than that in the TPL).

7.7 Transitional Proposal 3: A Transition Unprotected Licence (“TUL”)

Summary of Document 15/70

- 7.50 In Document 15/70, ComReg expressed the view that it is appropriate to propose transitional measures to address the unique circumstances identified in relation to the 3.6 GHz band which are of a short-term transitory nature and could raise issues in the context of ComReg's objectives in relation to:
- maximising benefits to users/safeguarding competition; and
 - ensuring the efficient use of spectrum during this transitional period.
- 7.51 ComReg stated that it is conscious that any regulatory mechanism proposed must not provide perverse incentives for the Existing Licensees in terms of:
- the nature and extent of their participation in the proposed award; or
 - coming to a market-based resolution of the transition scenario identified.
- 7.52 In addition, ComReg stated that it is conscious that its proposed regulatory measure must also be permissible in law, including by furthering ComReg's statutory objectives and according with its regulatory principles. ComReg stated that it had taken these considerations into account in designing the transition proposal outlined below.
- 7.53 At a high level, ComReg's proposal consisted of allowing each Existing Licensee, under certain pre-conditions, the possibility of obtaining a TUL on the same terms and conditions as its existing licence (with the exception of the items discussed below) for a maximum period of not more than 2 to 5 years with the exact upper limit still to be decided. The pre-conditions for eligibility and conditions are outlined below.

Necessary preconditions

- 7.54 To obtain a TUL, ComReg proposed that the preconditions would be that the Existing Licensee:
- has agreed to be bound by the transition plan arrangements and rules for the 3.6 GHz band;²²⁵ and

²²⁵ ComReg acknowledges that, at paragraph 7.50 of Document 15/70, it indicated that an Existing Licensee who did not agree to be bound by the transition plan could avail of a Transition Unprotected Licence while, at

- must hold a General Authorisation.

Conditions

7.55 ComReg was of the preliminary view that the following conditions would attach to a TUL:

- in general, the same terms and conditions as the existing licence (with some exceptions);
- it would be issued on a non-protected non-interference basis;
- it would be issued with a variation, as necessary, of the frequency assignment in the 3.6 GHz band. Two options were discussed, with one option limiting the TUL to the same frequency assignment as in its existing licence, and the other option allowing the Existing Licensee the possibility of choosing and modifying its TUL frequency assignment;
- it would be of a limited duration. ComReg proposed a maximum duration of 2 to 5 years. In addition, ComReg noted that a TUL could be terminated before this maximum duration, linked to certain events such as the introduction of fixed services of a comparable nature being provided in the service area of the Existing Licensee, or services in the 3.6 GHz band being provided by a new licensee in the same spectrum and in the same service area of the Existing Licensee; and
- there were various options for setting the licence fees, including (i) using the existing FWALA fees, (ii) updating the Existing FWALA fees to present day prices, or (iii) using a pro-rata adjustment of the fees paid for new liberalised spectrum rights. ComReg stated that it was of the preliminary view that it would be appropriate to use option (ii) as the FWALA fees were set almost 12 years ago in 2003 and so do not reflect present day prices.

7.8 Submissions in relation to Transition Proposal 3

7.56 Both the Joint FWA 4 and Ripplecom agreed with Transition Proposal 3, subject to a TUL being protected from “*interference by unlicensed transmission*”.

paragraph 7.60, it stated that a precondition to apply for a Transition Unprotected Licence would be agreeing to be bound by the transition plan arrangements and rules for the 3.6 GHz band. ComReg confirms that paragraph 7.60 correctly reflects its views in this regard.

- 7.57 Ripplecom suggested “*that under a transition license (protected or unprotected) that an operator will be authorised to continue to provide services using the current FWALA band plan, equipment and conditions of use*” and that “*the specific frequency assignment should be arbitrated by ComReg on a case by case basis prior to the licence issue*”. In this regard they pointed out that there “*are significant differences in the frequency agility of 3.6 GHz equipment*” giving a typical range of contiguous frequencies “*within a 30 or 40 MHz section of band*”. Ripplecom went on to suggest that the TUL should “*not necessarily have a maximum term*” and that “*ComReg should allow flexibility in this regard and determine when and if a licence should be terminated based on market conditions*” and that the TUL licensee should be given a “*minimum of 18 months’ notice of the termination of the licence*”. In a similar manner they suggested that, as “*DCENR is proposing to provide state aid to provide fibre services to each premises*”, there should be no fee increase from the current FWALA prices for a TUL.
- 7.58 Finally, Ripplecom summarised its view on the practicalities involved in a FWALA upgrade process. In particular, this was in relation to truck rolls for Consumer Premises Equipment replacement and the possibility of simultaneous frequency assignments. As such, they argued that the MBSA transition time frame is not feasible.
- 7.59 3IHL commented on the proposed maximum duration of a TUL seeing merit in the proposal, but arguing that “*a 5 year term is excessive. The maximum permitted should be 2 years and must be on a non- interference unprotected basis*”.
- 7.60 Eircom agreed with ComReg’s view that a TUL should not create a perverse incentive regarding participation in the proposed award, or in terms of coming to a market-based resolution of the transition scenario.
- 7.61 That said, Eircom gave conditional support to the proposal, contingent on the following principles:
- TULs should only be available to Existing Licensees who participated in the award process “*and failed to acquire sufficient spectrum to maintain an existing fixed wireless broadband service*”;
 - the Existing Licensee is the sole provider of broadband in the area;
 - a maximum duration of 2-5 years;

- that the TUL should be “*Terminated rapidly following deployment of alternative means of supply of fixed broadband*” to the area;
 - the frequency assignment should be the same as the existing licence because, if alternative services had been deployed, there should be no requirement for such a licence; and
 - fees based on the outcome of the award process are the only justifiable approach.
- 7.62 Vodafone asserted that it did not agree with a TUL as it believed it “*compromises the auction which should generate the best option for customers*”, and argued that “*this could also provide incentives to ComReg to artificially set higher minimum prices in the auction*”.

7.9 ComReg's analysis of responses to Transition Proposal 3

- 7.63 In relation to the comments made in the Joint FWA 4 submission, ComReg would point out that the focus should be not on ‘unlicensed transmission’ but unauthorised transmission (which excludes legitimately operating equipment, for example under Licence Exemptions or Industrial, Scientific and Medical usage). In general and in line with its statutory objectives and duties, ComReg will investigate and take appropriate action in respect of any unauthorised operations in this and any other band.
- 7.64 In relation to Ripplecom’s comment that “*the specific frequency assignment should be arbitrated by ComReg on a case by case basis prior to the licence issue*” and that there “*are significant differences in the frequency agility of 3.6 GHz equipment*” giving a typical range of contiguous frequencies “*within a 30 or 40 MHz section of band*”, ComReg would reiterate that its proposal envisaged ComReg setting the details of the transition plan following the outcome of the proposed award process and after having considered any transition project proposals from Existing Licensees and winning bidders. This process allows the Existing Licensees to inform ComReg of any technology constraints associated with its existing systems and such details can be then taken into consideration by ComReg in the setting of the specific frequency assignments in the transition plan. The transition plan encompasses the full suite of licensing tools available to ComReg including the amendment of existing licences before 31 July 2017, and the issue of TPLs and TULs.

- 7.65 In relation to Ripplecom's comment that TULs should not necessarily have a maximum term, ComReg notes that TULs are intended as a tool to facilitate transition rather than an alternative to the proposed award process for the long term grant of rights of use. In accordance with its licensing practice generally, ComReg remains of the view that it is appropriate to specify an absolute date for the licence expiry of TULs.
- 7.66 In relation to Ripplecom's proposal for an 18 month termination process of a TUL, ComReg notes that Ripplecom has provided no material to support this view and, in the absence of such, ComReg is of the view that such a period is likely to be excessive in light of the inherent short term nature of such licences. Such a lengthy termination process could also significantly delay the roll-out of new advanced services using this spectrum by a new licensee.
- 7.67 As discussed earlier, following the outcome of the award process ComReg proposes that the specific circumstances of the Existing Licensees (including any prospective TUL licensees who have agreed to abide by the transition rules) and new licensees would be considered by ComReg in determining the transition plan. ComReg envisages that the transition plan would provide a reasonable time period to the Existing Licensees to transition to the outcome of the award process and, in addition, it would assist ComReg in identifying the appropriate commencement date of new spectrum rights on a per spectrum block and per region basis.
- 7.68 Noting that a reasonable time period would already have been provided to Existing Licensees (including TUL Licensees) in the transition plan, ComReg is of the view that any subsequent notification period from a new licensee to a TUL licensee should be of a short duration. In relation to this notification period, ComReg observes that:
- a notification from a new licensee could be issued during the implementation of the transition plan, such that any TUL licensee would have to vacate the specific spectrum block and region once the transition activities for that spectrum block and region have been completed in line with the transition plan. This would facilitate the timely deployment of services by a new licensee.
 - for the avoidance of doubt, should a spectrum block be unsold in a particular region following the proposed award, a TUL licensee would clearly not be subject to notification from a new licensee for that particular spectrum block in that region;

- 7.69 ComReg notes the views of Eircom and 3IHL on the duration of a TUL. Noting the transition proposals have been designed to ensure that there is no undue delay in the roll-out of new services by a new licensee, and given the potential benefits associated with the TUL proposal in terms of maximising the benefits to end users, ComReg is of the view that all TULs would expire on or before 31 July 2022 (i.e. a maximum duration of 5 years for TULs that commence on 1 August 2017). ComReg notes that TULs may also expire prior to 31 July 2022, for example in circumstances where there is no suitable spectrum for licensing following notification from a new licensee that it intends to provide services in spectrum and area licensed to a TUL licensee.
- 7.70 In relation to Eircom's conditional views on the TUL proposal:
- ComReg disagrees with Eircom's suggestion that only Existing Licensees who take part in the award process should be eligible for a TUL. As the transition issues which the TUL aims to address (i.e. maximising benefits to users and ensuring the efficient use of spectrum) may be experienced by all Existing Licensees, ComReg believes that the TUL should be available to all Existing Licensees, and not just those who participated in the award process, provided certain pre-conditions are met including agreeing to be bound by the transition rules;
 - ComReg would reaffirm its view that it is proportionate to issue a TUL even when the Existing Licensee is not the sole supplier of broadband in a given area as this proposal would reduce the risk of consumer disruption and increase the efficient use of spectrum by allowing the TUL licensee to use spectrum that might otherwise remain fallow;
 - Similar to the above, ComReg is of the view that an alternative supply of fixed broadband to an area is not an appropriate trigger for the termination of a TUL. An appropriate trigger for the termination of a TUL would be the licence expiry date of 31 July 2022 or an earlier licence expiry date if it is not possible to assign a frequency to the TUL (e.g. in the area of the TUL, all 3.6 GHz frequencies are licensed to TPL licensees or new licensees who have notified ComReg of their intention to provide services);
 - ComReg disagrees with Eircom's suggestion that the frequency assignment should be the same as that in the existing licence because, among other things, the TUL proposal aims to maximise benefits to users and ensure spectrum efficiency. Assigning a frequency assignment to a TUL that is different to the frequency assignment in its existing licence can further these

objectives, e.g. if it is possible for the TUL to provide services in spectrum that otherwise would remain fallow. In addition, ComReg notes that a new licensee could use the 3.6 GHz band to provide a variety of services other than those services provided under a TUL (e.g. mobile or backhaul); and

- Finally, in relation to fees, ComReg is of the view that it would be inappropriate to set the fees based on the outcome of the award process as the proposed terms and conditions of the TUL licence would not allow the provision of new liberalised services. ComReg remains of the view that it is appropriate to set the TUL licence fee on the basis of the existing FWALA fees, updated to present day prices.

7.71 In relation to Vodafone's comments, ComReg is of the view that the terms and conditions for the TUL should mitigate its concerns, i.e. the limited duration of a TUL, the inability to provide new liberalised services, the unprotected nature of the licence which, following completion of the transition plan, would require the TUL to cease using frequencies assigned to a new licensee following a reasonable notification period from the new licensee that it intends to provide services with those frequencies, etc.

7.10 ComReg's updated Transition proposals

- 7.72 Following consideration of respondents' views as outlined above, ComReg remains of the view that transitional arrangements will be needed. Similar to its considerations in Document 15/70, ComReg does not believe that market mechanisms alone would be likely or sufficient to address all of the potential transitional issues.
- 7.73 ComReg therefore remains of the view that all of the tools that it proposed to address transitional issues in 15/70 remain appropriate, namely:
- Transition Proposal 1: the setting of transition rules and the formulation and implementation of a transition plan.
 - Transition Proposal 2: the Transition Protected Licence.
 - Transition Proposal 3: the Transition Unprotected Licence.

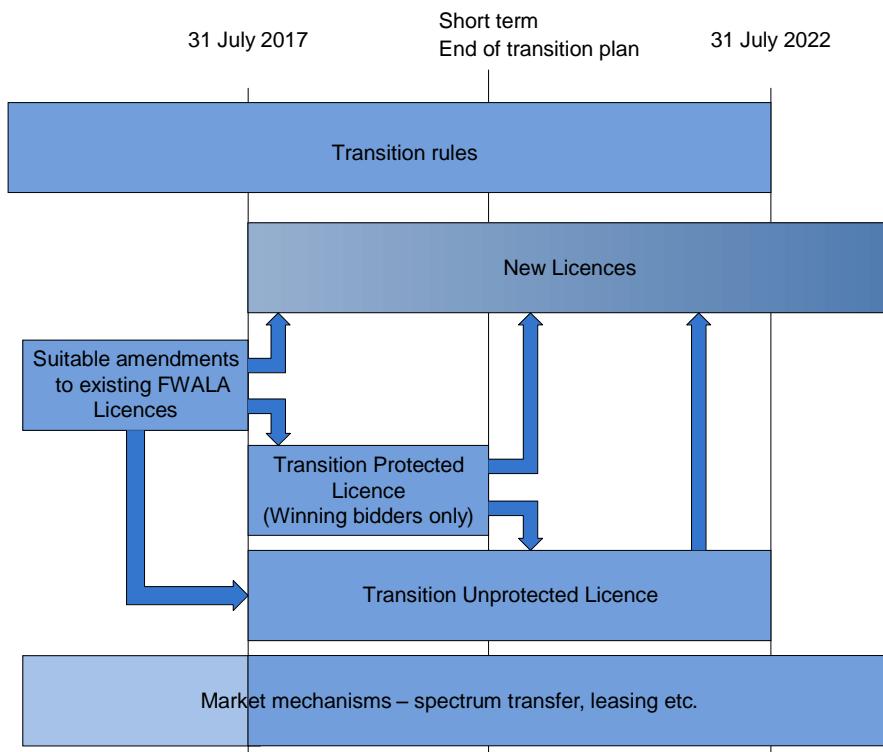


Figure 7: ComReg's updated transition proposals and other key tools.

- 7.74 ComReg acknowledges that, depending on the outcome of the proposed award process and the difficulties faced by existing licensees and winning bidders, some, or all of these tools may not be required. The following sets out ComReg's updated transition proposals in light of the above consideration of responses received to Document 15/70.

7.11 Transition Proposal 1: The setting of transition rules and the formulation and implementation of the transition plan

- 7.75 To determine the transition rules and formulate a transition plan, a number of steps are likely to be required including:
- the collection of information from Existing Licensees to inform ComReg's transition proposals, rules and transition plan.
 - the setting of transition rules in advance of the award process.
 - the determination and implementation of a transition plan, including the potential requirement for TPLs and TULs to be issued.

Collection of information from Existing Licensees to inform ComReg's transition proposals, rules and transition plan

7.76 The precise nature and extent of transition activities for an Existing Licensee (including the time required by an Existing Licensee to complete its transition to the outcome of the award process) will only be known following the outcome of the proposed award. It is nevertheless important for ComReg to obtain information from Existing Licensees (and potentially other interested parties) in advance so as to inform ComReg's transition proposals and rules for the 3.6 GHz band and to enable it to act in a timely manner.

7.77 Accordingly, ComReg proposes that:

- between now and the start of the proposed award process, all Existing Licensees consider and, where practicable, make preparations for transition activities which might be required of them. There are a number of options²²⁶ that an Existing Licensee can consider in seeking to mitigate the scale and time of any transition activity required; and
- during this consultation process and prior to the award process itself, ComReg will, in the first instance, request information from Existing Licensees on transition considerations relevant to them which may include but is not limited to the frequency agility of equipment and the impact this may have on the likely transition activities required and timeframes.

The setting of transition rules in advance of the award process and the process to determine a transition plan.

7.78 In order to define a 3.6 GHz transition plan, it is first necessary to define transition rules in advance of the award process which would oblige parties abiding by these rules to fully participate, in good faith, and agree with the terms set out in the subsequent transition plan. The transition rules proposed below would define:

- the parties who would be obliged to comply with the transition rules;
- the elements of a transition plan;

²²⁶ Aside from understanding the frequency agility and time potentially required to modify the existing technology, options available to Existing Licensees to minimise the impact on existing consumer services include providing such services using licence-exempt spectrum or alternative spectrum bands, and/or by concluding commercial agreements with other operators (including winners of new 3.6 GHz rights of use) such that the Existing Licensee could continue to provide a service (e.g. transfer or leasing arrangements).

- the process for defining a transition plan; and
- consequential outcomes such as the delayed commencement of a new licence.

All bidders (including Existing Licensees and winning bidders) in the proposed 3.6 GHz award process and all Existing Licensees who apply for a TUL would be obliged to comply with the transition rules as relevant to them

- 7.79 In advance of the award process, ComReg would set out transition rules for the award process.
- 7.80 ComReg proposes that the transition rules would apply to:
- all bidders (including Existing Licensees and winning bidders) in the 3.6 GHz award process, where a condition of entry to the proposed 3.6 GHz award process would be the acceptance of the transition rules; and
 - persons applying for a TUL, where the acceptance of the transition rules would be a pre-condition for applying for same.
- 7.81 If an Existing Licensee is not a bidder in the award process and further chooses not to apply for a TUL, then this Existing Licensee would not be obliged to comply with the transition rules. For the avoidance of doubt, such an Existing Licensee would remain entitled to fully enjoy its existing 3.6 GHz rights of use until licence expiry.
- 7.82 ComReg encourages all Existing Licensees to fully participate in the process to determine a 3.6 GHz transition plan as this would give each Existing Licensee the opportunity of providing transition proposals to ComReg that reflect the specifics of its transition activities. This, in turn, would enable the formulation of a well-informed and robust transition plan thereby facilitating an orderly and timely transition.

The elements of a transition plan

- 7.83 A transition plan for the 3.6 GHz band is likely to involve:
- the identification of all transition activities to be undertaken by the Existing Licensees and the order of each activity in the 3.6 GHz band;
 - the setting of milestone dates for each transition activity identified;
 - where the transition activities of one Existing Licensee is dependent upon the transition activities of another, this will be clearly identified in the

transition plan such that any consequential delays by one party due to the delay of another party can be clearly attributable to the responsible party;

- a robust and transparent mechanism to allow ComReg (including any of its agents or servants), Existing Licensees, winners of 3.6 GHz rights of use in the award process and other interested parties to monitor compliance with the transition activity milestones and deliverable dates (subject to non-disclosure of properly confidential information);
- the completion of transition activities prior to a deadline date as set by ComReg in the transition plan; and
- attribution and acceptance of liability for liquidated damages payable by the Existing Licensee(s), TPL licensee and/or TUL licensee in the event of non-compliance with the transition activity milestones identified in the transition plan, where such Existing Licensee(s)', TPL licensee's or TUL licensee's actions or omissions caused the non-compliance with the relevant milestone date.

The process to determine a 3.6 GHz transition plan

7.84 ComReg proposals would involve:

- the setting of transition arrangements and rules by ComReg in advance of the award process, which among other things could specify or indicate an end-date for the completion of specific transition activities in advance of determining the transition plan;
- the opportunity for Existing Licensees and winning bidders to collectively formulate an industry transition project proposal for ComReg to consider, and in the absence of collective formulation, to make one, or more submissions to ComReg as to the appropriate provisions for such a plan;
- the finalisation of the transition plan, containing milestones and completion dates, by ComReg having considered the proposal(s) received, if any;
- the subsequent monitoring and reporting against the progress of the relevant transition activities against these milestones; and
- the completion of all of the transition activities by the Existing Licensees, TPL licensees and TUL licensees in accordance with the milestones determined by ComReg as set out in the transition plan.

The potential for delays to the commencement date of new spectrum rights of use, the acceptance of liquidated damages and the potential to issue spectrum rights for partial regions

7.85 As noted at paragraph 7.53 of Document 15/70, and as a consequence of the transition plan activities, it is possible that some TPLs or TULs could delay the availability of spectrum rights to the winning bidders in the 3.6 GHz award process.²²⁷ To address this possibility, ComReg proposes that:

- bidders in the proposed award process would be obliged to accept that the commencement date of any new spectrum rights of use won in the 3.6 GHz award process could be delayed due to the transition plan activities of Existing Licensees, TPL licensees or TUL licensees. ComReg proposes to address any such delayed commencement, including envisaging a pro-rata refund of licences fees in a similar manner to that adopted in the MBSA process²²⁸; and
- each Existing Licensee, TPL licensee and TUL licensee would be obliged to agree to the prospect of paying liquidated damages to ComReg in respect of non-compliance by it with the transition plan. In ComReg's view, the paying of liquidated damages and the prospect of such payments are appropriate to (i) reflect any potential losses to ComReg and (ii) to incentivise the completion of transition activities in an effective and timely manner.

7.86 Noting the local area nature of the existing FWALA licences and the issue of a TPL or a TUL in respect of one, or more, such areas, ComReg observes that the transition plan activities of such licensees may only cover a small proportion of a region in which new spectrum rights have been won. In such instances, ComReg reserves the right to issue a new spectrum right for the remainder of that region thereby facilitating a new licensee in deploying services earlier²²⁹. To compensate the new licensee for the issue of spectrum rights for less than the entire region, ComReg proposes that any TPL or TUL fees paid to ComReg for

²²⁷ In the MBSA process a short-term licence extension was provided to two of the existing GSM licensees for a maximum period of 3 months beyond the 1 February 2013 commencement date of TS1 (see Document 13/05). This resulted in a delay in the availability of some the new spectrum rights of use issued.

²²⁸ See section 2.2.6 of ComReg Document 12/52

²²⁹ Following the completion of the transition plan activities, ComReg would issue spectrum rights for the full of the region.

the relevant duration be transferred to the new licensee affected.²³⁰ Where the area of a TPL or TUL spans (i) two or more regions or (ii) the frequency ranges assigned to two or more new licensees, ComReg proposes to apportion such fees between the affected licensees. For the avoidance of doubt, ComReg reserves the right to recover liquidated damages from a TPL or TUL licensee in accordance with the transition rules and transition plan.

7.12 Transition Proposal 2: The Transition Protected Licence

- 7.87 Where an Existing Licensee is a winning bidder of new rights of use in a region that contains the service area of its existing licence, and the transition activities associated with this existing licence are likely to occur after the end date of the FWALA licensing scheme on 31 July 2017, ComReg proposes to allow such Existing Licensees to apply for a Transition Protected Licence in order to facilitate the timely and orderly completion of its transition activities in line with the transition plan.
- 7.88 While ComReg does not know the extent of the transition plan activities at this point in time, ComReg remains of the view that any Transition Protected Licence would be of a short-term nature in order to avoid unnecessary delay to the introduction of new licences.
- 7.89 In addition, ComReg proposes that, in general terms, the terms and conditions of the TPL would be the same as those in the existing licence with the exceptions of the duration, the frequency assignment and licence footprint which may be appropriately modified in order to facilitate the completion of the 3.6 GHz transition plan.
- 7.90 ComReg notes that in this case any equipment used by Existing Licensees should ideally be able to retune to other parts of the 3.6 GHz band. In addition, and as part of ComReg's information gathering exercise, any constraints in this regard should be expressly identified to ComReg for its earliest consideration.
- 7.91 ComReg would also point out that, prior to the outcome of the proposed award process and the finalisation of the transition plan, it is unable to assess the requirement and extent of any modifications to a frequency assignment or a licence footprint.

²³⁰ This is, in part, because the area affected will be unlikely to comprise an entire region and it would be difficult to calculate such rebates and, in part, to encourage the use of market mechanisms.

7.13 Transition Proposal 3: Transition Unprotected Licence

7.92 This proposal consists of allowing an Existing Licensee (whether or not it wins rights of use in the proposed award process) under certain pre-conditions to obtain a Transition Unprotected Licence ('TUL') on the same terms and conditions as its existing licence (with the exception of the items discussed below). The purpose of the TUL is to:

- facilitate the timely and orderly completion of the Existing Licensee's transition activities in accordance with the transition plan; and
- maximise the benefits to users and ensure the efficient use of spectrum during the transitional period.

Necessary preconditions

7.93 To be eligible to apply for a Transition Unprotected Licence, ComReg proposes the following preconditions, namely that the applicant:

- is an Existing Licensee or a TPL licensee in the service area for which it is making an application;
- has agreed to be bound by the transition rules and transition plan for the 3.6 GHz band; and
- must hold a General Authorisation.

Conditions

7.94 In applying for a TUL licence, the applicant would only be able to obtain a TUL in the same local area, for the same amount or a lower amount of spectrum rights, and for the equipment with the same functionality as currently licensed under its existing FWALA licence. Where the applicant is also a holder of new spectrum rights or a TPL, the applicant would also be eligible to apply for a TUL provided the combined spectrum holdings under its new 3.6 GHz licence, the TPL licence and the TUL do not exceed the total amount of spectrum in its existing licence.

7.95 In applying for a TUL licence, the applicant would acknowledge that the TUL would be issued on the same terms and conditions as the existing licence with the following exceptions:

- it would be issued on a non-protected non-interference basis, noting that it would be protected from unauthorised systems, that is to say those not operating legally;
 - the frequency assignment would be varied by ComReg as necessary;
 - the TUL would expire on or before 31 July 2022 depending upon, among other things, the availability of suitable spectrum;
 - the TUL may be offered, or amended, with a modified licence footprint; and
 - licence fees would be equivalent to the existing FWALA fees updated to present day prices using the overall Consumer Price Index (CPI). Noting that the FWALA fees were set in March 2003, a CPI adjustment of 17.29% would be applied to the FWALA fees to update them to present day prices²³¹.
- 7.96 Following the completion of the transition plan for a particular spectrum block and region, it is ComReg's intention to issue spectrum rights for that spectrum block and region to the new licensee. Should a TUL also encompass that same spectrum block and geographic area, then following a reasonable notification period, which ComReg believes to be of a short-term nature, the TUL licensee would be required to cease using the spectrum assigned to the new licensee. Should no other suitable spectrum be available for the TUL licensee, the TUL would then expire.

7.14 Preparatory Licences

- 7.97 In advance of the commencement date of any new licences issued in the 3.6 GHz band, and in preparation for the provision of new services, winning bidders may wish to carry out preparations to their network to install or test equipment. Such preparations may require the winning bidder to keep and have possession of apparatus for wireless telephony, and unless licence exempted, a Wireless Telephony licence is required for such preparations.
- 7.98 Similar to the preparatory licences for the 800 MHz, 900 MHz and 1800 MHz bands as provided for in S.I. 251 of 2012, ComReg proposes to make preparatory licences available to all winners of liberalised spectrum rights in the 3.6 GHz band. Such licences would enable the installation of networks and

²³¹ This CPI adjustment is based on the change in the overall CPI index between March 2003 and November 2015 using the December 2001 base reference data available on the Central Statistics Office (CSO) website.

associated equipment but would not allow any wireless telephony transmissions. ComReg proposes that the preparatory licences for the 3.6 GHz band would be available as soon as practicable following completion of the proposed award process and would operate until the commencement date of new liberalised licences.

- 7.99 In addition, winning bidders would be able to apply for a wireless test or trial licence.

Chapter 8

8 Draft Decision

This chapter sets out, in draft form, a decision document based on the positions set out by ComReg in the preceding chapters and their supporting annexes.

Draft Decision

1. DEFINITIONS AND INTERPRETATION

1. In this Decision, save where the context otherwise admits or requires:

“2008 3.6 GHz EC Decision” means European Commission Decision 2008/411/EC;²³²

“2014 3.6 GHz EC Decision” means European Commission Decision 2014/276/EU;²³³

“3.6 GHz Band” means spectrum in the range 3400 MHz to 3800 MHz;

“3.6 GHz Band Liberalised Use Licence” means a licence of the type set out in draft form in Schedule 1 to the 3.6 GHz Band Licence Regulations;

“3.6 GHz Band Licence Regulations” means the Wireless Telegraphy (Liberalised Use, Preparatory and Transitional Licences in the 3.6 GHz Band) Regulations 2016, a draft form of which is set out in Annex [X] to ComReg Document 16/[XX] [the Draft Information Memorandum];

“3.6 GHz EC Decision” means the 2008 3.6 GHz EC Decision, as amended and supplemented by the 2014 3.6 GHz EC Decision;

“Authorisation Regulations” means the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations, 2011 (S.I. No. 335 of 2011);

²³² The 2008 3.6 GHz EC Decision of 21 May 2008 on the harmonisation of the 3400-3800 MHz frequency and for terrestrial systems capable of providing electronic communications services in the Community. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:144:0077:0081:EN:PDF>.

²³³ The 2014 3.6 GHz EC Decision of 2 May 2014 on amending the 2008 3.6 GHz EC Decision 2008/411/EC on the harmonisation of the 3400-3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0276&from=EN>.

“Award Spectrum” means the 3.6 GHz Band excluding the Guard Band Spectrum and the State Services Spectrum;

“Base Price” means the price to be paid by a Winning Bidder for the package of Lots allocated to it in the main stage of the competitive selection procedure described herein;

“Communications Regulation Act 2002” means the Communications Regulation Act, 2002, (No. 20 of 2002), as amended;

“ComReg” means the Commission for Communications Regulation, established under section 6 of the Communications Regulation Act 2002;

“Existing Licensee” means a person holding one, or more, licences issued pursuant to the Wireless Telegraphy (Fixed Wireless Access Local Area Licence) Regulations, 2003 (S.I. No. 79 of 2003), as amended by the Wireless Telegraphy (Fixed Wireless Access Local Area Licence) (Amendment) Regulations, 2003 (S.I. No. 530 of 2003), which will expire on 31 July 2017;²³⁴

“Fixed Frequency Lot” means a right of use in respect of spectrum in the range 3410 MHz to 3435 MHz which will be made available as a single frequency-specific lot per Region;

“Frequency Generic Lot” means a right of use in respect of 1 x 5 MHz block of spectrum in the range 3475 MHz to 3800 MHz, which bidders can bid for in the main stage of the competitive award process, with the specific frequencies being allocated to such lots in the assignment stage;

“Framework Regulations” means the European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011, (S.I. No. 333 of 2011);

“Guard Band Spectrum” means spectrum in the range 3400 to 3410 MHz;

“Information Memorandum” means the information memorandum which ComReg intends to publish in due course, and **“Draft Information Memorandum”** means the draft information memorandum published by ComReg on [XX] 2016 under ComReg Document Number 16/[XX];

“Lot” means a Frequency Generic Lot or a Fixed Frequency Lot;

²³⁴ See ComReg Document 10/29.

“Minister” means the Minister for Communications, Energy and Natural Resources;

“Preparatory Licence” means a licence of the type set out in draft form in Schedule [XX] to the 3.6 GHz Band Licence Regulations;

“Qualified Bidder” means an applicant who, following consideration of its application by ComReg, has been informed, in accordance with the requirements of the Information Memorandum that its application is compliant and that it is entitled to participate in the competitive selection procedure described herein;

“Region” means a region as identified in Figure 1 of this draft decision;

“RIA” means Regulatory Impact Assessment;

“State Services” means State Services provided using the State Services Spectrum;

“State Services Spectrum” means spectrum in the range 3435 to 3475 MHz;

“Transitional Licence” means a Transition Protected Licence or a Transition Unprotected Licence;

“Transition Protected Licence” means a licence of the type set out in draft form in Schedule [XX] to the 3.6 GHz Band Licence Regulations;

“Transition Unprotected Licence” means a licence of the type set out in draft form in Schedule [XX] to the 3.6 GHz Band Licence Regulations;

“Winning Bidder” means a Qualified Bidder that wins at least one Lot in the competitive selection procedure described herein; and

“Wireless Telegraphy Act 1926” means the Wireless Telegraphy Act, 1926 (No. 45 of 1926), as amended.

2. DECISION-MAKING CONSIDERATIONS

2. In arriving at its decisions in this document, ComReg has had regard to:

- i. the contents of, and the materials and reasoning referred to in, as well as the materials provided by respondents in connection with, the below-listed ComReg documents:
 - a) 14/101 (insofar as relevant to the 3.6 GHz band);
 - b) 14/126 (insofar as relevant to the 3.6 GHz band);
 - c) 15/70;

- d) 15/140;
 - e) 16/XX [forthcoming Draft Information Memorandum]; and
 - f) 16/YY [document to which the final decision will be attached];
- ii. the consultants' reports commissioned, and the advice obtained by ComReg in relation to the subject-matter of the documents and materials listed above;
 - iii. the powers, functions, objectives and duties of ComReg, including, without limitation those under and by virtue of:
 - a) the Communications Regulation Act 2002, and, in particular, sections 10, 12 and 13 thereof;
 - b) the Framework Regulations, and, in particular, Regulations 13, 16 and 17 thereof;
 - c) the Authorisation Regulations, and, in particular, Regulations 9, 10, 11, 12, 15, 16, 17, 18(1)(c) and 19 thereof;
 - d) Regulation 6(1) of the Access Regulations;
 - e) the 3.6 GHz EC Decision;
 - f) Sections 5 and 6 of the Wireless Telegraphy Act, 1926; and
 - g) the applicable Policy Directions made by the Minister under Section 13 of the Communications Regulation Act 2002,

and, noting that it has:

- a) given all interested parties the opportunity to express their views and make their submissions in accordance with Regulation 11 of the Authorisation Regulations and Regulation 12 of the Framework Regulations; and
- b) evaluated the matters to be decided, in accordance with ComReg's RIA Guidelines (ComReg Document 07/56a) and the RIA Guidelines issued by the Department of An Taoiseach in June, 2009,

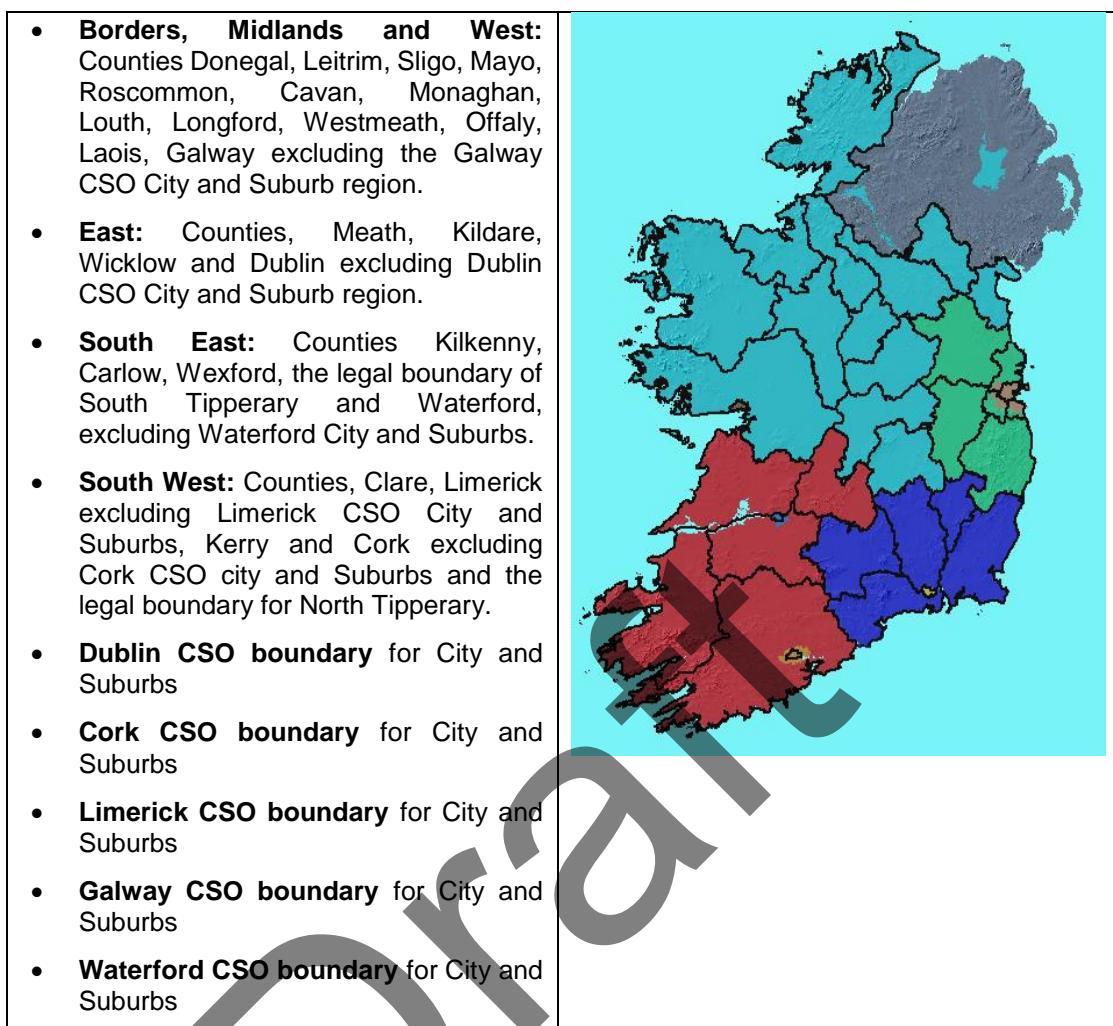
as set out in the various chapters of Document 16/[XX] [document to which the final decision will be attached] and their supporting annexes, ComReg has decided:

3. DECISIONS

- 3.1 to continue to licence the operation of the State Services, which constitute an existing use, within the meaning of Article 1 of the 3.6 GHz EC Decision;
- 3.2 to implement a guard band between 3400 MHz and 3410 MHz to give appropriate protection to systems in adjoining bands, as provided for by Article 2(2) of the 3.6 GHz EC Decision;
- 3.3 to specify a time division duplex mode of operation (i.e. band plan) in the frequency range 3400 MHz to 3600 MHz²³⁵, without prejudice to the continued operation of the State Services²³⁶;
- 3.4 subject to obtaining the consent of the Minister, to the making of the 3.6 GHz Band Licence Regulations pursuant to section 6 of the Wireless Telegraphy Act 1926, prescribing relevant matters in relation to 3.6 GHz Band Liberalised Use Licences, Preparatory Licences and Transitional Licences, including prescribing the form of the licences concerned, their duration and the conditions and restrictions subject to which they are granted;
- 3.5 under section 5 of the Wireless Telegraphy Act 1926, and pursuant to the 3.6 GHz Band Licence Regulations, to grant a limited number of individual rights of use for radio frequencies, by way of 3.6 GHz Band Liberalised Use Licences, in respect of the Award Spectrum;
- 3.6 to select those parties who will be eligible to be granted 3.6 GHz Band Liberalised Use Licence(s) by means of a competitive selection procedure which is more particularly described in Document 16/[XX] [document to which the final decision will be attached] and which will be further particularised in the Information Memorandum;
- 3.7 to make rights of use in respect of the Award Spectrum available on a regional basis as set out in Figure 1 below:

²³⁵ This is the 'preferred' duplex mode of operation identified in paragraph A.1 of the Annex to the 3.6 GHz EC Decision.

²³⁶ In respect of spectrum in the range 3600 MHz to 3800 MHz, the 3.6 GHz EC Decision specifies time division duplex mode of operation so ComReg has no discretion in this regard.

**Figure 1: Regions**

- 3.8 to make rights of use available in the form of Frequency Generic Lots per Region;
- 3.9 to make rights of use available in the form of a Fixed Frequency Lot per Region;
- 3.10 to incorporate into the competitive selection procedure, *inter alia*, the following elements:
- 3.10.1 a number of stages including an application stage, a qualification stage, a main stage and an assignment stage, with the outcome of the qualification stage determining whether the procedure moves directly to the assignment stage due to demand not exceeding supply, or whether the main stage is necessary, due to demand exceeding supply;
- 3.10.2 the main stage, if it occurs, comprising of a combinatorial clock auction;

- 3.10.3 3.6 GHz Band Liberalised Use Licences in respect of the Award Spectrum being granted for a maximum term of 15 years and where all rights of use of spectrum granted shall expire absolutely on 31 July 2032²³⁷;
- 3.10.4 in the event of the main stage of the auction proceeding, multiple clock primary rounds, with the auctioneer setting the price in each round for each lot category specified in the Information Memorandum, with Qualified Bidders entitled to bid, subject to detailed rules to be set out in the Information Memorandum, for packages of lots at those prices, until supply equals or exceeds demand across all lot categories at the round prices or for such other reason as may be set out in the Information Memorandum;
- 3.10.5 following any such primary rounds, a single, sealed-bid, supplementary round, entitling Qualified Bidders to submit a number of bids for packages of lots for which such Qualified Bidders are eligible to bid, at bid prices of their choosing, all of which will be subject to detailed rules set out in the Information Memorandum. Winning bids will be determined by selecting at most one bid from amongst the entirety of bids made by each Qualified Bidder in order to maximise the total value of winning bids subject to not allocating more Lots than available. A price calculation methodology as set out in the Information Memorandum, will then be applied to calculate the Base Price on the basis of the opportunity cost of awarding Lots to each Winning Bidder;
- 3.10.6 an assignment stage, in which Winning Bidders will be required to participate (other than in respect of the Fixed Frequency Lot) in which such parties are eligible to bid for their preferred locations in the Award Spectrum;
- 3.10.7 a constraint in the assignment stage whereby (except in respect of the Fixed Frequency Lot) all Winning Bidders will be assigned contiguous lots in each Region;

²³⁷ Any delay to the commencement of 3.6 GHz Band Liberalised Use Licences due to Transitional Licences shall not affect this expiry date.

- 3.10.8 winning bids and prices in the assignment stage being determined in accordance with the winner and price determination methodology set out in the Draft Information Memorandum;
- 3.10.9 a spectrum cap, which will apply to each Qualified Bidder in the competitive selection procedure, and only for the duration of that procedure, of 150 MHz of Award Spectrum per Region;
- 3.10.10 reserve prices and spectrum usage fees (SUFs) for the 3.6 GHz Band Liberalised Use licences described herein, to be determined in accordance with the methodology set out in Chapter XX of Document 16/YY [document to which the final decision will be attached], and with the Benchmarking Report prepared by DotEcon and which accompanies Document 16/YY [document to which the final decision will be attached], where the final prices will be set out in the Information Memorandum, taking account of any additional relevant data at that time;
- 3.10.11 to require all Winning Bidders and all parties applying for a Transition Unprotected License to abide by transition rules as set out in the Information Memorandum;
- 3.10.12 to develop and finalise a transition plan in consultation with interested parties;
- 3.10.13 to provide reimbursement of a pro rata proportion of spectrum access fees (as described in the Information Memorandum) and SUFs to a Winning Bidder in the event that the commencement of its 3.6 GHz Band Liberalised Use Licence is delayed as a result of delayed availability of spectrum to it because of a Transitional Licence awarded for the completion of the transition plan;

upon application properly being made to it by Winning Bidders within the terms of the 3.6 GHz Band Licence Regulations, as made following the obtaining of Ministerial consent, and on payment of the fees prescribed thereby, to grant 3.6 GHz Band Liberalised Use Licences to Winning Bidders, under section 5 of the Wireless Telegraphy Act 1926 for the period, and subject to the conditions and restrictions (including conditions as to revocation), prescribed in the 3.6 GHz Band Licence Regulations, including, as appropriate, the schedules to the 3.6 GHz Band Liberalised Use Licences as currently set out in Annex [XX] of Document 16/[XX] [document to which the final decision will be attached];

- 3.11 upon application properly being made to it by Winning Bidders within the terms of the 3.6 GHz Band Licence Regulations, to consider granting a Transition Protected Licence in accordance with the transition plan;
- 3.12 upon application properly being made to it by Winning Bidders, Existing Licensees or holders of Transition Protected Licences within the terms of the 3.6 GHz Band Licence Regulations, to consider granting a Transition Unprotected Licence to such persons;
- 3.13 upon application properly being made to it by Winning Bidders within the terms of the 3.6 GHz Band Licence Regulations, to consider granting a Preparatory Licence to such persons; and
- 3.14 to retain its discretion regarding how it might treat any unsold Lots depending on the factual circumstances arising from the award process, save for the decision that unsold Lots will not be considered for assignment for a reasonable period after the process, and, in any event, will not be considered for a period of at least 2 years.

4. STATUTORY POWERS NOT AFFECTED

- 4.1 Nothing in this document shall operate to limit ComReg in the exercise of its discretions or powers, or the performance of its functions or duties, or the attainment of objectives under any laws applicable to ComReg from time to time.

[•]

[CHAIRPERSON, or COMMISSIONER]

THE COMMISSION FOR COMMUNICATIONS REGULATION

THE DAY OF [•] 2016

Annex aa – Wireless Telegraphy (Liberalised Use, Preparatory and Transitional Licences in the 3.6 GHz Band) Regulations 2016, a draft form of which is set out in Annex [X] to ComReg Document 16/[XX] [the Draft Information Memorandum]

Chapter 9

9 Submitting Comments and Next Steps

9.1 Submitting Comments

- 9.1 All input and comments are welcome. However, in order to analyse responses more efficiently respondents are requested to, where possible, please cross-reference their comments to the relevant section/paragraph number in each chapter and annex in this document.
- 9.2 Respondents are also kindly requested to set out detailed reasoning and all supporting information.
- 9.3 The six week period for comment will run until 17:00 on Tuesday 2 February 2016, during which time ComReg welcomes written comments on any of the issues raised in this paper.
- 9.4 ComReg has chosen a longer response period of six weeks considering that the consultation is running over the Christmas period and that other consultations are open during this time.
- 9.5 Responses must be submitted in written form (post or email) to the following recipient, clearly marked —Submissions to ComReg 15/140:

Mr Joseph Coughlan
Commission for Communications Regulation
Irish Life Centre
Abbey Street
Freepost
Dublin 1
Ireland

- 9.6 ComReg would request that electronic submissions be submitted in an unprotected format so that they can be included in the ComReg submissions document for electronic publication.
- 9.7 ComReg appreciates that respondents may also wish to provide confidential information in their responses. In order to promote openness and transparency, ComReg will publish all respondents' submissions to this consultation as well as all substantive correspondence on matters relating to this document, subject to the provisions of ComReg's guidelines on the treatment of confidential information²³⁸. In that regard, respondents are requested to provide both a confidential and non-confidential version of their submissions, including supporting reasoning as to why they consider particular material to be confidential. Alternatively, respondents are requested to place confidential material in a separate annex to their response, again with supporting reasoning in that annex as to why such material is considered to be confidential.

9.2 Next Steps

- 9.8 ComReg intends to publish in early 2016 a draft Information Memorandum outlining in detail the processes and procedures it currently envisages employing when implementing its spectrum release proposals as referred to in the draft decision. Interested parties will be welcome to comment on that draft Information Memorandum when it is published and ComReg will have due regard to all comments received before publishing its final Information Memorandum.
- 9.9 ComReg notes that any material changes made in ComReg's final RIAs and final decision may require subsequent changes to be made to the draft Information Memorandum and ComReg reserves the right to do so, if required.
- 9.10 Following receipt and consideration of submissions received in response to this document, the above draft Information Memorandum, and other relevant material, ComReg intends to publish a response to consultation and final Decision, and a final Information Memorandum.

²³⁸Document 05/24 - Response to Consultation - Guidelines on the treatment of confidential information - March 2005.

- 9.11 ComReg intends to further assist all bidders in developing an understanding of the auction rules through the running of workshops, seminars and providing the tools necessary for bidders to simulate auction conditions.
- 9.12 While ComReg cannot provide further clarity on the overall timelines at this juncture, as this will depend, among other things, on the nature of responses received, ComReg would reiterate that it remains conscious of the expiry of existing 3.6 GHz licences in July 2017 and is working towards providing clarity on the future of the 3.6 GHz band as far as possible in advance of this date.

Annex 1: Glossary

A1.1 Definitions

- 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:

700 MHz band	The frequency range 694 – 790 MHz
800 MHz band	The frequency range 790 – 862 MHz
900 MHz band	The frequency range 880 – 915 MHz paired with 925 – 960 MHz
1.4 GHz band	The frequency range 1452 - 1492 MHz
1 800 MHz band	The frequency range 1 710 – 1 785 MHz paired with 1 805 – 1 880 MHz
2.3 GHz band	The frequency range 2300 – 2400 MHz
2.6 GHz band	The frequency range 2500 – 2690 MHz
3.6 GHz band	The frequency range 3400 – 3800 MHz. However for the purposes of this award the 3.6 GHz band herein should, unless the context requires otherwise, be read as excluding the portion of the band which is in use by State services and the 10 MHz

	guard band between 3400-3410 MHz. Hence, the 3.6 GHz band contains a total of 350 MHz of spectrum available for award.
10.1 GHz band	The frequency range 10.0 – 10.154 GHz
10.5 GHz FWALA band	The frequency range 10.154 – 10.672 GHz
26 GHz FWALA band	The frequency range 24.549 – 25.781 GHz
26 GHz band	The frequency range 24.773 – 26.453 GHz
Award Process	The overall process through which it is intended that rights of use of the Award Spectrum will be granted in the event that at least one Applicant submits a valid Application, which by definition must include a valid Bid.
CPI	Consumer Price Index published by the Central Statistics Office.
Capacity band	A spectrum band whose propagation characteristics render it unsuitable for its use to serve wide geographical areas, and may be more suitable for urban deployment as hot spots or high capacity infill.
Complementarity	The term can be taken as referring to spectrum bands where the value attributed by an interested party to spectrum in one band is enhanced by having or winning rights of use of spectrum in another band in relation to the proposed award process.
Coverage band	A spectrum band whose propagation characteristics render it suitable to serve wide geographical areas, such as the deployment of macro cells for wide area services.

2.6 GHz EC Decision	Refers to EC Decision 2008/477/EC. See Section A1.3 below for further details
3.6 GHz EC Decision	Refers to EC Decision 2014/276/EU. See Section A1.3 below for further details
ECC 1.4 GHz Decision	Refers to ECC Decision (13)03. See Section A1.3 below for further details
ECC 2.3 GHz Decision	Refers to ECC Decision (14)02. See Section A1.3 below for further details
General Authorisation	An authorisation for an undertaking to provide an electronic communications network or service under and in accordance with Regulation 4 of the Authorisation Regulations.
IMT	International Mobile Telecommunications, is an ITU global standard for mobile telecommunications.
MBSA Process	MBSA or the MBSA Process refers to the Multi-Band Spectrum Award process whose final results were announced in ComReg Document 12/131 on 5 December 2012
Minimum Price	The price per Lot in a Lot Category at the beginning of the Award Process. This price is the combination of the Reserve Price and SUF.
MMDS	Multipoint Microwave Distribution System, means a system of wireless telephony apparatus used for the retransmission of programme services on a point to multipoint basis at frequencies of 1 gigahertz or above;
NGA	Next Generation Access

NRA	National Regulatory Authority
Paired spectrum	Typically refers to the use of frequency bands (or sub-bands) in a duplex arrangement to provide symmetrical two-way communications.
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.
Rurtel	Rural Telecommunications, a legacy rural wireless fill-in service by Eircom designed in promoting and accelerating the penetration of broadband services in rural areas.
Reserve Price	The minimum Bid for a Lot for such a Lot to be assigned.
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.
Spectrum Usage Fees (SUFs)	Fees, typically annual, which a Winning Bidder must pay in respect of spectrum rights of use assigned in the Award Process.
Substitutability	The term can be taken as referring to spectrum bands which can serve the same purpose for interested parties and so those parties are relatively indifferent to switching between those bands in relation to the proposed award process.
The Minister	Minister for Communications, Energy and Natural Resources
UHF band	The band 470 to 790 MHz.

Unpaired spectrum	Typically refers to the use of frequency bands (or sub-bands) using time division multiplexing technology to provide two-way communications.
WAPECS	Wireless Access Policy for Electronic Communications Services, is a framework for the provision of electronic communications services (ECS) within a set of frequency bands to be identified and agreed between European Union Member States in which a range of ECS may be offered on a technology and service neutral basis, provided that certain technical requirements to avoid interference are met, to ensure the effective and efficient use of the spectrum, and the authorisation conditions do not distort competition
Winning Bidder	A Bidder that wins at least one Lot in an Award Process.
WBB	Wireless broadband

A1.2 European and Governmental Bodies, Regulatory and Standardisation Organisations

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

A1.3 Primary and Secondary Legislation

S.I.	Statutory Instrument
2002 Act	The Communications Regulation Act 2002 (No. 20 of 2002), as amended ²³⁹
Authorisation Regulations	European Communities (Electronic Communication Networks and Services) (Authorisation) Regulations 2011 (S.I. No 335 of 2011)
Broadcasting Act 2009	Broadcasting Act 2009 (No. 18 of 2009).
Commission Directive 2002/77/EC	A European Commission Directive on competition in the markets for electronic communications networks and services
EC Decision 2008/477/EC	European Commission Decision on the harmonisation of the 2500-2690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community
EC Decision 2009/766/EC	European Commission Decision on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community
EC Decision 2011/251/EU	European Commission Decision, amending Decision 2009/766/EC, on the harmonisation of the 900 MHz and 1800 MHz frequency bands for

²³⁹ Includes the Communications Regulation (Amendment) Act 2007 and the Communications Regulation (Premium Rate Services and Electronic Communications Infrastructure) Act 2010.

	terrestrial systems capable of providing pan-European electronic communications services in the Community.
EC Decision 2014/276/EU	European Commission Decision on amending Decision 2008/411/EC on the harmonisation of the 3400-3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.
European Parliament and Council Decision 243/2012/EU	European Parliament and Council Decision establishing a multi-annual radio spectrum policy programme.
ECC Decision (13)03	Electronic Communications Committee decision to harmonise the use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL).
ECC Decision ECC/DEC(14)02	Electronic Communications Committee decision to harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for Mobile/Fixed Communications Networks (MFCN).
Framework Regulations	European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No 333 of 2011)
Specific Regulations	Specific Regulations has the same meaning as set out in Regulation 2 of the Framework Regulations

A1.4 Glossary of Technical Terms

3G	Third Generation Mobile System (e.g. UMTS)
BEM	Block Edge Mask
CCA	Combinatorial clock auction
CPI	Consumer Price Index
DTT	Digital Terrestrial Television
ECN	Electronic Communications Networks
ECS	Electronic Communications Service as defined under the Framework Regulations
EMC	Electro Magnetic Compatibility
E-UTRA	Evolved Universal Terrestrial Radio Access
FDD	Frequency Division Duplex
FWA	Fixed Wireless Access
FWALA	Fixed Wireless Access Local Area
GHz	Gigahertz (1 000 000 000 Hertz)
Guard-band	An unused spectrum bandwidth separating channels to prevent interference
GSA	The Global mobile Suppliers Association
GSM	Global System for Mobile Communications

GSMA	GSM Association
Hertz	Unit of Frequency
H3GI	Hutchison 3G Ireland
kHz	Kilohertz (1 000 Hertz)
LTE	Long Term Evolution of 3G
LTE Advanced / LTE+	An evolution of LTE, having the capability to provide 4G services.
MFCN	Mobile/fixed communications networks
MHz	Megahertz (1 000 000 Hertz)
MNO	Mobile Network Operator
MVNO	Mobile Virtual Network Operator (a licensed mobile operator with no spectrum assignment and with or without network infrastructure)
MoU	Memorandum / Memoranda of Understanding
NPV	Net Present Value
PMSE	Programme Making and Special Events
PPDR	Public Protection and Disaster Relief
QoS	Quality of Service
Restricted block	A spectrum block to which restricted conditions apply.

SAF	Spectrum Access Fee
SBC	Sealed-bid combinatorial (auction)
SCA	Simple clock auction
S-DAB	Satellite Digital Audio Broadcasting
SDL	Supplementary Downlink
SMRA	Standard simultaneous multiple-round ascending (auction)
SSF	Special Sub Frame
SUF	Spectrum Usage Fee
T-DAB	Terrestrial Digital Audio Broadcasting
TDD	Time Division Duplex
TD-LTE	Time Division – Long Term Evolution
TPL	Transition Protected Licence
TUL	Transition Unprotected Licence
UE	User Equipment
UMTS	Universal Mobile Telecommunications System.
UMTS-TDD	Universal Mobile Telecommunications System – Time Division Duplex
UTRA	Universal Terrestrial Radio Access

WDMDS	Wideband Digital Mobile Data Services
WiMAX	Worldwide Interoperability for Microwave Access
WRC	World Radiocommunications Conference

4 Glossary of respondents²⁴⁰

3IHL	Three Ireland Hutchison Ltd.
Airwave	Lackabeha services Ltd
Aptus	Aptus Ltd
BBNet	EOBO Ltd
Carnsore BB	Carnsore Broadband Ltd – John Hersey
Digital Forge	Brendan Hurley
Eircom	Eircom
Eurona	Eurona Brisknet Ltd
Imagine	Imagine Telecommunications Business Ltd
FWA 4	<ol style="list-style-type: none"> 1. Lightnet – Lighthouse Networks Ltd 2. permaNET – Permanet Ltd 3. Ripplecom – Ripplecom communications Ltd 4. WestNet – Western Broadband Networks Ltd
FWA 16	<ol style="list-style-type: none"> 1. Airwave Internet Ltd t/a Airwave Internet 2. Ajisko Ltd t/a Integrated Media Solutions 3. Atlantek Computers Ltd 4. Carnsore Broadband Ltd 5. DigitalForge 6. Interpoint Technologies Ltd 7. Ker Broadband Limited t/a KerNet Broadband

²⁴⁰ This list provides the reference used in this document and further details for the entity(s) where known. Not all respondents provided full details of its company name in its response. ComReg has aimed to update the table based on the information available to it, but would appreciate clarifications on same.

	8. Kerry Broadband Ltd 9. Link Broadband Ltd 10. Lighthouse Networks Ltd t/a Lightnet 11. Mr Paul Humphreys Meanus, t/a Maints Broadband 12. Ninetreehill Broadband Ltd 13. Rapid Broadband Ltd 14. Real Broadband Ltd 15. Skytel Networks Ireland Ltd t/a Skytel 16. Wireless Connect Ltd
KerNet	Ker Broadband Communications Ltd
Munster Wireless	Munster Wireless Ltd.
Net1	Net1 Ltd.
Premier BB	Premier Broadband Ltd.
Rapid BB	Rapid Broadband Ltd
Real BB	Real Broadband Ltd
Ripplecom	Ripplecom Communications Ltd
Viatel	Viatel Ireland Ltd
Vodafone	Vodafone Ireland Limited

Annex 2: Legal Framework and Statutory Objectives

- A 2.1 The Communications Regulation Acts 2002-2011²⁴¹ (the “2002 Act”), the Common Regulatory Framework (including the Framework and Authorisation Directives²⁴² as transposed into Irish law by the corresponding Framework and Authorisation Regulations²⁴³), and the Wireless Telegraphy Acts 1926 to 2009²⁴⁴ 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 licensing and making regulations in relation to licences, ComReg’s functions include the management of Ireland’s radio frequency spectrum in accordance with ministerial Policy Directions under Section 13 of the 2002 Act, having regard to its objectives under Section 12 of the 2002 Act, Regulation 16 of the Framework Regulations and the provisions of Article 8a of the Framework Directive. ComReg is to carry out its functions effectively, and in a manner serving to ensure that the allocation and assignment of radio frequencies is based on objective, transparent, non-discriminatory and proportionate criteria.
- A 2.3 This annex is intended as a general guide as to ComReg’s role in this area, and not as a definitive or exhaustive legal exposition of that role. Further, this annex restricts itself to consideration of those powers, functions, duties and objectives of ComReg that appear most relevant to the matters at hand and generally excludes those not considered relevant (for example, in

²⁴¹ 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.

²⁴² 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”).

²⁴³ 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.

²⁴⁴ The Wireless Telegraphy Acts 1926 to 1988 and Sections 181 (1) to (7) and (9) and Section 182 of the Broadcasting Act 2009.

relation to postal services, premium rate services or market analysis). For the avoidance of doubt, however, the inclusion of particular material in this annex does not necessarily mean that ComReg considers same to be of specific relevance to the matters at hand.

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

A2.1 Primary Objectives and Regulatory Principles under the 2002 Act and Common Regulatory Framework

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

- promote competition²⁴⁵;
- contribute to the development of the internal market²⁴⁶;
- promote the interests of users within the Community²⁴⁷;
- ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under Section 13 of the 2002 Act²⁴⁸; and
- unless otherwise provided for in Regulation 17 of the Framework Regulations, take the utmost account of the desirability of technological

²⁴⁵ Section 12 (1)(a)(i) of the 2002 Act.

²⁴⁶ Section 12 (1)(a)(ii) of the 2002 Act.

²⁴⁷ Section 12(1)(a)(iii) of the 2002 Act.

²⁴⁸ 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.

neutrality in complying with the requirements of the Specific Regulations ²⁴⁹ in particular those designed to ensure effective competition ²⁵⁰.

A2.1.1 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;
 - 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.

²⁴⁹ 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).

²⁵⁰ Regulation 16(1)(a) of the Framework Regulations.

A2.1.2 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.

A2.1.3 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 needs of specific social groups, in particular, elderly users and users with special social needs, and
 - promote the ability of end-users to access and distribute information or use applications and services of their choice.

A2.1.4 Regulatory Principles

- A 2.13 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.

A2.1.5 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.

A2.1.6 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;²⁵¹
- have regard to international developments with regard to electronic communications networks and electronic communications services, associated facilities, postal services, the radio frequency spectrum and numbering²⁵²; 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.²⁵³

²⁵¹ Section 12(3) of the 2002 Act.

²⁵² Section 12(5) of the 2002 Act.

²⁵³ Section 12(6) of the 2002 Act.

A2.1.7 Policy Directions²⁵⁴

- 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.
- A 2.17 The Policy Directions which are most relevant in this regard include the following:

Policy Direction No.3 on Broadband Electronic Communication Networks

- A 2.18 ComReg shall in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.

Policy Direction No.4 on Industry Sustainability

- A 2.19 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.

²⁵⁴ ComReg also notes, and takes due account of, the Spectrum Policy Statement issued by the Department of Communications Energy and Natural Resources in September 2010.

Policy Direction No.5 on Regulation only where Necessary

A 2.20 Where ComReg has discretion as to whether to impose regulatory obligations, it shall, before deciding to impose such regulatory obligations on undertakings, examine whether the objectives of such regulatory obligations would be better achieved by forbearance from imposition of such obligations and reliance instead on market forces.

Policy Direction No.6 on Regulatory Impact Assessment

A 2.21 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 2.22 ComReg shall ensure that, where market circumstances are equivalent, the regulatory obligations imposed on undertakings in the electronic communications market in Ireland should be equivalent to those imposed on undertakings in equivalent positions in other Member States of the European Community.

Policy Direction No.11 on the Management of the Radio Frequency Spectrum

A 2.23 ComReg shall ensure that, in its management of the radio frequency spectrum, it takes account of the interests of all users of the radio frequency spectrum.

General Policy Direction No.1 on Competition (2004)

A 2.24 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

A2.2 Other Relevant Obligations under the Framework and Authorisation Regulations

A2.2.1 Framework Regulations

A 2.25 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 2.26 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 2.27 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 2.28 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 2.29 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 2.30 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 2.31 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 2.32 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 2.33 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 1 July 2011. Spectrum allocations, general authorisations and individual rights of use which already existed on 1 July 2011 are subject to Regulation 18 of the Framework Regulations.
- A 2.34 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 2.35 Regulation 17(11) requires ComReg to, in the fulfilment of its obligations under that Regulation, respect relevant international agreements, including the ITU-RR and any public policy considerations brought to its attention by the Minister.

A2.2.2 Authorisation Regulations

Decision to limit rights of use for radio frequencies

A 2.36 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 2.37 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 2.38 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 2.39 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 2.40 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 2.41 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 2.42 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 2.43 Regulation 10(2) also requires that any attachment of conditions under Regulation 10(1) to rights of use for radio frequencies must be non-discriminatory, proportionate and transparent and in accordance with Regulation 17 of the Framework Regulations.

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

A 2.44 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 2.45 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 2.46 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 2.47 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 2.48 ComReg is required to ensure that any such fees are objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose and take into account the objectives of ComReg as set out in Section 12 of the 2002 Act and Regulation 16 of the Framework Regulations.

Amendment of rights and obligations

- A 2.49 Regulation 15 of the Authorisation Regulations permits ComReg to amend rights and conditions concerning rights of use, provided that any such amendments may only be made in objectively justified cases and in a proportionate manner, following the process set down in Regulation 15(4).

A2.3 Other Relevant Provisions

Wireless Telegraphy Act, 1926 (the “1926 Act”)

- A 2.50 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 2.51 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 2.52 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 2.53 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 2.54 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 telephony.

Broadcasting Act 2009 (the “2009 Act”)

A 2.55 Section 132 of the 2009 Act relates to the duties of ComReg in respect of the licensing of spectrum for use in establishing digital terrestrial television multiplexes and places an obligation on ComReg to issue:

- two DTT multiplex licences to RTÉ by request (see Sections 132 (1) and (2) of the 2009 Act); and
- a minimum of four DTT multiplex licences to the BAI by request (see Sections 132 (3) and (4) of the 2009 Act) for the provision of commercial TV content.

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

A 2.56 Article 4 of the Competition Directive provides that:

"Without prejudice to specific criteria and procedures adopted by Member States to grant rights of use of radio frequencies to providers of radio or television broadcast content services with a view to pursuing general interest objectives in conformity with Community law:

- *Member States shall not grant exclusive or special rights of use of radio frequencies for the provision of electronic communications services.*
- *The assignment of radio frequencies for electronic communication services shall be based on objective, transparent, non-discriminatory and proportionate criteria."*

Radio Spectrum Policy Programme

A 2.57 On 15 February 2012, the European Parliament adopted the five-year Radio Spectrum Policy Programme ("RSPP") which establishes a multi-annual radio spectrum policy programme for the strategic planning and harmonisation of the use of spectrum. The objective is to ensure the functioning of the internal market in the Union policy areas involving the use of spectrum, such as electronic communications, research, technological development and space, transport, energy and audiovisual policies.

A 2.58 Among the activities being undertaken in the context of the RSPP is a comprehensive inventory of spectrum use in the range 400 MHz to 6 GHz in order to identify developing and potentially significant uses of that spectrum.

Annex 3: Relevant EC/CEPT Decisions and technical documents

A 3.1 This Annex sets out, in the following table, key documentation, at an EC and CEPT level, relating to the bands referenced in this consultation:

Spectrum Band	Document Title	Description and link
2.6 GHz band	EC Decision 2008/477/E C ('the EC 2.6 GHz Decision')	The EC Decision sets out the harmonisation of the band for ECS including frequency arrangements and technical conditions: http://eur-lex.europa.eu/legal-content/EN/ALL/?ELX_SESSIONID=FVBRTYsPmkGjHrBJPN7YtpGn59B1tdKm9mJhZVVQZV4BjpnnQGGQ!-462921947?uri=CELEX:32008D0477
	ECC Decision (05)05	Harmonises the utilisation of spectrum for IMT-2000/UMTS systems operating within the band http://www.erodocdb.dk/docs/doc98/official/pdf/ECCDec0505.pdf
	ECC Report 131	Derivation of a block edge mask (BEM) for terminal stations in the 2.6 GHz frequency band (2500-2690 MHz): http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep131.pdf
2.3 GHz band	EC Mandate to CEPT -	EC Mandate to CEPT to develop harmonised technical conditions for the 2300-2400 MHz ('2.3 GHz') frequency band in the EU for the provision of wireless broadband electronic communications services; http://www.cept.org/Documents/fm-52/17474/FM52(14)17_Mandate-to-CEPT-on-2300-2400-MHz
	ECC Decision (14)02 ('the ECC 2.3 GHz Decision')	This ECC Decision harmonises the band for the for Mobile/Fixed Communications Networks (MFCN) including frequency arrangements and technical conditions; http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1402.PDF
	ECC Report 172	Derives technical conditions and frequency arrangements for Broadband Wireless Systems Usage in the band:

Spectrum Band	Document Title	Description and link
1.4 GHz band		<u>http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep172.pdf</u>
	ECC Report 205	Sets out an approach to licenced shared access ('LSA') particularly in relation to the 2.3 GHz band: <u>http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP205.PDF</u>
	EC Mandate to CEPT - RSCOM13-67rev3	EC mandate to CEPT to perform technical studies in the 1452-1492 MHz frequency band for its use for wireless broadband electronic communications services in the EU: <u>http://www.cept.org/Documents/fm-51/17426/FM51(14)Info-40_EC-Mandate-to-CEPT-on-the-band-1452-1492-MHz</u>
	ECC Decision (13)03	Harmonises the use of the band for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL) including frequency arrangements and technical conditions: <u>http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1303.PDF</u>
	ECC Report 202	Derives the out of band emission limits for Mobile/Fixed Communication Networks (MFCN) Supplemental Downlink (SDL) operating in the band: <u>http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP202.PDF</u>
	ECC Report 188	Presents an analysis of the most suitable use for the band in Europe: <u>http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP188.PDF</u>
3.6 GHz band	EC Decision 2008/411/EC	Commission Decision of 21 May 2008 on the harmonisation of the 3400 - 3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community: <u>http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32008D0411</u>
	EC Decision 2014/276/EU	Amends EC Decision 2008/411/EC on the harmonisation of the 3400-3800 MHz frequency band for terrestrial systems capable of providing electronic communications services.

Spectrum Band	Document Title	Description and link
		The decision includes the setting of preferred frequency arrangements and technical conditions for the band: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.139.01.0018.01.ENG
	ECC Decision (11)06	Harmonises the frequency arrangements and technical conditions for mobile/fixed communications networks (MFCN) operating in the bands 3400-3600 MHz and 3600-3800 MHz: http://www.erodocdb.dk/docs/doc98/official/pdf/ECCDec11_06.pdf
	ECC Report 203	Derives modified BEM to facilitate the deployment of broadband fixed, mobile and nomadic communications systems in the band: http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP2_03.PDF

Annex 4: International Update

A4.1 Regulation of the 3.4–3.6 and 3.6–3.8 GHz bands in EU member States



Regulation of the 3.4–3.6 and 3.6–3.8 GHz bands in EU member States

Last update: November 2015

On May 2, 2014 the Commission adopted implementing decision [2014/276/EU](#) to set new, more detailed harmonised conditions for the 3.4–3.8 GHz band. Whereas the previous decision of 2008 only harmonised power limits, the 2014 conditions divide the whole 3.4–3.8 GHz band in blocks of 5 MHz and define the power limits in form of block edge masks (BEM) that are suitable for LTE.

In the 3.4–3.6 GHz sub-band the preferred duplex mode is time division duplex (TDD), which means that the entire 200 MHz of the band should be awarded as unpaired blocks in multiples of 5 MHz. However, Member States may also decide to implement frequency division duplex (FDD), which means that paired blocks in multiples of 2x5 MHz will be awarded. If FDD is used, the uplink shall use 3410–3490 MHz and the downlink 3510–3590 MHz. Parts of the sub-band (3400–3410, 3490–3510 and 3590–3600 MHz) would remain unused as guard bands.

In the 3.6–3.8 GHz sub-band only TDD should be used.

Member States had to implement the new harmonised conditions by June 30, 2015 and were required to report to the Commission on the implementation by September 30, 2015.

This table shows the current licensing situation and Member States' preparations to implement the newly harmonised conditions, in particular whether Member States:

- have already amended the frequency plan to implement the new conditions (in particular the block sizes to be assigned in multiples of 5 MHz and the block edge masks);
- plan to use TDD or FDD in the lower sub-band;
- plan to refarm existing licences (e.g. by changing the block sizes to multiples of 5 MHz, re-arranging the position within the band, switching from FDD to TDD, and/or changing power limits to harmonised BEMs); and
- plan to award new licences in unused parts of the sub-bands, based on the newly harmonised conditions.

More detailed information is available in Cullen International's [Radio Spectrum Service](#).

Country	Regulation of the 3.4–3.6 GHz band			Regulation of the 3.6–3.8 GHz band		
	Current licences (summarised) Expiry dates	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?	Current licences (summarised)	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?
AT	Regional licences 2019	No	No	Mostly unused	No	No
BE	Regional and local licences 2019, 2021, 2025	No	No	Land stations for fixed satellite service	No	No
CH	One regional licence Dec. 2015	Not applicable (not an EU Member State)	No	Unused	Not applicable (not an EU Member State)	No
CZ	417 local licences 2020 / unlimited	Yes	No	Unused, to be auctioned in 2016	Yes	Yes See below

Country	Regulation of the 3.4–3.6 GHz band			Regulation of the 3.6–3.8 GHz band		
	Current licences (summarised) Expiry dates	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?	Current licences (summarised)	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?
				<p>CTO consulted until May 5, 2015 on the tender conditions. According to CTO's consultation:</p> <ul style="list-style-type: none"> • The whole 200 MHz would be offered in five abstract lots of 40 MHz, all for TDD under the newly harmonised conditions. • CTO proposed to conduct a simultaneous multiple round auction SMRA. • Licensees would be obliged to cover certain numbers of municipalities and districts, depending on the amount of spectrum they will win. For details, see the tables in chapter 7.4 of the proposed tender conditions. • Licence would expire on Dec. 31, 2030 (after about 15 years) 		
DE	Regional licences 2021	No	No	Point-to-point links and satellite ground stations	No	No
ES	Three national licences 2020	No	No	<p>Radio links (scheduled to end in 2018) and a limited number of satellite station services.</p> <p>Use of the band for ECS is foreseen in the national frequency plan (note UN107) but no licences yet awarded.</p>	<p>Yes</p> <p>In April 2015 the Ministry of Industry (spectrum NRA) reviewed the national frequency plan to allow for the use of the band for ECS in accordance with decision 2014/276/EU. Existing licences in the band must migrate to other bands, and no new licences for radio links will be granted.</p>	<p>Yes</p> <p>The Ministry of Industry (spectrum NRA) has opened a public consultation ending on June 21, 2015 on the future award of the band for ECS in accordance with Commission decisions</p>
FI	Several local licences Dec. 2016	No	No	Radio links for the transport of TV signals	No	No published plans, but the frequency allocation table says that the band is under review
FR	Two national and several regional licences 2018/2026	No	No	Unused	No	No

Country	Regulation of the 3.4–3.6 GHz band			Regulation of the 3.6–3.8 GHz band		
	Current licences (summarised) Expiry dates	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?	Current licences (summarised)	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?
HU	Five national licences 2016	No Procedure to amend the frequency plan is ongoing	No Consultation expected by the end of 2015	Unused	No Procedure to amend the frequency plan is ongoing	No Consultation expected by the end of 2015
IE	Many regional licences July 2017	No (but proposed to be so amended)	Yes ComReg is preparing a new award of the entire band.	Many regional licences July 2017	No	Yes ComReg is preparing a new award of the entire band.
IT	14 'macro regional' and 21 regional licences 2023 Band partly used by ministry of defence	Yes	No	Information not available	Yes	No
NL	Ministry of defence	No	No	Unused	No	Yes No new licences issued in preparation to include mobile broadband in this band
PL	17 regional licences 2020 to 2026	No	No	3 national and 62 regional licences 2016 to 2022	No	Yes Tender launched on July 29, 2015: 6 applicants applied for 23 regional licences.
PT	Regional licences 2024/2025	No	Yes ANACOM launched in April 2015 a public consultation on availability of spectrum in the band.	Regional licences 2025	No	Yes ANACOM launched in April 2015 a public consultation on availability of spectrum in the band.
RO	7 national licences Dec. 2015 New award completed (see below)	Proposed	No	1 national licence Dec. 2015 New award completed (see below)	Proposed	No
	On Oct. 27, 2015 ANCOM announced the results of an auction of 16 paired blocks of 2x5 MHz in the 3.4–3.6 GHz band (reserve price: €370,000) and 36 unpaired 5 MHz blocks in the 3.6–3.8 GHz band (reserve price: €185,000). 16 paired 2x5 MHz blocks allocated at the national level in the 3.4–3.6 GHz band were auctioned out, 11 of which were awarded					

Country	Regulation of the 3.4–3.6 GHz band			Regulation of the 3.6–3.8 GHz band			
	Current licences (summarised) Expiry dates	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?	Current licences (summarised)	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?	
	<p>in the selection procedure. Furthermore, 36 unpaired 5 MHz blocks allocated at the national level in the 3.6–3.8 GHz band went under the hammer, 29 of which were awarded. The winning bidders are 2K Telecom S.R.L., Orange Romania S.A., RCS&RDS S.A., The National Radiocommunications Company and Vodafone Romania S.A.</p> <p>The total licence fees collected are €10,124,101 and the new rights of use of the radio spectrum will be valid for a 10-year period effective Jan. 1, 2016. Licence conditions will be based on decision 2014/276/EU. Licensees will have to establish 25 base stations within one year, 50 within two years and 100 within four years.</p>						
SE	2 national licences 2017 10 regional licences 2023	No	No On Dec. 11, 2014 PTS issued a statement that refarming and award of new licences in the 3.5 GHz band in line with decision 2014/276/EU can be carried out only after expiry of all current local and regional licences in this band in 2023.	1159 local licences 2022	No	No The remaining local/regional licences in the 3.5 GHz band would be awarded based on first-come-first-served principle until expiry of the existing licences	
SI	4 regional licences 2021	No	No	1 regional licence 2022	No	No	
SK	Three national licences (100 MHz in total) auctioned in 2015 Another 2 national licences of 2x14 MHz issued before All licences expire in 2025	Yes	Yes New licences awarded in 2015 (Flash)	Three national licences of 40 MHz	Yes	Yes New licences awarded in 2015 (Flash) Remainder of the band to be awarded later	
	<p>RU published a call for tender in February 2015, then cancelled the tender for lack of demand. RA published a new call for tender in June 2015, with reduced reserve prices. RA offered three national licences, two with 2x20 MHz (that can be used as 2x20 MHz FDD or 40 MHz TDD) and one with 20 MHz (TDD). The three lots were awarded by a simultaneous multiple round auction (SMRA) in July 2015. O2 acquired 2x40 MHz (FDD or TDD) and Swan 20 MHz (TDD). Winners have to offer at least one access point in each of the 79 districts within 24 months, and will have to cover at least three administrative units with less than 3000 inhabitants within 36 months. Special obligations apply for Bratislava and Kosice. Licences will expire on August 31, 2025 (after about ten years)</p>			<p>RU auctioned three national licences of 40 MHz in January 2015. The auction design differed from typical multiple round spectrum auctions. The auction had one round of 120 minutes, with possible extensions. If a bidder increased his bid within 10 minutes before the scheduled end of the auction, the time was extended by 10 minutes. However, only 60 such extensions were possible and the auction therefore was to end after 12 hours at the latest. Winners have to offer at least one access point in each of the 79 districts within 24 months, and have to cover at least three administrative units with less than 3000 inhabitants within 36 months. Special obligations apply for Bratislava and Kosice. Licences will expire on December 31, 2024 (after about ten years).</p>			
UK	UK Broadband holds a national licence of	Proposed	Yes See below	UK Broadband holds a national licence with	Proposed	No	

Country	Regulation of the 3.4–3.6 GHz band			Regulation of the 3.6–3.8 GHz band		
	Current licences (summarised) Expiry dates	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?	Current licences (summarised)	Frequency plan amended to implement decision 2014/276/EU?	Preparations for refarming or award of new licences?
	2x20 MHz with indefinite duration.	UK Broadband already uses its licence for LTE-TDD.		indefinite duration: 3605–3689 / 3925–4009 MHz. With regard to 3605–3689 MHz the licence was amended in 2009. The band is also used for satellite ground stations and fixed links.	UK Broadband already uses the 3605–3689 MHz of its licence for LTE-TDD.	

A4.2 Other notable updates from non EU countries

Japan

- 9.13 Japan has assigned 120MHz of spectrum in the 3.5 GHz band for TD-LTE services. The Japanese Ministry of Internal Affairs and Communications has assigned 40 MHz of spectrum to each of Japan's three main mobile operators. The licences, are valid from 31 March 2016 and are assigned as follows:
- NTT Docomo: 3480–3520 MHz
 - KDDI: 3520–3560 MHz
 - SoftBank: 3560–3500 MHz
- 9.14 As is customary in Japan, the assignment was made through a [beauty contest](#). ComReg understands that KDDI, NTT Docomo and SoftBank are expected to begin using these frequencies from June, October, and December respectively in 2016.

Annex 5: Award RIA and other issues

- A 5.1 Annex 5 contains issues related to the Award RIA and Chapter 3, and is laid out as follows:
- Section A5.1 contains the ‘Spectrum for Award’ RIA.
 - Section A5.2 contains ComReg’s response to issues raised by respondents on the assessment of the Preferred Option against ComReg’s statutory functions, objective and duties.
 - Section A5.3 contains ComReg’s response to reasons provided by respondents in relation to the ‘Assignment Process’ RIA and in support of using an administrative award.
 - Section A5.4 contains ComReg’s response to other material issues raised in relation to the draft RIA but not considered elsewhere.

A5.1 Award RIA

Introduction

- A 5.2 Chapter 3 of Document 15/70 contained the draft ‘Spectrum for Award’ RIA which set out whether the 3.6 GHz band should be released in a separate award process and, if so, what, if any, bands should be included in that award process.
- A 5.3 ComReg received a number of submissions from respondents with regard to Chapter 3 of Document 15/70. The submissions in relation to the Assignment Process RIA are considered in detail in Chapter 3 of this document along with the revised Assignment Process RIA.
- A 5.4 There was support amongst all respondents for ComReg’s preferred option in the Spectrum for Award RIA (i.e. Option 2 - an award of the 3.6 GHz band alone) and this Annex, therefore, sets out ComReg’s revised draft ‘Spectrum for Award RIA’ updated and amended as appropriate.
- A 5.5 References to “RIA(s)”, “this RIA” and “the RIA(s)” in this document should be read as meaning the revised draft RIAs set out in this Annex, unless the context otherwise requires.

RIA Framework

- A 5.6 In general terms, a RIA is an analysis of the likely effect of a proposed new regulation or regulatory change, and, indeed, of whether regulation is necessary at all. A RIA should help identify the most effective and least

burdensome regulatory option and should seek to establish whether a proposed regulation or regulatory change is likely to achieve the desired objectives, having considered relevant alternatives and the impacts on stakeholders. In conducting a RIA, the aim is to ensure that all proposed measures are appropriate, effective, proportionate and justified.

Structure of a RIA

- A 5.7 As set out in ComReg's RIA Guidelines²⁵⁵, there are five steps in a RIA. These are:
- Step 1: Identify the policy issues and identify the objectives.
 - Step 2: Identify and describe the regulatory options.
 - Step 3: Determine the impacts on stakeholders.
 - Step 4: Determine the impact on competition.
 - Step 5: Assess the impacts and choose the best option.

- A 5.8 In the following sections ComReg identifies the relevant stakeholder groups, specific policy issues to be addressed, of which two are fundamental to the current process, and relevant objectives (i.e. Step 1 of the RIA process).

Identification of stakeholders

- A 5.9 The focus of Step 3 is to assess the impact of the proposed regulatory options available to ComReg on stakeholders. A precursor to the subsequent steps in the RIA, therefore, is to identify the relevant stakeholders. Stakeholders consist of two main groups:
- consumers (for the purposes of this RIA, consumers include both business and residential end users of spectrum), and
 - industry stakeholders.
- A 5.10 There are a number of key industry stakeholders in relation to the matters considered in this chapter.²⁵⁶

²⁵⁵ See Document 07/56a - Guidelines on ComReg's approach to Regulatory Impact Assessment - August 2007.

²⁵⁶ ComReg acknowledges that other stakeholders have an interest in the 3.6 GHz Band including the State (in respect of State services provided using spectrum in the Band), entities using the adjoining spectrum and equipment manufacturers. However, it does not appear to ComReg that these stakeholders would be

- existing service providers;
- licensees with spectrum rights of use in the 3.6 GHz band (e.g. FWALA licensees);
- parties who currently provide services using other spectrum (licensed or license exempt) for whom the spectrum being considered for inclusion in the award may be of particular interest to satisfy existing and potential demand (e.g. mobile network operators or other wireless broadband providers); and
- potential new entrants who do not currently provide any services using spectrum in the State. ComReg is of the view that such potential entrants would most likely wish to deploy wireless broadband (WBB)²⁵⁷.

- A 5.11 Prior to receiving submissions on ComReg's various proposals contained in this consultation, ComReg has, in the following analysis, taken a reasonable and pragmatic approach to considering the likely impact of each option on the various stakeholders without, in some cases, being in a position to reference particular views expressed by those stakeholders (e.g. consumers), but having regard to its experience and expertise and also having regard to the advice of its consultants.
- A 5.12 The focus of Step 4 is to assess the impact on competition of the proposed regulatory options available to ComReg. In that regard, ComReg notes that it has various statutory, objectives, regulatory principles and duties which are relevant to the issue of competition.
- A 5.13 Of themselves, the various RIA guidelines and the RIA Policy Direction²⁵⁸ provide little guidance on how much weight should be given to the positions and views of each stakeholder group (Step 3), or the impact on competition (Step 4). Accordingly, ComReg has been guided by its statutory objectives which it is obliged to pursue when exercising its functions. ComReg's statutory objectives in managing the radio frequency spectrum, include:

significantly impacted by how the 3.6 GHz band is allocated. Accordingly, they are not considered further in this chapter.

²⁵⁷ While other ECS services can also be provided in the 3.6 GHz band and the other bands discussed in Document 14/101, WBB is generally considered to be the most likely use. Indeed, the relevant EC harmonising decision (2008 3.6 GHz EC Decision), emphasises that "*the services provided in this frequency band should mainly target end-user access to broadband communications*". Accordingly, this RIA focuses the likely demand for this band and other bands in the context of WBB.

²⁵⁸ See Policy Direction Number 6.

- the promotion of competition;
- contributing to the development of the internal market; and
- promoting the interest of users within the Community.

A 5.14 In this document, ComReg has adopted the following structure in relation to Step 3 and Step 4 – the impact on industry stakeholders is considered first, followed by the impact on competition, followed by the impact on consumers. The order of this assessment does not reflect any assessment of the relative importance of these issues but rather reflects a logical progression. For example, a measure which safeguards and promotes competition should also, in turn, impact positively on consumers. In that regard, the assessment of the impact on consumers draws substantially upon the assessment carried out in respect of the impact on competition.

Identify the policy issues and identify the objectives (Step 1)

A 5.15 All rights of use in the 3.6 GHz band awarded under the FWALA licencing scheme are due to expire on or before 31 July 2017. In Document 14/101²⁵⁹, ComReg began the process of consulting on the award of new rights of use in this band and proposed its release as part of a multi-band award process. However, there was limited support for this proposal amongst respondents to that consultation. In particular, there was broader support for releasing this band in a separate award process. As a result, ComReg has given further consideration as to how to approach releasing rights of use in this band. Accordingly, the 3.6 GHz band is the focus of the policy issues to be considered in this Annex.

Policy Issues

A 5.16 ComReg is of the view that the primary policy issue in this RIA is to consider whether to release the 3.6 GHz band in a multi-band award process, as proposed in Document 14/101, or in a separate award process (either on its own or with additional bands).

A 5.17 In relation to this policy issue, ComReg sets out below some relevant high level observations which will feed into the identification of valid regulatory options.

²⁵⁹ Document 14/101 – “Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands”.

- A 5.18 It is generally agreed that the 3.6 GHz band is primarily suitable for the provision of WBB services. Indeed, as noted previously, this is emphasised in the 3.6 GHz EC Decision and WBB is the main use to which the band is put (i.e. FWALA licensees). Accordingly, this RIA focuses on the likely demand for this band and other bands in the context of WBB.
- A 5.19 The 3.6 GHz band has characteristics which somewhat set it apart from other bands which were considered for inclusion in Document 14/101. In particular:
- Unlike other bands, this band can be considered “brownfield” in terms of the provision of wireless broadband services.
 - Compared to the other bands, this band has the most spectrum available for release, making it particularly suitable for the potential deployment of high speed broadband services by multiple wireless broadband providers.
 - Compared to most of the other bands considered in Document 14/101 (i.e. 2.3 GHz, 2.6 GHz and 700 MHz) the LTE device ecosystem for the 3.6 GHz band is not well developed.²⁶⁰ The status of the LTE device ecosystem is one of the factors that interested parties are likely to consider in assessing the attractiveness or suitability of a band for the deployment of LTE services. That said, a WBB provider will likely select all equipment (base stations and consumer premises equipment). Accordingly, a small range of equipment may be sufficient, while a mobile broadband provider is likely to require that a wide range of user terminals support a band (as users select their own terminals). ComReg recognises that other technologies compliant with the relevant EC Decisions (e.g. WiMAX) may also be deployed in these bands but notes that a number of responses to Document 14/101 and Document 15/70 identified LTE as the likely technology to be deployed in the 3.6 GHz band in the coming years.
 - Of all the bands considered in Document 14/101, this band has the least favourable propagation characteristics in terms of delivering coverage.

²⁶⁰ In November 2015, the Global mobile Suppliers Association (GSA) indicated that there were 33 LTE TDD devices in the 3.6 GHz bands (Bands 42 and 43). For the other bands, the GSA indicated that there were 1,719 LTE FDD devices in the 2.6 GHz band, 1,021 LTE TDD devices in the 2.3 GHz band (Band 40), 769 LTE TDD devices in the 2.6 GHz band (Band 38) and 147 LTE FDD devices in the 700 MHz band. The 1.4 GHz band is not mentioned in the GSA report.

Source: Status of the LTE Ecosystem. 2 November 2015

- A 5.20 Of the other bands considered in Document 14/101, the timing of the availability of three of those bands is currently known (i.e. the 1.4 GHz, 2.3 GHz and 2.6 GHz bands). The 1.4 GHz and 2.3 GHz bands are “greenfield” bands and could be made available now while the 2.6 GHz band becomes available when the current MMDS licences expire in April 2016. Accordingly, all three bands will be available when the 3.6 GHz band becomes available from 31 July 2017 and could therefore be considered for inclusion alongside the 3.6 GHz band. On the other hand, the availability of the 700 MHz band is as yet unclear, and this uncertainty weighs against releasing the 700 MHz band in the same award process as the 3.6 GHz band, particularly given the impending FWALA licence expiry date of 31 July 2017 and the general desire amongst industry stakeholders (particularly existing licensees) to have this band re-assigned as soon as possible.
- A 5.21 In addition, as alluded to by respondents to Document 14/101, given its favourable propagation characteristics and international harmonisation, the 700 MHz band could be considered a focal spectrum band in a future spectrum award. Therefore, in considering the potential inclusion of the other spectrum bands (1.4 GHz, 2.3 GHz and 2.6 GHz) in an award process with the 3.6 GHz band, ComReg remains cognisant of what impact their inclusion/exclusion would have on a potential future award process which might have the 700 MHz band as the focal spectrum band.
- A 5.22 Focusing firstly on the 1.4 GHz band, while this band has some characteristics which suggest that it might be appropriate to include in an award process with the 3.6 GHz band (e.g. both bands might be used for LTE in the future), on balance its characteristics would weigh against releasing it in a separate award process with the 3.6 GHz band. For example:
- in Document 14/101 ComReg noted that, while there may be complementarity between paired 2.6 GHz frequencies and the 1.4 GHz band, this is less clear with the 3.6 GHz band given the differences in propagation;
 - while noting that the question was not specifically asked, there was little or no indication in the responses to Document 14/101 that the 1.4 GHz band should be included in an award with 3.6 GHz spectrum;
 - the band is much closer in propagation characteristics to the sub-1 GHz (or coverage bands) than to the 3.6 GHz band and is therefore potentially most beneficially used as a complementary downlink for FDD networks operating sub-1 GHz spectrum;

- further the 2015 EC Decision on the 1.4 GHz band²⁶¹ allows Member States to set an increased in-block power limit such that the 1.4 GHz band could be used in aggregation with spectrum in lower frequency bands. This possibility was also noted by one the respondents to Document 14/101;
- as noted by the Qualcomm response to 14/101 (page 16), the joint award of the 1.4 GHz and 700 MHz bands would enable a potential new entrant or an MNO without spectrum in the 900 MHz or 800 MHz bands to fully benefit from the 1.4 GHz band;
- the ECC 1.4 GHz Decision²⁶² refers to this band specifically as a mobile broadband system and calls it “*a strategic tool to tackle the growing mobile data traffic asymmetry*”. This supports the view that it should be included in an award where there is likely to be strong demand from MNOs. This is more likely to be the case in an award of the 700 MHz band than a separate award of the 3.6 GHz band; and
- while Document 14/101 noted that equipment is likely to become available within the timeframe of the award, as of November 2015 the Global Mobile Suppliers Association (GSA) indicated that there were no LTE devices available in the 1.4 GHz band²⁶³.

- A 5.23 For these reasons, the 1.4 GHz band is not, in ComReg’s view, suitable for inclusion in a separate award of the 3.6 GHz band (as distinct from the 700 MHz band) and is not therefore considered further in this RIA.
- A 5.24 Focusing on the 2.3 and the 2.6 GHz bands, the characteristics of these bands are such that these bands could be considered substitutable with the 3.6 GHz band as:
- all three bands are, or will be in the short term, harmonised for both mobile and fixed communications networks with a particular emphasis on the provision of wireless broadband services²⁶⁴; and

²⁶¹ EC Decision (EU) 2015/750 of 8 May 2015 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015D0750&from=EN>

²⁶² ECC Decision (13)03 - Electronic Communications Committee decision to harmonise the use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL).

²⁶³ Source: Status of the LTE Ecosystem. 2 November 2015
http://www.gsacom.com/cgi/redir.pl5?url=http://www.gsacom.com/downloads/pdf/GSA_Lte_ecosystem_report_021115.php4

²⁶⁴ See, the ECC 2.3 GHz Decision, the EC 2.6 GHz Decision and the 3.6GHz EC Decision.

- for mobile services these bands (i.e. the 2.3 GHz, 2.6 GHz and 3.6 GHz bands) are also suitable for capacity purposes in areas where there is constant or periodic spikes in demand (e.g. in urban areas).
- A 5.25 On the other hand, the somewhat more favourable propagation characteristics of the 2.3 GHz and 2.6 GHz bands and the considerably better LTE device ecosystem might suggest that these bands would, in ComReg's view, be better suited to a future award process which could have the 700 MHz band as the focal spectrum band.
- A 5.26 Unlike the 700 MHz and 1.4 GHz bands, it is therefore less obvious that the 2.3 GHz and 2.6 GHz bands should be excluded from this RIA.
- A 5.27 In light of the above, if the 3.6 GHz band is considered suitable for release in a separate award process, it would appear appropriate to assess whether the 2.3 and/or the 2.6 GHz bands should be included in that award process. This is considered further below.

Objectives

- A 5.28 The focus of this RIA is to assess the impact of the proposed measure(s) (see regulatory options below) on stakeholders, and on competition and consumers. In that way, it allows ComReg to identify and implement the most appropriate and effective means to assign spectrum rights of use, while allowing ComReg to achieve its objectives:
- assigning rights of use in the 3.6 GHz band and, if appropriate, one or more other bands;
 - assigning rights of use in the 3.6 GHz band in line with the 3.6 GHz EC Decision and other relevant legislation;
 - taking appropriate measures in advance of licence expiry in the 3.6 GHz band;
 - providing further clarity on the likely availability of spectrum for release in other relevant bands; and
 - promoting the interests of the electronic communications sector and, in turn, the economic development of the State.
- A 5.29 ComReg also aims to design and carry out this assignment process in accordance with its broader statutory objectives (set out in Annex [2]), including, but not limited to, the promotion of competition in the electronic communications sector.

- A 5.30 ComReg's other overarching objectives are to contribute to the development of the internal market and to promote the interests of users within the Community. ComReg also notes that, in achieving its objectives, its ultimate aim is to choose regulatory measures which maximise the benefits for consumers in terms of price, choice and quality.
- A 5.31 Unlike other bands considered in this RIA, the 3.6 GHz band is essentially "brownfield" in terms of the provision of wireless broadband services. There are currently 25,258²⁶⁵ existing customers in the 3.6 GHz band who may be at risk of losing their service on licence expiry²⁶⁶ and ComReg has a general objective to take all reasonable measures aimed at promoting the interests of users. In this regard, ComReg observes that some respondents to this consultation process, referencing the above statutory objective, appear to suggest that ComReg's design of the proposed award process should be influenced by the impact on these existing customers above all else. While ComReg has considered these views, the objective of promoting the interests of users cannot however be read in isolation and must be balanced against other principal objectives including the promotion of competition which includes encouraging efficient use and ensuring the effective management of radio frequencies. ComReg will therefore promote the interests of users, but only to the extent that it is proportionate vis-à-vis its other statutory objectives.
- A 5.32 Having identified the above policy issue and objectives, the following section considers this policy issue within the framework of the four remaining steps in the RIA process (the 'Spectrum for Award' RIA). The remainder of this Annex then sets out an assessment of the Preferred Option against ComReg's relevant statutory functions, objectives and duties.

²⁶⁵ This estimate is based on data from ComReg's latest (Q3 2015) Quarterly Report and a questionnaire circulated to all 3.6 GHz licensees in February 2015. This figure includes subscriber figures for 10 of the 14 3.6 GHz FWALA operators as some of the 3.6 GHz FWALA operators did not respond to the questionnaire.

²⁶⁶ ComReg would note that there are specific consumer circumstances relating to the 3.6 GHz band where the existing WBB customers of 3.6 GHz licensees may not have an alternative comparable fixed broadband service in their area at the time of licence expiry. This could leave such customers without a fixed broadband service. In that regard, ComReg notes that a distinction can be drawn between this situation and the MMDS licence expiry in the 2.6 GHz band, where the MMDS customers are likely to have alternative comparable TV platform providers to turn to, such as Sky Ireland, Saorview, FreeSat, etc.

Regulatory Options (Step 2):

- Option 1 – a single multi-band award process as proposed in Document 14/101;
- Option 2 – an award of the 3.6 GHz band alone;
- Option 3 – an award of the 3.6 GHz band with the 2.3 GHz and/or 2.6 GHz bands.

Impact on Stakeholders and Competition (Steps 3 and 4)

- A 5.33 The focus of this section of the RIA is to assess the impact of the aforementioned regulatory options on:
- i. industry stakeholders (being existing operators and potential new entrants),
 - ii. competition, and
 - iii. consumers.
- A 5.34 In Section 3.3.2 (under the heading ‘Demand for Spectrum’) of Document 14/101, ComReg set out some useful background information concerning the characteristics of, and developments in, the demand for the spectrum bands (including the 3.6 GHz band) that were under consideration. ComReg does not propose to repeat that information here except to note that such information remains relevant to the current process, at least to the extent that it assists ComReg in understanding the likely attitudes of industry stakeholders and consumers to the release of the 3.6 GHz band.
- A 5.35 ComReg sets out below a comparative analysis of the three spectrum band award options outlined above, in terms of their impact on stakeholders, competition and consumers.

Impact on Industry Stakeholders

- A 5.36 As noted above, industry stakeholders can be split between those operators that are currently active in the electronic communications sector and potential new entrants that may be considering entry into the electronic communications sector in the State.

Option 1 (Multi-band award) versus Option 2 (3.6 GHz only)

- A 5.37 In chapter 3, ComReg summarises and assess the submissions received on this issue and notes that there was broad support for holding a separate award process for the 3.6 GHz band.

- A 5.38 In light of these submissions and in the absence of information to the contrary, ComReg is of the preliminary view that industry stakeholders would, on balance, prefer for the 3.6 GHz band to be released in a separate award process.

Option 2 (3.6 GHz band only) versus Option 3 (3.6 GHz band and 2.3 and/or 2.6 GHz bands)

- A 5.39 ComReg is not considering the possibility of releasing the 2.3 GHz and/or the 2.6 GHz bands in a standalone award process. Unlike for the 3.6 GHz band, such possibility was not generally raised by respondents to Document 14/101 or indeed since. Instead, ComReg currently intends to release these bands either as part of a multi-band award process involving the 3.6 GHz band, or a multi-band award process involving the 700 MHz band (depending on the preferred option identified). The appropriate point of reference for the assessment here is therefore whether these bands would be better released with the 3.6 GHz band on the one hand, or the 700 MHz band (and the 1.4 GHz band) on the other.
- A 5.40 In Document 15/70, ComReg noted that it was at that time unclear whether industry stakeholders would, on balance, prefer the inclusion of one or both of these bands in an award of the 3.6 GHz band. However, ComReg did note that stakeholders seemed to acknowledge the differences between this band and other bands and the benefit to including the 2.3 GHz and 2.6 GHz bands in any award of the 700 MHz band. As noted above, there was broad support amongst respondents to Document 15/70 for holding a separate award process for the 3.6 GHz band.
- A 5.41 Accordingly, it would appear that, on balance, stakeholders would prefer Option 2 over Option 3.

Impact on Competition

- A 5.42 Where the demand for spectrum in different bands is interdependent, this may give rise to strong economic efficiency reasons for combining bands into an integrated award process to reduce the risk for interested parties and to provide maximum opportunity for different types of interested parties (with potentially different intended uses and technologies) including potential new entrants.
- A 5.43 Encouraging the efficient use and ensuring the effective management of available spectrum should, in turn, promote competition on the relevant downstream markets.

Option 1 (Multi-band award) versus Option 2 (3.6 GHz only)

- A 5.44 Including substitutable and/or complementary spectrum in the same award (i.e. a multi-band award) can be efficient and lead to greater competition in the award process and more efficient entry. On the other hand having a separate award process for the 3.6 GHz band poses potential risks around creating artificial scarcity in that award process and/or in a subsequent multi-band award. This also poses risks around creating common value uncertainty for parties interested in spectrum across both award processes.
- A 5.45 The extent of these potential risks is linked to the difficulties which interested parties may have in bidding in consecutive award processes. However, given the large amounts of spectrum available in both the 3.6 GHz band and the other bands considered in this paper, and the broad support expressed by interested parties for a separate award of the 3.6 GHz band given its different characteristics (as detailed earlier in this Annex), the potential risks described above would appear to be minimal.
- A 5.46 In addition, releasing the 3.6 GHz band in a multi-band award including the 700 MHz band could delay the award of new rights of use in this band beyond the FWALA licence expiry date of 31 July 2017. This would result in a delay in the liberalisation of the band in line with the 3.6 GHz EC Decision.
- A 5.47 In light of the above, ComReg is of the view that, on balance, Option 2 is preferred to Option 1 in terms of the impact on competition.

Option 2 (3.6 GHz band only) versus Option 3 (3.6 GHz band and 2.3 and/or 2.6 GHz bands)

- A 5.48 It is important to note that there are, on the face of it, a number of reasons to consider releasing one or both of the 2.3 and 2.6 GHz bands with the 3.6 GHz band. For example, like the 3.6 GHz band, both of these bands:
- are higher frequency bands (what might be viewed as ‘performance’ or ‘capacity’ bands, depending on the operator);

- are available for release within a short time period²⁶⁷; and
- are harmonised or are in the process of being harmonised, for ECS services including WBB at EU level²⁶⁸.

- A 5.49 In addition, both of these bands have equipment and technology roadmaps which suggest suitability for the deployment of fixed and mobile broadband services in the foreseeable future. Indeed, as discussed earlier, the LTE device ecosystem for the 2.3 GHz and 2.6 GHz bands is considerably more extensive than the LTE device ecosystem for the 3.6 GHz band.
- A 5.50 The above factors suggest some substitutability between these bands and the 3.6 GHz band. There are general benefits to including substitutable (and complementary) spectrum in the same award process. For example, this increases the ability of award participants to express a full suite of preferences, thereby enhancing the efficiency of the award outcome which, in turn, has a positive impact on competition. This benefit is particularly pronounced given the exponential growth in consumer demand for wireless data services and the consequent increased demand for wireless broadband spectrum.
- A 5.51 However, there are also a number of potential drawbacks of Option 3 over Option 2, as this would preclude the inclusion of the 2.3 GHz and 2.6 GHz spectrum bands in a potential future award process where the 700 MHz band could be the focal spectrum band. The benefits of including large amounts of complementary ‘capacity’ type spectrum in a future award of the 700 MHz band were described in Document 14/101. In particular, this would increase the potential for efficient new entry. In respect of MNO demand, optimal network configuration also often involves a mix of both coverage and capacity bands and operators should be enabled, where possible, to obtain spectrum which allows them to configure an optimal network. This would support the inclusion of ‘capacity’ type bands in an award of sub-1 GHz spectrum where possible.
- A 5.52 Furthermore, there is already a significant amount of spectrum (350 MHz) available for release in the 3.6 GHz band, and the additional benefits of

²⁶⁷ The 2.3 GHz band is largely a ‘greenfield’ band and thus available for release. In respect of the 2.6 GHz band, while Virgin Media Ireland currently provides television services to a number of customers using MMDS licences in this band, all existing MMDS licences in this band will expire on 18 April 2016 (see ComReg Document 13/31).

²⁶⁸ See the ECC 2.3 GHz Decision and the EC 2.6 GHz Decision.

adding large amounts of other spectrum to a 3.6 GHz award appear questionable.

- A 5.53 Removing one of the 2.3 or 2.6 GHz bands from a subsequent multi-band award, could increase the risks of common value uncertainty and artificial scarcity in respect of 2.3 or 2.6 GHz spectrum.
- A 5.54 It would therefore appear that the benefits to competition of releasing the 2.3 GHz and 2.6 GHz bands in a potential future award of the (complementary) 700 MHz band would outweigh the benefits of an earlier combined award with the 3.6 GHz band.
- A 5.55 In light of the above, ComReg is of the view that, on balance, Option 2 is preferred to Option 3 in terms of the impact on competition.

Impact on Consumers

- A 5.56 As noted previously, for the purposes of this RIA, consumers include both business and residential end users of services provided over spectrum.
- A 5.57 It can be assumed that what is good for competition, and what promotes investment in infrastructure, is, in general, good for consumers. This is because increased competition between wireless service providers brings benefits to their customers in terms of price, choice and quality of services. Consumer demand for wireless data services has grown significantly in recent years and is expected to grow exponentially, in data volume terms, over the coming years. This has and will increase the demand for spectrum suitable for WBB services. The spectrum bands under consideration in this RIA are all suitable for the provision of wireless broadband.

Option 1 (Multi-band award) versus Option 2 (3.6 GHz only)

- A 5.58 To the extent that holding a separate award for the 3.6 GHz band provides greater certainty around the future use of the band to existing end-users in that band, ComReg considers that they are likely to prefer Option 2 over Option 1.
- A 5.59 To the extent that holding a separate award process for the 3.6 GHz band can be expected to provide earlier certainty on the 3.6 GHz spectrum rights of use post licence expiry, ComReg considers that consumers in general are likely to prefer Option 2 over Option 1.
- A 5.60 Furthermore, as noted above, ComReg is of the view that Option 2 is, on balance, preferable over Option 1 in terms of its impact on competition. In

turn, it can be expected that the benefits of competition will be experienced by consumers in terms of price, choice and quality.

- A 5.61 Accordingly, ComReg is of the view that Option 2 is preferred to Option 1 in terms of the impact on consumers.

Option 2 (3.6 GHz band only) versus Option 3 (3.6 GHz band and 2.3 and/or 2.6 GHz bands)

- A 5.62 ComReg has not identified any obvious efficiency gain from the inclusion of the 2.3 GHz and/or 2.6 GHz band in a separate award with the 3.6 GHz band. Indeed, ComReg has identified drawbacks in relation to the exclusion of one or both of these bands from any future award which included the 700 MHz band.
- A 5.63 As noted above, ComReg is of the view that Option 2 is, on balance, preferable over Option 3 in terms of its impact on competition. In turn, it can be expected that the benefits of competition will be experienced by consumers in terms of price, choice and quality.
- A 5.64 In that light and to the extent that the inclusion of these bands is capable of undermining competition and effective entry arising from a subsequent 700 MHz band award process, consumers of mobile services are unlikely to have a preference for the inclusion of one or other of these bands in an award process with the 700 MHz band.
- A 5.65 Accordingly, ComReg is of the view that Option 2 is preferred to Option 3 in terms of the impact on consumers.

The ‘Spectrum for Award’ RIA: Assessment and the Preferred Option (Step 5)

- A 5.66 In light of the above, ComReg is of the view that, on balance, Option 2 (i.e. the release of the 3.6 GHz band alone in a separate award process) is the preferred option in terms of its impact on stakeholders, competition and consumers.

A5.2 Response to assessment of Preferred Option against ComReg’s other relevant functions, objectives and duties

Assessment in Document 15/70

- A 5.67 In section 3.2 of Document 15/70, ComReg came to the preliminary view that the 3.6 GHz band should be released on its own and by way of auction (the “Preferred Option”). This followed an assessment of a number of regulatory options available to ComReg within the context of the RIA analytical framework as set out in the ComReg’s RIA Guidelines (i.e. impact on industry stakeholders, impact on competition and impact on consumers).
- A 5.68 In section 3.3 of Document 15/70, ComReg then carried out an assessment of the Preferred Option with regard to other statutory provisions relevant to the management of Ireland’s radio frequency spectrum. This involved identifying those statutory provisions (set out in Annex 2 of Document 15/70) which ComReg considers to be particularly relevant to the use and management of the radio frequency spectrum along with an assessment (to the extent not already dealt with as part of the draft RIAs) of whether, and to what extent, the Preferred Option accords with those provisions. In carrying out this assessment, ComReg highlighted some of the relative merits / drawbacks which would arise if it was to select some of the alternative options assessed under the draft RIAs.
- A 5.69 For the purposes of that section, the statutory provisions which ComReg considered to be particularly relevant to the management of the radio frequency spectrum in the State were grouped as follows:
- general provisions on competition;
 - contributing to the development of the internal market;
 - to promote the interest of users within the Community;
 - efficient use and effective management of spectrum;
 - regulatory principles;
 - relevant Policy Directions and Policy Statements; and
 - general guiding principles (in terms of spectrum management, setting of fees and licence conditions):
 - Objective justification;
 - Transparency;
 - Non-discrimination; and
 - Proportionality.

- A 5.70 Following that assessment, ComReg came to the preliminary view that the Preferred Option accords with those other statutory provisions relevant to the management of Ireland's radio frequency spectrum.
- A 5.71 ComReg summarises and considers below the submissions received on section 3.3 and Annex 2 of Document 15/70. This is done by reference to each of the above mentioned statutory provisions, where possible.

Views of respondents and ComReg's position

- A 5.72 At the outset, ComReg would point out that there is significant overlap in the views expressed and arguments made in certain submissions, in particular the FWA 16 submission, and to the extent that some of those views/arguments have already been addressed earlier in this document, ComReg does not propose to repeat them below. Notwithstanding, the full non-confidential versions of all submissions received, including the FWA 16 submission, can be found in ComReg Document 15/106R.

General

Interpretation of statutory provisions

- A 5.73 ComReg notes that certain respondents, in particular the FWALA 16 submission, purported to enter into debate as to the interpretation of many of ComReg's statutory functions, objectives and duties, often asserting that they must be interpreted in a certain manner. ComReg is satisfied that it has made its position consistently clear throughout this and previous consultation processes as to how it interprets and applies those statutory functions, objectives and duties relevant to its management of the radio frequency spectrum.

Specific Provisions

Policy Direction No.3 on Broadband Electronic Communication Networks

- A 5.74 In Annex 2 of Document 15/70, ComReg noted that it was cognisant of the fact that the three year objective described in this policy direction has now expired making this direction less relevant currently. The FWALA 16 and Imagine submissions suggested that ComReg has disregarded Policy Direction No.3. On the contrary, ComReg notes that its comments on the three year time period were an observation only.
- A 5.75 In the context of this same policy direction, the FWALA 16 submission then suggests that ComReg should assess whether the National Broadband

Scheme (“**NBS**”) complied with the European Commission’s 2008 State aid decision (State aid No N 475/2007) and whether the NBS objectives were realised. In response, ComReg would point out that it has neither the remit nor the vires to make such an assessment

Policy Direction No.4 of 21 February 2003 on Industry Sustainability

- A 5.76 On page 11 of the FWALA 16 submission, it is suggested that the FWA sector has been “weakened and is now under severe threat” due to “*ComReg’s delay in dealing with the replacement of the FWALA licences*”. This suggestion of ‘delay’ has also been made elsewhere in its submission. In response, ComReg would first point out that existing FWALA licensees have no legitimate expectation to be awarded 3.6 GHz spectrum under the proposed award process. Secondly, ComReg is of the view that its consultation process has been carried out in a timely manner given that existing rights of use in the 3.6 GHz band do not expire until mid-2017 (see also ComReg’s observations above in respect of the timeliness of the current consultation and proposed award process). ComReg therefore rejects the suggestion that it has delayed the release of rights of use in this band or that its proposed timing of such release has been the cause of any detriment to the FWA sector. On the contrary, ComReg has clearly facilitated an expedited release of rights of use in the 3.6 GHz band by proposing its release in a standalone award process.
- A 5.77 The FWA 16 submission also suggests that ComReg has not taken into account the impact of the proposed award process on FWA operators. ComReg rejects this suggestion and notes that the proposed award process has clearly been designed with the impact on all industry stakeholders, including FWA operators, in mind. This is evident not only throughout the draft RIA (which considers the impact on industry stakeholders), but also ComReg’s proposals in respect of regional licensing and transition. Indeed, ComReg’s proposal to hold a separate award process for the 3.6 GHz band was clearly influenced in large part by the consultation submissions received from FWA operators.

Regulatory principles

- A 5.78 In a number of places in the FWA 16 submission, it is suggested that ComReg has acted contrary to the regulatory principle of **promoting regulatory predictability** on the basis that it previously assigned rights of use in the 3.6 GHz band on an administrative assignment basis but is not

now proposing to do so. However, this view ignores, amongst other things, the fact that:

- a) this band has since been harmonised at EU level on a technology neutral basis and it is therefore no longer appropriate to favour a particular technology; and
- b) demand is now more likely to exceed the supply of spectrum for part or all of this band so a ‘first-come-first-serve’ approach to spectrum assignment is no longer appropriate.

- A 5.79 In the context of the same regulatory principle, ComReg is also criticised in the FWA 16 submission for focussing on the fact that mobile operators have increasing experience with auctions. ComReg accepts that FWA operators are likely to have little or no experience of spectrum auctions and this was recognised in Document 15/70.²⁶⁹ ComReg discusses measures aimed at addressing auction complexity in detail in Annex 8.
- A 5.80 The FWA 16 submission also suggests that ComReg has “*nowhere*” taken due account of the **variety of conditions relating to competition and consumers that exist in the various geographic areas** within the State. In response, ComReg would point to, for example, its proposals as to regional licences discussed in detail in Chapter 4 of Document 15/70.
- A 5.81 The FWA 16 submission also suggests that ComReg is not **promoting efficient investment and innovation in new and enhanced infrastructures** because it not “*enabling the FWA sector to upgrade their networks to NGA services*”. In response, ComReg notes that the above suggestion ignores the fact that:
- a) its proposals do not in any way preclude the participation of the FWA sector in the proposed award process; and
 - b) the 3.6 GHz band has been harmonised on a technology neutral basis which (along with, amongst other things, the rules regarding non-discrimination) precludes the favourable treatment of FWA operators.
- A 5.82 Accordingly, ComReg remains satisfied that the Preferred Option accords with this regulatory principle (see paragraph 3.165 of Document 15/70).

Conclusions

- A 5.83 In light of the above discussion and in the absence of other developments or information to the contrary, ComReg remains of the view that the

²⁶⁹ See, for example, section 5.2.5 of Document 15/70.

Preferred Option accords with the other statutory provisions relevant to its management of Ireland's radio frequency spectrum.

- A 5.84 Having considered the submissions by respondents to Document 15/70 and any other relevant information to hand, ComReg's draft RIA and its assessment of the Preferred Option against its other relevant functions, objectives and duties is set out in section 3.5 of Chapter 3 of this document.

A5.3 ComReg's response to reasons provided by respondents in support of using an administrative award

- A 5.85 FWA operators are of view that spectrum should be reserved for FWA/NGA type use only. In particular Imagine contends that, in effect, there is no likely demand for mobile services using 3.6 GHz spectrum. As a result, MNOs would only acquire spectrum rights of use to deny that same spectrum to fixed wireless users.

- A 5.86 In that regard, ComReg notes the following issues (other than matters relating to the NBP and SAG – which are discussed in Chapter 2 and section 2 of Annex 6) were raised by respondents as a rationale for excluding mobile and other uses and assigning rights of use to the 3.6 GHz band to FWA providers on an administrative basis.

- A claim that an assessment of demand for 3.6 GHz spectrum in order to justify the use of an auction was not undertaken;
- There is a lack of demand for mobile use in the 3.6 GHz band;
- Propagation characteristics of the 3.6 GHz band are not suited to mobile use;
- Ireland's low population density inconsistent with the use of 3.6 GHz band for mobile services; and
- Mobile use of the 3.6 GHz band would be limited to mobile hotspots in large towns.

No assessment of demand to justify the use of an auction (FWA 16)

- A 5.87 FWA 16 claims that ComReg has not demonstrated that there will be excess demand in order to justify the use of an auction, ComReg does not consider that it is reasonable or indeed necessary to determine the real level of demand prior to any competitive process. Any ex-ante assessment on the

extent to which potential bidders have demand for certain lots is subject to large information asymmetries and bidders are unlikely to offer a reliable indication of interest prior to the award of harmonised spectrum.

- A 5.88 In any event, the FWA 16 claim may be based on a misunderstanding, as the main stage of the auction will only arise where demand exceeds supply. In that regard, the application stage of the award will determine the extent to which demand exceeds supply. Applications will require a binding bid at reserve prices from each bidder. These are then used to assess the extent to which the demand for lots across regions exceeds supply and ultimately the need for an auction. If demand does not exceed supply, there would be no main stage of auction and lots would be assigned at reserve prices. A subsequent assignment stage auction would still be needed to determine which specific frequencies were assigned to bidders where more than one bidder had demand for the same frequency assignment.

Lack of demand for mobile use in the 3.6 GHz band (Imagine, Premier Broadband)

- A 5.89 Imagines contention that there is no likely demand for mobile services using 3.6 GHz spectrum is not reliable and the evidence it cites seems misunderstood. Therefore, its conclusion that MNOs might only acquire such rights of use for hoarding or other anti-competitive purposes is also incorrect, since there are many valid mobile and other uses for those rights of use, now and potentially over the duration of the licence²⁷⁰.

MNOs response to consultation

- A 5.90 Imagine contends that ComReg has not taken account of the clear views of MNOs who allege a clear lack of demand for mobile. In this regard, Imagine cite the views of Vodafone and 3IHL.
- A 5.91 Firstly in respect of the views of 3IHL, Imagine references those views as stated in response to 14/101, where 3IHL argued that the band should not be included in same award process as the other bands.²⁷¹ In the context, of a single 3.6 GHz band award process, ComReg notes the most recent views of MNOs in response to Document 15/70.

²⁷⁰ ComReg notes that it uses a range of tools to ensure the efficient use of the radio spectrum and prevent harm to consumers and competition. This includes competition caps (Chapter 5), transfer and leasing arrangements (Chapter 6), spectrum hoarding (Chapter 6), spectrum usage fees (Chapter 5), licence conditions (Chapter 6), and transition proposals (Chapter 7).

²⁷¹ ComReg notes that number of devices with capability on the 3.6 GHz band has increased from x to Y over the period and could

- A 5.92 For example, in response to the latest consultation 3IHL note, in relation to the 3.6 GHz band that:
- "it might be used in several different ways depending on the licensee and location, e.g. it might be used for mobile capacity in urban areas and for fixed wireless access or initial stage backhaul in rural areas. ComReg need to allow enough flexibility for these different types of use to emerge."*
- A 5.93 In addition, Eircom notes that:
- . "This strikes the right balance...and the release of the 3.6 GHz band where there is already established demand and which is likely to be of significant interest to mobile and fixed operators in the provision of wireless broadband services"*
- A 5.94 ComReg notes Vodafone views that the "*propagation characteristics of the 3.6 GHz band will ensure that this band is used principally for FWA type services*" and its views that "*the 3.6 GHz band could accommodate a variety of possible uses, including fixed wireless applications, nomadic wireless services, and possibly some additional capacity for existing mobile operators.*"
- A 5.95 ComReg does not agree with Imagines contention that the MNOs are of the view that mobile broadband is not likely to be a credible potential use of the band. ComReg accepts that there is uncertainty around the eventual use of the 3.6 GHz band. However, the purpose of this award process is to release spectrum rights of use in line with the 3.6 GHz EC Decision, and not artificially exclude any potential use from the award process. If demand subsequently does not exist for any particular use, the outcome of the award will establish this.

DotEcon

- A 5.96 In support of its case that there is a lack of demand for mobile use, Imagine contends that ComReg has not taken account of the advice of DotEcon published with its Consultation.
- A 5.97 Much of the claim referred to above relies on the view as stated by Imagine that:
- "DotEcon said that the supply of spectrum without 3.6GHz may already be sufficient to meet demand at the time of the award and that there was a risk that demand for 3.6 GHz was low relative to availability"*
- A 5.98 In effect, Imagine contends that the DotEcon analysis suggests that demand for the 3.6 GHz band for mobile uses is likely to be low. ComReg,

however, is of the view that Imagine has misunderstood and/or taken out of context the views of DotEcon.

- A 5.99 Firstly, it should be noted that Imagine appears to refer to the advice provided in Document 14/102 when DotEcon was considering the inclusion of the 2.6 GHz and other available bands (700 MHz, 1.4 GHz, 2.3 GHz, and 2.6 GHz and 3.6 GHz bands). This does not represent the views of DotEcon in light of the award of the 3.6 GHz band in a single band award process, which was considered separately in Document 15/71 and contains a significantly smaller supply of spectrum compared to that considered in Document 14/102.
- A 5.100 Imagine's assessment of DotEcon's views are incorrect for a number of reasons. In relation to the claim that (a) the supply of spectrum without 3.6 GHz may already be sufficient at the time of the award and (b) there is a risk that demand for 3.6 GHz spectrum is low relative to availability, ComReg notes that:
- The DotEcon analysis in Document 14/102 applied where 3.6 GHz spectrum was included with other available bands (700 MHz, 1.4 GHz, 2.3 GHz, and 2.6 GHz and 3.6 GHz bands) in the same award. As such DotEcons views, at that point, considered the award of 3.6 GHz spectrum with an additional 390 MHz potentially included in the same award. Such a large difference in supply would clearly have influenced DotEcons views and is not what is proposed under the current 3.6 GHz only award process, where the supply of spectrum only extends to the 3.6 GHz band;
 - DotEcon does not claim that there was a risk that demand for 3.6 GHz among MNOs was low relative to availability. Indeed, DotEcon refer specifically to "*existing users*" in analysing the scope for demand substitution between the 3.6GHz band and other bands.
 - Finally, DotEcon refers to the supply of spectrum "**at the time of the award**". ComReg notes that it considers the efficient use of the radio spectrum over the total duration of the licence (15 years) and not at any specific point in time.
- A 5.101 In any event, DotEcons advice in respect of a single and separate award of rights of use for the 3.6 GHz band is contained in Document 15/71 wherein (para 35 and 36) and in particular, it notes that:

“The 3.6GHz band may be of interest for a wide range of potential users, including current FWALA licensees, mobile operators and others wishing to provide high and width nomadic services.”

“While the band is already used for fixed wireless access services, it may also be suitable for other applications.”

“However, participation and competition in the auction is difficult to forecast. In this context it is appropriate to use an auction to assign usage rights for the available frequencies, as this allows interested parties to express their various needs.”

- A 5.102 ComReg is therefore of the view that it has accurately reflected the views of DotEcon in this and previous consultations and the evidence cited by Imagine does not support the view that demand for 3.6GHz from MNOs is low and unlikely to be used for mobile use.

Propagation characteristics and lack of a developed device ecosystem (Imagine)

- A 5.103 In relation to Imagines concerns, ComReg notes the following,

- The device ecosystem for the 3.6 GHz band continues to grow. There were 33 LTE TDD devices in the 3.6 GHz bands (Bands 42 and 43) up from 26 devices in April.²⁷²
- DotEcon note that there remains some scope for demand substitution between the 3.6 GHz band and other bands despite the lower propagation of signals using these higher frequencies; and
- operators might also use 3.6 GHz spectrum for backhaul purposes (where the 3.6 GHz band has favourable propagation characteristics)

- A 5.104 The propagation characteristic of the spectrum has also not prevented the 3.6 GHz being consider for mobile use currently or in the future. For example: The 3.6 GHz band has been recently assigned to mobile operators in Japan²⁷³, Slovenia, and Romania.

²⁷² Global mobile Suppliers Association (GSA), LTE Ecosystem Report, November 2015.

²⁷³ <http://www.policytracker.com/headlines/japan-assigns-3.5-ghz-band>

- A 5.105 Finally, developments relating to the next generation of mobile broadband technologies (i.e. "5G") appear to be focused upon frequency bands with less favourable propagation characteristics than the 3.6 GHz band.²⁷⁴

Ireland's Low population Density (Imagine)

- A 5.106 Furthermore, the unsupported assessment that Ireland's population density is low and that MNOs may only have demand for 3.6 GHz spectrum in certain dense conurbations, is not, in and off itself, a valid reason for ComReg to exclude it or other uses from expressing that demand for all available spectrum in those or other regions.
- A 5.107 It is questionable whether demand for the 3.6 GHz band exists on a national basis for mobile use, and in some cases for FWA use. As such, the assignment of spectrum on a national basis may not allow for the efficient use of the radio spectrum. The award of the 3.6 GHz band (as requested by FWA operators) recognises this and assigns spectrum across certain geographic regions so as interested parties (including FWA users) can better express their demand across relevant areas. In that regard, ComReg notes that while the population density of the State is low at 67 persons/KM² urban regions ranges from 1,163 persons/KM² (Waterford) to 3,498 persons/km² (Dublin City and Suburbs) and demand for mobile use may exist in such regions. Therefore, where any interested party has demand for spectrum in high density areas the assignment process should allow for the delivery of advanced LTE services in certain regions.²⁷⁵
- A 5.108 It might well be the case that demand from MNOs for 3.6 GHz spectrum only exists in dense urban conurbations. In any event, it is not, nor has it ever been ComReg's contention that there is a large demand for 3.6 GHz spectrum among mobile operators or across all areas of the State. Rather that demand from all users should be expressed on an equal basis with spectrum rights of use assigned on a service and technology neutral basis.

Mobile use of spectrum for hotspots (BBNet, Digital Forge and Ripplecom)

- A 5.109 Other FWA providers are of the view that it is inappropriate to award a significant amount of spectrum via an auction process to MNOs for use solely as capacity spectrum in hotspots in larger towns within rural regions.

²⁷⁴ For example, Ofcom also said they were considering whether radio spectrum in other bands, such as 3.6 to 3.8GHz and 3.8 to 4.2GHz could be used for 5G.

²⁷⁵ <http://www.ericsson.com/news/1880227>

In addition, requirements for in building capacity spectrum by MNOs could and should be met through an obligatory system of sub leasing of spectrum for these purposes.

- A 5.110 In accordance with the EC 3.6 GHz Decision and the RSPP Decision²⁷⁶, ComReg intends to proceed on a service and technology neutral basis. ComReg does not therefore propose specifying the technologies / services which licensees (including MNOs, if applicable) must use / offer post award. Notwithstanding, ComReg notes that its proposed roll-out conditions (see Chapter 6) to a large extent address the concern raised by these respondents.
- A 5.111 In respect of the sub-leasing of spectrum, this is discussed in Chapter 6. ComReg does not intend to impose a sub-leasing licence condition. However, it is proposed that licensees (both in city and rural regions) will be free, and indeed encouraged, to negotiate sub-leasing arrangements with other operators

A5.4 Consideration of other material issues raised by respondents

Lack of information

- A 5.112 At paragraph 3.101 of Document 15/70, ComReg noted the difficulty with making an accurate assessment of alternative assignment options under an administrative assignment mechanism and the associated risk of making an inefficient assignment. This is due to the limited information that ComReg has about certain issues including the value of the services that each applicant could provide and the bandwidth of frequencies that would need to be assigned to an applicant.
- A 5.113** For the avoidance of doubt, the limited information ComReg refers to does not relate to information “*that presently exists and is certain*”²⁷⁷ as claimed by FWA 16, which is collected on an ongoing basis in order to produce the Quarterly Report. This data has already and continues to inform this consultation process. Rather, ComReg was referring to information that would be required by it in order to reliably assess what set of outcomes best ensures the efficient use of spectrum. Such information is revealed in an auction process but not in an administrative award.

Uncertainty

²⁷⁶ Decision No 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme.

²⁷⁷ FWA 16 response, p24

- A 5.114 The FWA 16 submission contends that ComReg has choked the FWA sector to a standstill with the uncertainty it has created since 2010 and has done nothing to allay this uncertainty.
- A 5.115 ComReg rejects any suggestion that it has created any uncertainty in the FWA sector or choked the sector to a standstill. On the contrary, ComReg's 2010 Information Notice left existing licensees in no doubt as to the duration of rights of use, a full 7 years in advance of licence expiry.
- A 5.116 Following the adoption of the 2014 3.6 GHz EC Decision on the 3.6 GHz band, ComReg initiated a spectrum award consultation (Document 14/101) in September 2014, which included consideration of the future of the 3.6 GHz band, almost three years in advance of licence expiry. In light of the responses received, ComReg released an Information Notice (Document 15/14) setting out the possible release of rights of use in the 3.6 GHz band in a separate award process, following which Document 15/70 was published in July of this year. Therefore, ComReg is satisfied that it has engaged fully with industry in a timely and transparent manner in respect of the 3.6 GHz band.

Lack of support for continuation of a local scheme

- A 5.117 FWA 16 questions ComReg's assertion that the weight of FWA responses did not support the continuation of a local areas licensing approach.
- A 5.118 In that regard, ComReg notes that in response to Document 14/101, Ripplecom stated that "*while the 3.6 GHz band is very well suited for FWA, the current FWALA scheme is not adequate for NGA speeds*". Similarly, the joint FWA operators²⁷⁸ response questions whether the current scheme has been as successful as it could have been.²⁷⁹ Finally, Viatel fully agreed with certain ComReg proposals including the use of a CCA auction on a technology neutral basis.
- A 5.119 Therefore ComReg remains of the view that FWA responses indicated a lack of support for the continuation of the current FWALA licencing scheme in its current form.

Evidence of future plans

- A 5.120 Ripplecom suggests that interested parties should not be permitted to acquire spectrum rights of use on the basis of potential for future use and

²⁷⁸ Fastcom, LightNet, permaNET Ripplecom and WestNet

²⁷⁹ This respondent outlines a number of factors leading to this conclusion including, cherry picking, lack of spectrum in areas adjacent to urban areas, imposition of 30 Km exclusion zones, spectrum hoarding.

that any award should be based on presentation of clear evidence of concrete roll-out plans.

- A 5.121 ComReg notes that Ripplecom's concern appears to be influenced by the desire to avoid anti-competitive spectrum hoarding. However, even had ComReg the statutory power to do so, Ripplecom's solution would, in ComReg's view, be a disproportionate response to such perceived concerns. Instead, ComReg has other more proportionate instruments at its disposal with which to ensure the efficient use of spectrum, including the imposition of coverage and roll-out licence conditions. ComReg also has the power under the Framework Regulations to lay down rules in order to prevent spectrum hoarding (Regulation 17(10)).
- A 5.122 In any case, ComReg notes that Ripplecom's proposal would likely involve a significant delay to the conduct of an award process contrary to the express wishes of the majority of the respondents to Document 15/70.

Consumer Preferences

- A 5.123 The FWA 16 submission criticises the approach taken by ComReg in the draft RIA in order to determine what consumers would prefer, noting that "*there is a complete dearth of input from such consumers*"
- A 5.124 At the beginning of its draft RIA in Document 15/70 (paragraph 3.12), ComReg made it clear that, prior to receiving submissions on its various proposals contained in that document, it had taken a reasonable and pragmatic approach to considering the likely impact of each option on the various stakeholders (including consumers) without, in some cases, being in a position to reference particular views expressed by those stakeholders, but having regard to its experience and expertise and also having regard to the advice of its consultants.
- A 5.125 However, mechanisms for the release of upstream inputs like radio frequency spectrum are, by their very nature, complex and, unsurprisingly, ComReg has not, to date, received any submissions from consumers or consumer bodies in respect of its proposals set out in Document 15/70.
- A 5.126 Notwithstanding, ComReg noted at paragraph 3.65 of Document 15/70 that it can be assumed that what is good for competition, and what promotes investment in infrastructure, is, in general, good for consumers. This is because increased competition brings benefits to customers in terms of price, choice and quality of services. ComReg took this into account when determining the likely preferences of consumers.

A 5.127 Accordingly, ComReg is satisfied that it has appropriately considered the impact of its regulatory proposals on consumers.

Transition

A 5.128 The FWA 16 submission asserts that “*ComReg’s suggestion that transition rules for existing incumbents will deal with service disruption to existing FWALA operators during the auction process completely misses the point. The incumbents need spectrum now, not at some unspecified time in the future*”

A 5.129 In response, ComReg notes that the FWA 16 submission appears to misunderstand the specific transition proposals designed to prevent service disruption to existing services. It appears to be conflating ComReg’s transition proposals to address the risk of disruption to customers of existing licensees with the provision of services under new rights of use assigned under the proposed award process. In summary, ComReg’s proposal is intended to address service disruption caused to customers of existing licensees and not new rights of use granted under the proposed award process. This licence would be for a maximum period of not more than 2 to 5 years, and not for some unspecified time period. In this way, an existing licensee will still be able to provide existing services for a maximum duration (See Section 7.3.3 in Document 15/70). Therefore, this transition proposal allows existing licensees access to 3.6 GHz spectrum under certain conditions for a period beyond its existing licence.

Annex 6: Other issues raised

- A 6 .1 This annex sets out ComReg's consideration of other issues raised by respondents to Consultation 15/70.
- A 6 .2 This annex is structured as follows:
- ComReg's consideration of other material issues relevant to Chapter 1; and
 - ComReg's consideration of other material issues relevant to Chapter 2.

Chapter 1 – other issues

Total FWA subscriber numbers

- A 6 .3 Some respondents to Document 15/70 claimed ²⁸⁰ that the total FWA subscriber figures presented in Document 15/70 for all FWA bands, misrepresents the actual numbers. The figures presented in Document 15/70 are from ComReg's Quarterly Report, which collects quarterly statistical data for the purposes of preparing Quarterly Key Data Reports from operators who generate in excess of €500,000 in revenues from electronic communications networks and services per annum. Hence, presented information on FWA subscribers would not include subscriber numbers from operators with annual revenues below this threshold.
- A 6 .4 Notwithstanding, the total figure of all FWA subscribers, including in other licensed and unlicensed bands, is less relevant in the proposed award for the 3.6 GHz band. The most relevant figure in terms of understanding the background to the proposed award is the figure for the 3.6 GHz band. In that regard, ComReg estimates that there are 25,258 subscribers²⁸¹, to services provided by the 3.6 GHz band.

Chapter 2 – other issues

- A 6 .5 In section 2.2 of Consultation 15/70, ComReg noted it had issued a call for input on the regulatory implications of the NBP (Document14/126). In that connection, ComReg took the opportunity to:

²⁸⁰ Including, Aptus, FWA 16, Imagine, Net1, Rapid BB,

²⁸¹ This estimate is based on data from ComReg's latest (Q3 2015) Quarterly Report and a questionnaire circulated to all 3.6 GHz licensees in February 2015. This figure includes subscriber figures for 10 of the 14 3.6 GHz FWALA operators as some of the 3.6 GHz FWALA operators did not respond to the questionnaire.

- “reiterate that ComReg has no decision-making role in regard to the design of the NBP or the award of contracts under the NBP; and
- confirm that, to the extent that interested parties have views how ComReg's spectrum award proposals may, in their view, better align with the NBP (including when more detailed information becomes available about the NBP), then ComReg remains open to consideration of such views in the context of ComReg's own statutory remit.” (page 12)

- A 6.6 ComReg received extensive submissions from several respondents in relation to this matter.
- A 6.7 ComReg also received correspondence from Imagine in relation to matters relating to the NBP and interested parties are referred to the non-confidential versions of this correspondence, and ComReg's response, all of which are published in Annex 10 alongside this response to consultation.
- A 6.8 These submissions are grouped and addressed in the context of the following broad headings:
- c) Imagine's suggestions that ComReg has failed to define “Fixed NGA” as the relevant market for the 3.6 GHz Band/award;
 - d) Suggestions that FWA should be preferred for the 3.6 GHz Band/award; and
 - e) Suggestions of unfairness in ComReg's proposed process due to a “one size fits all approach”.

A. ComReg's “obligations” in respect of the NBP and DAE (including particular reference to the SAG)

- A 6.9 Several respondents suggested that ComReg's 3.6 GHz Band award proposals as set out in Consultation 15/70 were either inconsistent with, or contrary to, the NBP, including by reference to the SAG.
- A 6.10 The issue of ComReg's role under the SAG is addressed in Chapter 2. More specific suggestions as to ComReg's "obligations" arising from the NBP, DAE and, in particular, the SAG are addressed here.
- A 6.11 In the following section, ComReg firstly summarises the reasons provided by respondents in respect of each category and then its response.

More specific suggestions as to ComReg's specific “obligations” arising from the NBP, DAE and, in particular, the SAG

Views of respondents

- A 6.12 Imagine's submissions on this issue are considerable and are set out in particular at pages 3 to 5 and 13 to 21 of its submission.
- A 6.13 Accordingly, interested parties are referred to the non-confidential version of this document which is published in ComReg Document 15/106.
- A 6.14 ComReg refers, in particular, to Imagine's submission that: "*In failing to recognise the importance of the provision of 'Fixed NGA' services as the relevant market and in failing to prefer Fixed NGA as the use of the spectrum ComReg's assessment of the use of and demand for the 3.6Ghz Spectrum is inconsistent and conflicts with the DAE, the NBP, SAG and DCENR market analysis underpinning the NBP.*"
- A 6.15 The FWA 16 also made submissions regarding their views of ComReg's role in connection with the NBP and advocating that ComReg has certain obligations in this regard, including in terms of State aid compliance.²⁸²

ComReg's response

- A 6.16 ComReg welcomes the views of Imagine and the Joint FWALA 16 on this issue, including the opportunity to provide clarity on same.
- A 6.17 ComReg observes that, as noted above and in Chapter 2:
- It is fully cognisant of the role envisaged of NRAs in the SAG, including in particular as described in paragraph 42 of the SAG;
 - Importantly, paragraph 42 does not in any way refer to the exercise of a NRA's spectrum management function in the context of State aid broadband projects and, in particular, in the manner as suggested by these respondents (e.g. to favour FWA or to "facilitate NGA investment").
- A 6.18 ComReg also refers to paragraph 44 of the SAG on which reliance is placed by Imagine and the FWA 16, which provides that "*Granting authorities shall also take into account spectrum (re-) allocations leading to possible network rollout in the target areas that could achieve the objectives of the granting authorities without the provision of direct grants*".
- A 6.19 Leaving aside the fact that the relevant body identified by the European Commission is the "granting authority" and not the "NRA", ComReg makes the following observations:

²⁸² At pages 3-4 of its submission.

- the “allocation” of radio spectrum in Ireland lies within ComReg’s remit²⁸³;
- the 3.6 GHz Band has been allocated across the EU by way of the 3.6 GHz EC Decision for the terrestrial provision of electronic communications services (ECS), an instrument with direct, binding effect on all Member States (and in contrast to the SAG). As discussed in detail in Chapter 2, this decision:
 - is service-neutral as it requires that any new 3.6 GHz rights holder be permitted to provide any ECS of their choice including, but not limited to, wireless broadband services;
 - is technology-neutral because it requires that any new 3.6 GHz rights holder be permitted to use any terrestrial electronic communications networks which comply with the parameters of Annex 2 of the 2014 3.6 GHz EC Decision; and
 - (of particular relevance to the current discussion), expressly obliges Member States to allow the use of the 3.6 GHz band for fixed, nomadic **and** mobile electronic communications networks²⁸⁴; and
 - in relation to the above bullet point above, recital 2 of the 2008 3.6 GHz EC Decision identifies that “[T]he designation of the 3 400-3800 MHz band for fixed, nomadic **and** mobile applications is an important element addressing the **convergence of the mobile, fixed and broadcasting sectors** and reflecting technical innovation. The services provided in this frequency band should mainly target end-user access to broadband communication” (emphasis added).

- A 6.20 That is, and in contrast to the suggestions of respondents that ComReg “favour” FWA networks over, for example, mobile networks, the 3.6 GHz EC Decision expressly requires Member States to ensure that **all** compliant ECN (including nomadic and mobile) be permitted to be used in the **entire** 3.6 GHz Band, including with the stated intention of addressing the **convergence** of the fixed, mobile **and** broadcasting sectors.
- A 6.21 Moreover, ComReg observes that recital 4 of the 2014 3.6 GHz EC Decision specifically identifies that the use of the 3.6 GHz band for wireless broadband should “contribute to the economic and social policy objectives

²⁸³ “Spectrum allocation” is defined in the Framework Regulations to mean “the designation of a given frequency band for use by one or more types of radiocommunications services, where appropriate, under specified conditions” (emphasis added).

of the Digital Agenda for Europe" (emphasis added), in circumstances where:

- it does not express a preference for any particular form of wireless broadband to be provided in the context of the DAE (e.g. FWA or indeed "NGA" (including Fixed NGA) as contended by respondents); and
- the 2014 3.6 GHz EC Decision post-dates the issue of its SAG (in 2013).

- A 6.22 In addition, ComReg would highlight the fact that the 3.6 GHz Band has already been allocated in Ireland by ComReg for "Terrestrial electronic communications services, including FWALA", in line with the 2014 3.6 GHz EC Decision, (i.e. 2014/276/EC)²⁸⁵.
- A 6.23 Moreover, ComReg would draw attention to section 5.5.3 of the PWC "NBP Ireland – State Aid Compliance Report – December 2015 update", which makes quite clear that the granting authority in Ireland (i.e. DCENR) is, in fact, taking into account the spectrum "(re)-allocations" as envisaged by paragraph 42 of the SAG.²⁸⁶

B. Imagine's suggestion that ComReg has failed to define "Fixed NGA services" as the "relevant market" for the 3.6 GHz Band and/or 3.6 GHz band award

- A 6.24 Interested parties are referred to Imagine's submission and, in particular, section 3 of same for the full text of this argument.
- A 6.25 Among other things, Imagine suggests:
- *ComReg's analysis is fundamentally flawed because it fails to identify the relevant markets for the 3.6GHz spectrum;*

²⁸⁵ In Ireland, "spectrum allocations" are set out in the "Radio Frequency Plan", which is statutorily prescribed by section 35 of the 2002 Act and which is described in subsection (4) thereof as follows:

"The plan shall be comprised of a set of tables indicating the frequency allocations in the radio spectrum at the publication of the plan".

The tables in the Radio Frequency Plan cover the frequency range from 9 kHz to 1000 GHz. The Radio Frequency Plan is available at: http://www.comreg.ie/_fileupload/publications/ComReg13118R.pdf.

In relation to the 3.6 GHz Band, see pages 124 and 125.

²⁸⁶ See: <http://www.dcenr.gov.ie/communications/en-ie/Broadband/Pages/Intervention%20Strategy%20Updated%20December%202015-Reports.aspx>

- *ComReg's award process is focussed excessively on mobile applications and the fixed NGA market has not been adequately considered, biasing the Regulatory Impact Assessment and leading to an incomplete analysis;*
- *Not alone has ComReg not acted actively to favour commercial NGA uses of the 3.6GHz spectrum it appears to favour unspecified potential future mobile uses.*
- *ComReg has not taken on board our conclusion that fixed NGA services were the relevant market for the 3.6GHz band. Neither has it taken on board the evidence we cited to support our case, namely that:*
 - *propagation characteristics and the lack of a developed device ecosystem made 3.6GHz less suitable than other bands for mobile services;*
 - *that demand for 3.6GHz from MNOs was low and that spectrum allocated to mobile services in Ireland was more than adequate to meet future demands for mobile services, given Ireland's relatively low population density. This is particularly true in areas outside the dense urban conurbations;*
- *DotEcon said that the supply of spectrum without 3.6GHz may already be sufficient to meet demand at the time of the award and that there was a risk that demand for 3.6 GHz was low relative to availability; and*
- *Instead of defining the relevant markets, ComReg's approach has been highly subjective, particularly in assuming that mobile broadband is likely to be a credible potential use of the band.*

ComReg's response

- A 6 .26 As a preliminary matter, ComReg observes that the SAG does not purport to define, in a competition law sense, a “NGA market” or a “market for fixed NGA services” as suggested by Imagine.
- A 6 .27 ComReg further observes that there is no need to undertake the exercise suggested by Imagine because, as noted above, the 3.6 GHz EC Decision:
- is service- and technology-neutral;
 - expressly obliges Member States to allow the use of the 3.6 GHz band for fixed, nomadic **and** mobile ECN; and

- in circumstances where the designation of the 3.6 GHz Band for such ECN is identified as being an “*important element addressing the convergence of the mobile, fixed and broadcasting sectors and reflecting technical innovation. The services provided in this frequency band should mainly target end-user access to broadband communication*” (emphasis added).

A 6 .28 That is, irrespective of any particular views a Member State may currently have on the current/likely use of the 3.6 GHz band, Member States are obliged to allow the entire 3.6 GHz band to be used for fixed, nomadic and mobile ECN.

A 6 .29 In addition, the 3.6 GHz Band has already been allocated in Ireland by ComReg in line with the 2014 3.6 GHz EC Decision.

A 6 .30 ComReg further observes that:

- whereas some of the factors cited by Imagine in support of its view relate to the immediate and/or near term (e.g. “*the lack of a developed device ecosystem made 3.6GHz less suitable than other bands for mobile services*” and “*demand for 3.6 GHz from MNOs was low*”), ComReg is proposing to issue 3.6 GHz rights for a 15 year duration and such factors may well change over this time period; and
- whereas Imagine cites the (less-advantageous) propagation characteristics of the 3.6 GHz band [for example, relative to other potential “mobile” bands (e.g. 2.3 GHz and 2.6 GHz)], developments relating to the next generation of mobile broadband technologies (i.e. “5G”) appear to be focused upon frequency bands of much higher frequency than the 3.6 GHz band.²⁸⁷

C. Suggestions that FWA should be preferred for the 3.6 GHz band/award

Views of respondents

²⁸⁷ See, for example, Policy Tracker article entitled “Eleven bands above 24 GHz to be studied for 5G at WRC-19”, 26 November 2015, available at: <http://www.policytracker.com/headlines/wrc-15-agrees-to-study-11-bands-above-24-ghz-for-5g-at-wrc-19>

- A 6 .31 ComReg also received a number of submissions suggesting that ComReg's own statutory functions, objectives and duties require that FWA should be preferred for the 3.6 GHz Band.
- A 6 .32 Views and reasons provided in support of such views include:
- (i) the "*national interest to deliver NGA broadband to as many rural premises as possible in the shortest timeframes and the lowest impact to the taxpayer*" (Joint FWA4 submission)
 - (ii) "*Section 12(4) of the 2002 Act means that although ComReg is an independent Regulatory Agency it has an obligation to support national policy and should seek to use its powers to support national policy in the national economic interest. This over-arching consideration to support national policy must therefore be of higher priority than ComReg's more technical duties, such as maximising the efficiency of spectrum use*" (Imagine);
 - (iii) "*it is unclear how government policy, which is to deliver NGA services to customers, can be reasonably equated by ComReg to mean an obligation to maximise utilisation of the available radio frequency spectrum for WBB services. This is incorrect since utilisation of spectrum for WBB (efficiently or otherwise) does not necessarily translate into NGA service delivery to customers. In this interpretation ComReg has erred.*" (Imagine);
 - (iv) "*ComReg itself has its own obligations to ensure its actions as NRA are supportive of, and importantly not in direct contravention of, the state's obligations as a whole under SAG to use all of the assets of the state (specifically including spectrum) to minimise any potential intervention in the market*" (Imagine); and
 - (v) by reference to Policy Direction No.3 on Broadband Electronic Communication Networks (Imagine).

ComReg's response

- A 6 .33 In relation to above points and in the context of the allocation of 3.6 GHz band ComReg refers to the previous discussion including:
- the obligations imposed on ComReg and the State by the 3.6 GHz EC Decision, including Article 3 of same; and
 - that the 3.6 GHz Band has already been allocated in Ireland by ComReg in line with the 2014 3.6 GHz EC Decision

A 6 .34 In relation to above points and in the context of ComReg's proposed assignment of spectrum rights in the 3.6 GHz band, ComReg refers to, among other things, Chapter 3 of this document which, in its view, clearly establishes that the Preferred Option accords with ComReg's statutory obligations and, furthermore, that preferring FWA would not.

D. Suggestions of unfairness in ComReg's proposed process due to a "one size fits all approach"

A 6 .35 Submissions received from Imagine on this issue are set out in full in the non-confidential version of its submission published in ComReg Document [x] and include the following:

- (i) *Fundamentally, ComReg appear to be determined to use the same award process as they used previously in the much referenced mobile spectrum award. This attempt to shoehorn the FWA (fixed NGA) market into a process that worked acceptably for mobile services completely ignores the fundamentally different dynamics of these market spaces and the fundamentally different nature of the economics involved and application of the technology.*
- (ii) *While previous spectrum awards as referenced dealt with mobile markets the current award is substantially different as it is dealing with the convergence of distinct markets using a common wireless technology. However the technology does not define the market and addressing the needs of the distinct nature of these markets necessitates an award process fit for that purpose. Ignoring this challenge and choosing a process which was based purely on mobile has the obvious consequence of failing to address the needs of the fixed market.*

ComReg's response

A 6 .36 Firstly, ComReg again recalls that the 3.6 GHz EC Decision:

- is service-neutral in that it permits holders of new 3.6 GHz rights to provide any ECS of their choice;
- is technology-neutral in that it obliges Member States to allow the use of the entire 3.6 GHz Band for ECN on a fixed, nomadic and mobile basis; and
- insofar as the 3.6 GHz EC Decision considers "wireless broadband" to be an ideal service to be provided in this band, including in the context of the economic and social objectives of the DAE (recital 4 of 2014 3.6 GHz EC Decision), then it nevertheless identifies a range of "preferred configurations for the deployment of wireless broadband networks and

services” including, but not limited to, “small cells”, “fixed wireless access” and “backhaul” links).

- A 6 .37 Given the above factors, ComReg considers it entirely appropriate to take into account all ECS that may be provided with rights in the 3.6 GHz and via fixed, nomadic and mobile ECN. In addition, given that ComReg proposed a 15 year duration for 3.6 GHz rights of use in Document 15/70, it remains entirely appropriate to take into account the various potential uses/ECN over this time period.
- A 6 .38 Furthermore, ComReg does not accept the suggestions that it has not appropriately taken into account the particular facts and circumstances of FWA in the development of its award proposals. In that regard, ComReg observes among other things that:
- it sought and obtained information from many existing 3.6 GHz licensees so as to better inform the award proposals in Document 15/70;
 - in Document 15/70 it proposed a regional licensing approach (which itself was a variant of a proposal received from certain FWA operators) which sought to appropriately cater for the particular demands from different uses (e.g. FWA, mobile etc...) and, further, that this proposal has been well received by many respondents including FWA operators;
 - it proposed a combinatorial clock auction to address some of the likely issues that could be faced by bidders (including existing regional FWA providers) given the above regional licensing proposal (e.g. aggregation risks);
 - its base station roll-out proposals had clear regard to the “*extent of the existing infrastructure deployment in the 3.6 GHz band, both in terms of the number of base stations deployed (in this case in the context of the regions proposed by ComReg in Chapter 4) and at a more granular level within these regions*” (paragraph 6.51 of Document 15/70)
 - it obtained and published technical advice from Plum Consulting concerning, among other things, an “*assessment of potential spectrum requirements per operator to provide fixed broadband connectivity at a minimum headline speed of 30 Mbps using a state of the art wireless technology such as LTE-Advanced.*” (page 1 of Plum Report 3: Analysis of the potential spectrum requirements for NGA services (ComReg Document 15/75));

- it further took this advice into account in its spectrum competition cap proposals; and
- its transition proposals:
 - adopted the *principles* from what proved to be a successful mechanism to manage a complex transition in its MBSA process;
 - specifically recognised that "*Existing Licensees may be the only provider of fixed wireless broadband services, or the provider of the best available broadband service, as other service providers (e.g. satellite broadband providers) may not be able to provide a sufficiently comparable service in terms of download/upload speeds, latency, price etc. These areas are likely to be in the more sparsely populated areas of Ireland and this characteristic increases the potential impact of disruption to existing consumer services in the 3.6 GHz band in these areas*"; and
 - in light of such factors, included a "transition unprotected licence" proposal so as to address the potential consumer, competition and spectrum efficiency issues that could arise from its award proposals.

- A 6 .39 More generally, ComReg believes it has made, and continues to make, very clear the reasons for each aspect of its award proposals, including its consideration of responses received from interested parties on same. Given this, ComReg does not accept Imagine's suggestion that it is attempting to apply a previous spectrum award process (i.e. that used in the MBSA) in the present case without careful consideration of the particular facts and circumstances involved.
- A 6 .40 ComReg also observes that its MBSA process differs considerably from the present proposed 3.6 GHz award process, e.g. in respect of the proposed adoption of a regional licensing approach.
- A 6 .41 In any event, ComReg notes that competitive auction award processes are now the norm across the EU and it is not, therefore, unusual for an NRA like ComReg to propose a spectrum award processes based on an auction format. This is unsurprising given the benefits of auction processes over administrative awards described elsewhere in this document and, in particular, Chapter 3. At the same time, ComReg remains conscious of concerns expressed about the potential complexity of its award proposals (particularly given the different nature of potential award participants). In

that regard, and as further detailed in Chapter 5, ComReg takes this opportunity to confirm that:

- it will seek to keep complexity to a minimum;
- it will assist all bidders in developing an understanding of the auction rules through the running of workshops, seminars and providing the tools necessary for bidders to simulate auction conditions; and
- the award process will be underpinned by a detailed Information Memorandum which will clearly outline the rules of same.

A 6 .42 Finally, ComReg readily acknowledges that its proposals do not “favour” FWA in the manner requested by Imagine and certain other respondents to Consultation 15/70 and, indeed, cannot for the reasons outlined above. This does not in ComReg’s view, however, diminish the extent to which ComReg has and continues to appropriately take into account the specifics of the FWA sector in its spectrum award proposals, including as outlined above. In that regard, and recalling its invitation in Consultation 15/70 for views from interested parties as to how its spectrum award proposals may better align with the NBP, ComReg would highlight that it is proposing, in Chapter 4 of this document, to modify its regional licensing proposal to align with the DCENR’s NBP Lots. In ComReg’s view, this revised proposal would accord with the principles identified by it in Consultation 15/70 and, at the same time, should avoid any unnecessary complications for those seeking to acquire 3.6 GHz spectrum rights for NBP-related purposes.

Annex 7: CSO Population Data

	<i>Population</i>	<i>Inflow</i>	<i>Outflow</i>	<i>Net</i>	<i>Adjusted Population</i>
East					
Meath	184,135	2,702	19,942	-17,240	166,895
Kildare	210,312	5,896	25,404	-19,508	190,804
Dublin (rest of county)	162,442	20,454	31,361	-10,907	151,535
Wicklow	136,640	3,614	17,355	-13,741	122,899
Total	693,529	32,666	94,092	-61,396	632,133
Border, Midlands & West					
Cavan	73,183	147	1,093	-946	72,237
Monaghan	60,483	83	529	-446	60,037
Longford	39,000	74	496	-422	38,578
Louth	122,897	597	4,321	-3,724	119,173
Westmeath	86,164	410	2,336	-1,926	84,238
Offaly	76,687	143	1,627	-1,484	75,203
Laois	80,559	186	2,886	-2,700	77,859
Donegal	161,137	74	410	-336	160,801
Leitrim	31,798	11	270	-259	31,539
Sligo	65,393	96	381	-285	65,108
Roscommon	64,065	111	771	-660	63,405
Mayo	130,638	232	1,601	-1,369	129,269

	<i>Population</i>	<i>Inflow</i>	<i>Outflow</i>	<i>Net</i>	<i>Adjusted Population</i>
Galway (Rest of country)	173,875	3,724	18,953	-15,229	158,646
Total	1,165,879	5,888	35,674	-29,786	1,136,093
South East					
Wexford	145,320	485	3,251	-2,766	142,554
Carlow	54,612	200	1,274	-1,074	53,538
Kilkenny	95,419	965	3,755	-2,790	92,629
Waterford (Rest of county)	62,276	1,211	6,421	-5,210	57,066
South Tipperary	88,432	575	1,970	-1,395	87,037
Total	446,059	3,436	16,671	-13,235	432,824
South West					
North Tipperary	70,322	319	2,894	-2,575	67,747
Limerick (Rest of county)	100,355	2,442	11,741	-9,029	91,326
Kerry	145,502	212	1,207	-995	144,507
Cork (Rest of county)	320,450	8,639	35,214	-26,575	293,875
Clare	117,196	272	5,627	-2,865	114,331
Total	753,825	14,374	56,413	-42,039	711,786
Five Cities					
Dublin City and Suburbs	1,110,627	117,764	35,860	81,904	1,192,531
Cork City and Suburbs	198,582	36,519	10,105	26,504	225,086
Limerick City and Suburbs	91,454	20,086	6,405	13,681	105,135
Galway City and Suburbs	76,778	20,560	4,715	15,845	92,623
Waterford City and Suburbs	51,519	10,646	3,006	7,640	59,159
Outside ROI					882
Total	4,588,252				4,588,252

Source: Central Statistics Office, ComReg.

Annex 8: Auction complexity

- A 8.1 This annex discusses auction complexity across three distinct groups in order for respondents to better understand the nature of auction complexity and how it affects bidders and the auction award. Therefore, ComReg considers it useful to consider auction complexity as illustrated in Figure 1.



Figure 1: Award Complexity

Mechanical complexity

- A 8.2 Mechanical complexity refers to the complexity arising from understanding the auction rules and operation of the auction.
- A 8.3 Mechanical complexity is a concern because interested parties especially those who lack experience of such awards may not understand the bidding process in such an award or the rationale for certain rules. As a result, there is potential for certain bidders to become discouraged from participating or otherwise disadvantaged. Importantly, this type of complexity can be found in all auction types, particularly those subject to multiple rounds and activity rules. Inexperienced bidders, at the outset, will invariably lack a clear understanding of the necessity for a particular design and certain rules but can be addressed in advance of the award. It should be noted that the extent of this type of complexity depends on the specifics of each award process.

- A 8.4 ComReg notes that the MBSA involved additional complexity in order to deal with time slices and the possibility of liberalising spectrum licences already in force. Neither complication would apply to the present award.
- A 8.5 Given that mechanical complexity is likely to arise in this award, DotEcon notes that substantial efforts should and would be made to ensure that inexperienced bidders are comfortable participating in the auction and that this should largely mitigate problems related to complexity and potentially disadvantaged bidders.
- A 8.6 ComReg agrees and will be mindful of this issue and seek to keep complexity to a minimum. As previously outlined in Documents 14/101 and 15/70, ComReg will assist all bidders in developing an understanding of the auction rules through the running of workshops, seminars and providing the tools necessary for bidders to simulate auction conditions. Further, the process will be underpinned by a detailed Information Memorandum which clearly outlines the rules of the auction.

Computational Complexity

- A 8.7 Computational complexity refers to the complexity involved in the process of determining the outcome of the award and the winning combination of bids that results in the most efficient outcome. As described by DotEcon in Document 15/72, the computational burden of determining winners and prices is a potential problem for combinatorial auctions. This will occur when the number of theoretically possible packages becomes too great.
- A 8.8 In terms of computational complexity the CCA, Simple Clock Auction (SCA)²⁸⁸ and Sealed Bid Clock Auction (SBCA) are more complex to implement than SMRAs as they require a mechanism for collecting and processing multiple package bids from individual bidders. However, it should be noted that while such considerations are important, the burden of computational complexity falls entirely on the auctioneer who typically uses algorithms to determine which of the bids will be winning bids and to determine what the winning bidders pay.
- A 8.9 In order to ensure bidders have full confidence in the award process, a programme of tests independent from the auctioneer on the operation of the winner and price determination algorithms will be implemented for the award of the 3.6 GHz spectrum. Therefore, bidders can be confident that

²⁸⁸ In terms of the SCA, ComReg notes that a SCA is similar to a CCA (save the use of a supplementary round) and uses a clock auction with an open stage, and supports package bidding. Therefore, the extent to which a SCA is significantly less complex (as claimed by 3IHL) in terms of mechanical complexity is limited.

winner and pricing determination will be fully fit for purpose and reliable in assessing the valuations of competing bids.

Bidding complexity

- A 8.10 Bidding complexity refers to the complexity of the bidding process during the award and the extent to which bidders are able to evaluate their valuations for various options and reflect them in a straight-forward manner through bids. In order to adequately explain the nature of this complexity, ComReg considers it necessary to explain, in detail, how the various award formats affect a bidder's ability to reflect their bids in a straightforward manner.
- A 8.11 The CCA utilises a second price rule which is aimed at encouraging truthful bidding and can help to simplify bid strategy, as explained in Document 14/101. However, as discussed in Chapter 3, the second price rule appears to be the source of some misunderstanding (FWA 16) and may deserve some further comment.
- A 8.12 The main difference between the first price (pay what you bid) and second price (opportunity cost based) rule is how bid amounts impact on a bidder's surplus, and what that means for bidding decisions.
- A 8.13 The first price rule is simpler for the auctioneer in that no calculations are required to determine prices, as winning bidders simply pay the amount of their bid. However, this apparent mechanical simplicity comes at the cost of bidding complexity for auction participants, as a winner's bid amount directly determines its winning price. Under this rule, bidding at valuation would cancel out any surplus achieved through winning, as the bidder would have to pay a price corresponding to its full value. Therefore, bidders have an incentive to bid below valuations in order to retain some surplus in the event of winning (a strategy that is commonly called 'bid shading'). When determining its bid amounts, a bidder will need to consider the impact that lowering its bid has both on its chances of winning and on the surplus it would obtain in the event of winning. This is a complex decision that involves a trade-off: the lower the bid relative to actual valuation, the greater the surplus the bidder achieves, but the greater the risk of being outbid at a price that the bidder would have been willing to pay. The complexity in bid decision does not only have an adverse effect on bidders, but may also compromise the efficiency of the auction; if different bidders under-represent their valuations to a different extent, there is a risk that the winning

bids do not correspond to those who place the highest value on the lots available, leading to an inefficient assignment of lots.

- A 8.14 Conversely, determining the price to be paid under a second price rule (See Box 1 below) is more complicated for the auctioneer as it requires calculations involving the bids received from competitors. However, the advantage of the second price rule is that the bid amount set by the winner typically does not directly affect its price²⁸⁹, but only the chances of winning. That is, the bid amount only establishes whether the bidder should win at different prices, but not the surplus it may obtain if winning. This simplifies bid decisions, as bidding at valuations ensures that the bidder will win if the price for the lots is below the bidder's valuation, and lose if the price of the lots is above valuation. Where the winning bid does not affect the price to be paid, there are no incentives for bidders to under-represent their valuation in their bids. The price that the bidder pays is in effect the same as if the bidder had managed to perfectly guess the minimum amount it would need to outbid its competitors. Similarly, there is no incentive to inflate bids, as this would only increase the chances of winning in outcomes in which the price for the lots is above the bidder's valuation, which would be undesirable in any event. If bidders follow this straightforward strategy, then the mechanism can assign lots in an efficient way (to those bidders who value them most), and winners can be assured that they will only need to pay the minimum amount they would have needed in order to outbid competitors.

²⁸⁹ The detailed pricing rule proposed for this auction does have the potential to create situations in which the price paid might be affected by the bid made in cases where a number of bidders win as a result of their bids *collectively exceeding losers' bids*. However, it is difficult for bidders to forecast if this might happen and such situations typically occur with low probability in spectrum auctions.

Box 1: Second Price Rule (Opportunity Cost Pricing) - Example

To illustrate the concept of opportunity cost-based pricing, consider a simple auction with only two lots for sale (lots 1 and 2). There are three bidders: A bids €10 for lot 1, B bids €10 for lot 2, and C bids €25 for a package of lots 1 and 2. There is a single winning bid, which is C's bid of €25. To calculate the price paid by C the auctioneer considers the opportunity cost of making it a winning bidder, in terms of what the alternative winning outcome would have been had there been no bids received from that bidder. In the absence of C, the bids from A and B would have been winning bids, with a total value equal to €20, which is €5 less than the total value of winning bids when C is included. A bidder's opportunity cost is calculated as its own bid amount (for C, €25) minus the difference in the total value of winning bids caused by excluding that bidder (€5). Therefore, C pays €20, which reflects what A and B would have been willing to pay in C's absence, and is the lowest amount that C could have bid and still won.

In practice, the price may not be determined just by the opportunity cost associated with a single winning bidder, but may also depend on the opportunity cost associated with a group of winning bidders. Consider a different scenario where A bids €10 for lot 1, B bids €10 for lot 2, and C bids €18 for a package of lots 1 and 2. This time, the winning bids are those of A and B, with a total value of winning bid amounts equal to €20. In the absence of A, C's bid of €18 would have been the only winning bid, so the total value of winning bids falls by €2. Therefore, A's opportunity cost is $\text{€}10 - \text{€}2 = \text{€}8$. By the same calculation, B's opportunity cost is also €8. However, in this case the total price for the two lots would be €16, but C would have been willing to pay a higher amount of €18. The auctioneer would then also consider the *joint* opportunity cost of A and B together. When A and B are both excluded, C would win its bid of €18. Taking the sum of A and B's bid amounts (€20) and subtracting the difference in the total value of winning bids caused by excluding the two bidders (€2) gives a joint opportunity cost of €18. This means that, although A and B have individual opportunity costs of €8, the sum of their final prices must at least equal €18. Therefore, they would each pay €9, reflecting the fact that C's bid of €18 could have been accepted in their absence.

- A 8.15 The second price rule therefore simplifies bidding decisions by allowing bidders, if they wish, to simply bid in line with their valuations without needing to consider the impact that this could have on prices, or form expectations over the bids of competitors.
- A 8.16 In relation to 3IHLs claim that a SMRA or SCA can produce an efficient outcome and is significantly less complex, ComReg notes that while a SMRA may be understood more easily because each bid for a specific lot is treated independently,²⁹⁰ there can be considerable bidding complexity associated with the format, particularly when there is complementarity or substitutability between spectrum in different bands, or as is the case in this

²⁹⁰ Competition for a lot takes no account of competition that might be taking place for other lots in the auction.

award, complementarity or substitutability that cover adjacent geographic regions. As noted by DotEcon the CCA is particularly effective in dealing with aggregation and substitution risk because the use of a regional lot structure with a large number of lots across categories can create relatively high substitution and aggregation risks, which the CCA addresses directly.

- A 8.17 Implementing an effective bidding strategy for a SMRA with many lots organised into regions is complex and would depend on forming expectations of the behaviour of other bidders. The SMRA suffers from serious aggregation risks which can create excessive complexity for bidders as they might either be forced to behave conservatively (thereby reducing competition in the auction) in order to avoid being stranded on unwanted lots, or bid aggressively (with the associated risk of being stranded with unwanted lots) in order to maximise the chance of being assigned their preferred lots.
- A 8.18 The activity rules and pricing mechanism (second price rule) under a CCA provide incentives for all bidders to bid in line with valuations. This is important in order to ensure that the information disclosed about demand in each round is reflective of the underlying bidder valuations, which can help to reduce common value uncertainty. In providing these incentives, an important aspect of the CCA is the fact that at the end of the auction any bid submitted during the clock rounds could potentially be selected as a winning bid, which has a disciplinary effect in terms of discouraging bidders from bidding for an unwanted package, especially as prices rise. Conversely, in a SCA (as suggested by 3IHL) only the bids submitted in the final round are winning bids, which increases the scope for bidders to bid for unwanted packages in earlier rounds; as a consequence, some bidders could hide their demand in the preceding rounds by bidding on unwanted packages for which they are reasonably confident that there will be excess demand, which means that the information disclosed to bidders during the open stage might be less reliable, increasing the bidding complexity for bidders. Furthermore, as prices are equal to final bids, a SCA risks creating strong incentives for bidders to reduce the amount of spectrum being competed for to obtain a lower price (strategic demand reduction). Such incentives can make bid decisions more difficult for bidders (e.g. in terms of deciding on the optimal point at which to drop demand), and can also be detrimental to the award process through the risk of inefficient outcomes.
- A 8.19 Similarly, in a SMRA, the true value of certain lots may not be informed by the round prices because the standing high bids are usually committing at the end of each round, so bidders who hold standing high bids cannot easily

switch. In a SMRA, bidders wishing to switch would need to be outbid on (or withdraw from, if the rules allow) lots they wish to switch away from. This potentially distorts incentives to bid in accordance with their relative preferences by creating situations where bidders are stranded on some lots or bidders switch between lots earlier to prevent getting stranded. As with the SCA, because prices are equal to final bids, there might be strong incentives for bidders to reduce the amount of spectrum being competed for to obtain a lower price.

- A 8.20 In a SCA and SMRA, a bidder that reduces its eligibility in bidding on certain lots will be unable to submit any further bids that are greater than its new eligibility level. In this way, a bidder will have to consider, in placing certain bids, whether the evolution of prices in the award is such that it would not prefer any alternative packages above its new eligibility regardless of the relative prices. However, under a CCA, bidders are still able to bid for packages that exceed their current eligibility in certain circumstances²⁹¹ depending on evolution of round prices.²⁹²
- A 8.21 Finally, while the assignment stage of the CCA (or any award format) might be seen as an unnecessary layer of mechanical complexity, in this award process where a large amount of spectrum is available it significantly reduces the bidding complexity a bidder might face. Specifically, the assignment stage removes the complexity of placing bids in order to target specific blocks so as to ensure contiguity of spectrum. Instead, the bidding process becomes easier and bidders can focus on the size of the package they wish to be assigned in the primary stage, with clarity that this will be assigned as contiguous bandwidth, and only consider its preferred assignment within the band at a later point in the assignment round.
- A 8.22 Computational complexity falls on the auctioneer and so long as the award does not restrict the ability of the auctioneer to determine winners and prices accurately it is not, in ComReg's view, a serious concern for this award process. DotEcon have advised that while the regional nature of any award in a CCA increases complexity, the number of the regions in this award would not be sufficient to compromise the ability to compute the outcomes of the award.

²⁹¹ Provided it doesn't exceed initial eligibility at the beginning of the auction and doing so is consistent with the preferences that the bidder previously expressed through bids made in primary bid rounds when the bidder dropped eligibility.

²⁹² The bidding interface will also make it clear what packages a bidder is permitted to bid on therefore a bidder is not required to compute eligibility.

- A 8.23 A trade-off exists between mechanical simplicity and the ability of bidders to ensure that their valuations deliver their optimum outcome. DotEcon notes that while the CCA rules may be perceived as complex, it is important to note that the complexity of bidding decisions and the risks faced by bidders in alternative formats may be significantly higher, even if the auction mechanics superficially appear simpler. ComReg is therefore of the view that the CCA for this award delivers the correct balance because the main motivation for increased mechanical complexity is to reduce the need for complex decisions to be made that can result in inefficient outcomes for bidders.

Annex 9: Draft RIA on Rollout and QoS Licence Conditions

Introduction

A 9.1 This annex sets out the Regulatory Impact Assessments (RIAs) on the proposed rollout and quality of service obligations as discussed in Chapter 6.

RIA Framework

A 9.2 In general terms, a RIA is an analysis of the likely effect of a proposed new regulation or regulatory change, and, indeed, of whether regulation is necessary at all. A RIA should help identify the most effective and least burdensome regulatory option and should seek to establish whether a proposed regulation or regulatory change is likely to achieve the desired objectives, having considered relevant alternatives and the impacts on stakeholders, consumers and competition. In conducting a RIA, the aim is to ensure that all proposed measures are appropriate, effective, proportionate and justified.

Structure of a RIA

A 9.3 As set out in ComReg's RIA Guidelines²⁹³, there are five steps in a RIA. These are:

Step 1: Identify the policy issues and identify the objectives.

Step 2: Identify and describe the regulatory options.

Step 3: Determine the impacts on stakeholders.

Step 4: Determine the impact on competition.

Step 5: Assess the impacts and choose the best option.

A 9.4 Each of these steps is considered in turn below for each of the RIAs.

²⁹³ See Document 07/56a - Guidelines on ComReg's approach to Regulatory Impact Assessment - August 2007.

RIA on Rollout

Introduction

A 9.5 This section sets out the RIA on rollout which assesses the level of regulatory impact of various approaches that ComReg could take and determines the appropriate minimum rollout obligation that should be set as part of the rollout licence condition for the 3.6 GHz band.

Objectives

A 9.6 ComReg's overall objectives in relation to this spectrum release process are set out in Annex 2

A 9.7 ComReg's objectives, insofar as rollout is concerned are as follows:

- to encourage the efficient use and effective management of spectrum;
- to ensure that all end users, including disabled users, derive maximum benefit in terms of choice, price and quality;
- to encourage efficient investment in infrastructure and promote innovation; and
- to ensure there is no distortion or restriction of competition in markets for the provision of electronic communications services.

Policy issue

A 9.8 The primary policy issue to be addressed is a concern that operators issued with new 3.6 GHz licences could potentially not use those licences to roll out services: across an acceptable geographic area, in a timely manner, and that this may not be in the interests of consumers or make efficient use of the radio spectrum.

A 9.9 As against this, the imposition of overly onerous rollout obligations could discourage participation in the award process by parties who want to deploy services.

A 9.10 Accordingly, the policy issue for ComReg is to determine an appropriate rollout obligation which would ensure a reasonable level of rollout without significantly discouraging participation in the award process.

Identifying the regulatory options

A 9.11 ComReg has undertaken a draft RIA to consider whether a rollout condition is necessary or appropriate for the 3.6 GHz band. In Document 15/70, ComReg considered that it would be appropriate to move away from the traditional population or geographic based coverage measure for the 3.6 GHz band and use a rollout type obligation based on the deployment of bases stations.

A 9.12 ComReg considers that the four regulatory options available to it are:

- **Option 1:** Impose no rollout obligation on the award spectrum.

This would mean that each new Licensee would have full flexibility to choose how extensive their rollout would be regardless of the amount of spectrum rights of use it was assigned in the band. An operator could choose to provide no services, only to provide services in high density areas, or choose to differentiate itself as a provider with an extensive network footprint.

- **Option 2:** Impose a rollout obligation, with a rollout period of 3-5 years, as set out in Document 15/70, as follows:

- for each of the non-urban regions: the deployment of network controlled base stations at 15 to 25 sites and that these sites should be located in 3 to 5 different counties within each region;

- for the Dublin region: the deployment of network controlled base stations at 15-25 sites; and

- for all other urban regions: the deployment of network controlled base stations at 2-4 sites

- **Option 3:** Impose a rollout obligation, with a rollout period of 3 years, as follows:

1. For an operator holding **up to 100 MHz**, as follows:

- for each of the non-urban regions: the deployment of network controlled base stations at 15 sites and that these sites should be located in 4 different counties within the region;

- for the Dublin region: the deployment of network controlled base stations at 10 sites; and

- for all other urban regions: the deployment of network controlled base stations at 2 sites.

- Allow leasing to count towards rollout.

2. For an operator holding **over 100 MHz**, as follows:

- for each of the non-urban regions: the deployment of network controlled base stations at 25 sites and that these sites should be located in 4 different counties within the region;

- for the Dublin region: the deployment of network controlled base stations at 15 sites; and

- for all other urban regions: the deployment of network controlled base stations at 4 sites.

- Allow leasing count towards rollout.

- **Option 4:** Impose a high rollout obligation:

For an operator holding **up to 100 MHz**, as follows:

- for each of the non-urban regions: the deployment of network controlled base stations at 30 sites and that these sites should be located in 4 different counties within the region;

- for the Dublin region: the deployment of network controlled base stations at 20 sites; and

- all other urban regions: the deployment of network controlled base stations at 4 sites.

- Allow leasing count towards rollout.

3. For an operator holding **over 100 MHz**, as follows:

- for each of the non-urban regions: the deployment of network controlled base stations at 50 sites and that these sites should be located in 4 different counties within the region;

- for the Dublin region: the deployment of network controlled base stations at 30 sites; and

- for all other urban regions: the deployment of network controlled base stations at 8 sites.
- Allow leasing count towards rollout.

Determining the impact on stakeholders

A 9.13 Stakeholders consist of two main groups:

- consumers, and
- industry stakeholders.

A 9.14 There are a number of key industry stakeholders in relation to the matters considered in this chapter:

- existing FWA providers;
- Potential new entrants to the FWA Sector; and
- Non FWA providers (e.g. MNOs)

A 9.15 Stakeholders are consistent across all RIAs in this Annex and will not be repeated elsewhere.

Impact on industry stakeholders

A 9.16 Industry stakeholders would prefer the rollout obligation that has the least impact on their commercial strategy, particularly if such obligations significantly differ from what they would choose to do independently of any obligation.

Option 1

A 9.17 Existing providers of FWA services would be unlikely to prefer Option 1 because this option would make it more likely for strategic bidders, who may not use the spectrum, especially in the short term, to compete in the award process. In that regard, some respondents to Document 15/70 expressed concern that certain operators might hoard spectrum damaging the FWA sector. In particular, Imagine expressed concern that Eircom might seek to acquire spectrum rights of use with the purpose of foreclosing opportunities for FWA providers, rather than using the spectrum to deliver services.

- A 9.18 For existing FWA providers, a rollout obligation may already be met²⁹⁴ given their current network, particularly within certain regions, and any residual obligations in respect of rollout would only arise in respect of any regions those operators would need to expand into. As such, any rollout obligations set as a minimum requirement would not likely impose a significant obligation on these providers, and as a result, existing FWA providers may be indifferent as to whether Option 1 is chosen.
- A 9.19 Potential new entrants are likely to prefer an option with as low a rollout obligation as possible, and therefore Option 1 could be their preferred option. However, given that such entrants would rollout a network to some degree, regardless of any obligation, a new entrant might well be indifferent between Option 1 and, Options 2 and 3 to the extent that it restricts strategic bidding.
- A 9.20 All MNOs (3IHL, Eircom and Vodafone) agree that some form of obligation should be imposed to ensure that the spectrum is being used by any winning bidder(s). MNOs are therefore unlikely to prefer Option 1 where a rival has the opportunity to be assigned spectrum with the purpose of denying it to alternative users. In particular, Eircom suggested that a more substantial rollout obligation is required to guard against hoarding of spectrum.
- A 9.21 In summary, it is likely that industry stakeholders would, on balance, prefer either Options 2, 3 or 4 over Option 1.

Option 4

- A 9.22 With the exception of Imagine, which expressed a preference for more aggressive rollout commitments than those suggested under Option 2, Option 4 is unlikely to be favoured by most FWA providers as, given the differentiated and geographic nature of FWA providers, they would likely prefer to have more control over when and how they roll out their networks. If the obligation required reaching a rollout that was too high or that had to be reached in an overly ambitious timeframe, this could lead to an unnecessary burden for certain FWA providers.
- A 9.23 An existing FWA provider's possible preference for a rollout obligation to prevent strategic bidding needs to be balanced against the desire to have flexibility in providing services to certain regions in line with its commercial strategy. For FWA providers, the rollout obligations for certain regions under

²⁹⁴ Noting that base station equipment will likely need to be replaced in due course to align with the band plan and provide an acceptable level of spectrum efficiency.

Option 4 are in excess of the number of base stations currently in place in those regions (as illustrated in Chapter 6 of Document 15/70). Therefore, it is likely that Option 4 would require existing FWA operators to rollout additional base stations in certain regions where they may not necessarily have additional demand. This could also potentially result in operators having to make inefficient investments in their network.

- A 9.24 Similarly, the high rollout obligation could act as a significant barrier to entry for a new entrant. While any new entrant would require the rollout of a network to some degree, such an obligation may not correspond to a new entrant's likely initial low market share and might therefore not be aligned with its business needs. Accordingly, the higher rollout obligation would negatively impact on the willingness of potential new entrants to participate in an award and ultimately provide services.
- A 9.25 Under Option 4, MNOs would be required to rollout and maintain a more extensive network than the other options when it could be more efficient to spread their investment across other spectrum bands in their portfolio, particularly in non-urban regions where sub 1 GHz bands are more conducive to providing wide area coverage. For this reason, MNOs would be unlikely to favour the rollout obligations of Option 4, as it could also result in inefficient infrastructure investment.
- A 9.26 In summary, it is likely that industry stakeholders would, on balance, prefer either Option 2 or 3 over Option 4.

Option 2 v Option 3

- A 9.27 Certain FWA respondents agreed with Option 2 (i.e. the rollout proposals set out by Document 15/70) without any substantive justification in support of their view. However, ComReg notes that these respondents²⁹⁵ have licences in non-urban regions and do not offer fixed wireless services in Dublin. Therefore, the extent to which these respondents agreed with Option 2 is likely to apply to non-urban regions only.
- A 9.28 In respect of urban regions, however, Viatel suggests that it has been able to maintain a large customer base in Dublin with just a fraction of the minimum base stations suggested by ComReg, perhaps indicating that the rollout obligation for the Dublin region may have been set too high thereby excluding certain class of services. Furthermore, ComReg notes that operators who are assigned spectrum rights of use to Dublin and the new

²⁹⁵ KerNet, Net1, Premier BB, Digital Forge and FWA 4

Eastern region may wish to locate base stations in the Eastern Region to serve Dublin in line with their current network configuration in which case the higher obligation would have a negative impact upon them. Therefore, in consideration of this and the concerns expressed by Viatel, ComReg considers that for Option 2 the rollout obligation for Dublin may have been set too high.

- A 9.29 Option 3, keeps the base station obligations within the levels set out in Option 2 for non-urban regions but reduces the Dublin obligation by 33% and 40% at the lower and higher end of the range respectively. Option 3, when compared with Option 2, does not impact operators whose footprint is in non-urban regions and sets the rollout obligation at the lower end of that range. It should also ensure that operators interested in urban areas are not set too high an obligation. In that regard, most FWA operators would likely prefer Option 3 over Option 2.
- A 9.30 Notwithstanding its likely preference for Option 4, Imagine also indicated an interest in rolling out high speed services through the use of more than 100 MHz (160 MHz). Therefore, Imagine is also likely to prefer Option 3 over 2 which increases the rollout obligation for assignments of spectrum above 100 MHz
- A 9.31 Eircom and Vodafone both agree that a base station rollout obligation is appropriate, while 3IHL believes it inappropriate to specify the number of base stations per region, as this may eliminate, in its view, some valid but unspecified types of use.
- A 9.32 Given the nature of the 3.6 GHz band, and its use primarily as a capacity band for mobile, the rollout obligations for urban regions are likely to be of relevance for MNOs. In that regard, MNOs are likely to prefer Option 3, as the lower rollout obligation in Dublin is less likely to eliminate any valid uses (as claimed by 3IHL) for the spectrum in that region and may be sufficiently high to prevent the non-use of spectrum across all uses. Furthermore, and in comparison with Option 2, it does not impact any operator wishing to use spectrum rights of use in non-urban regions.
- A 9.33 Noting the above, the business plans and investment decisions of operators should not be affected because equally efficient providers arguing for a higher obligation will be able to express that willingness in the retail market.
- A 9.34 Finally, all interested parties are likely to prefer Option 3 over Option 2 to the extent that leasing provision more scope to meet the rollout obligation.

- A 9.35 In light of the above, ComReg is of the preliminary view that industry stakeholders would, on balance, prefer Option 3 over Options 1, 2 and 4.

Impact on competition

- A 9.36 Competition for mobile services would not likely be affected to any great degree by any of the regulatory options, as competition for mobile services (unlike FWA) is informed by multiple differentiated spectrum bands of varying importance. Furthermore, unlike FWA providers where there is a large asymmetry between various regional, subnational and national operators, all three MNOs operate on a national basis and the rollout obligation is unlikely to be too burdensome for one MNO but not the others.
- A 9.37 The remainder of this section considers the impact of competition for fixed wireless services.

Option 1

- A 9.38 Option 1, all other things being equal, would not deter any interested parties from participation in the auction, thereby arguably promoting competition within the auction. Winning bidders would also have a high degree of flexibility and could choose their own rollout levels allowing customers to make a choice of provider based on the services provided over relevant region(s). Such flexibility could have a positive impact on competition at the retail level.
- A 9.39 Option 1, however, may harm competition to the extent that it could result in strategic bidders gaining spectrum rights of use for purposes other than providing services to consumers, or to enable them to make inefficient use of spectrum. If this occurred, interested parties wishing to provide services might not be able to compete in the award.
- A 9.40 Further, a suitably designed rollout obligation (i.e. under Options 2, 3 or 4) could have an additional positive impact on competition not available under Option 1, as, in ComReg's experience, it can serve as a useful reference point and encourage winning bidders to move ahead with the rollout of services at a speed and level greater than that set by the obligations.
- A 9.41 In summary, it is likely that either Option 2, 3 or 4 would, on balance, have a more positive impact on competition than Option 1.

Option 4

- A 9.42 On the one hand, Option 4 reduces the prospect of spectrum going unused and could lead to a more comprehensive roll-out of advanced innovative services which, as noted under the previous heading, can act as a useful reference point and have a positive impact on competition.
- A 9.43 However, by imposing a high roll-out obligation, Option 4 is more likely than other options to discourage participation and dampen competition within the award process. Setting a roll-out obligation which is too high could also negatively impact on competition at the retail level by increasing the likelihood that winning bidders must make inefficient investment in infrastructure.
- A 9.44 In addition, Option 4 could also reduce competition between FWA providers to the extent that the obligations may be too high, excluding certain smaller FWA providers from competing for spectrum rights of use. This could reduce competition in the retail market in two ways:
- It could prevent certain providers from providing FWA services altogether; or
 - It would require certain FWA providers to provide services using other licenced (10.5 GHz) or license exempt (5.8 GHz) spectrum. This however could also reduce competition to the extent that:
 - Those providers may need additional or new equipment to operate in these bands in order to provide the same service to the same number of users; and
 - For license exempt spectrum there is less certainty regarding network reliability.
- A 9.45 In summary, it is likely that either Option 2 or 3 would have a more positive impact on competition than Option 4.

Option 2 v Option 3

- A 9.46 By setting a minimum rollout obligation sufficiently high, Option 2 could mitigate the risk of spectrum not being used, or used inefficiently, and allow existing FWA providers and new entrants²⁹⁶ to increase competition for fixed wireless services.

²⁹⁶ Given its intention to enter, any new entrant would require some level of investment to provide an initial level of service regardless of any obligation.

- A 9.47 However, while it appears that the rollout obligation may be set at an appropriate level for non-urban regions under Option 2, the proposed requirement in Dublin might impact certain FWA providers reducing the level of competition in that region. In this regard, Option 2 could prevent operators from offering differentiated services and could therefore lead to a reduced choice for consumers.
- A 9.48 Furthermore, because the assignment of spectrum rights of use above 100 MHz provides an opportunity for FWA providers to provide high speed services, an insufficient rollout obligation at these levels does not incentivise the efficient use of spectrum. This could restrict the extent to which high speed services are provided, reducing competition between FWA providers and broadband services more generally.
- A 9.49 The business plans of all potential licensees, including new entrants, are likely to plan for a certain level of network investment and coverage. Option 3 is likely to be the best option for competition because it would set the rollout obligation at a sufficiently high level to restrict the non-use of spectrum and also would encourage the provision of services across all regions. Furthermore, there are good reasons to expect market forces to be reasonably effective in providing incentives for rollout greater than those set by the regulator.
- A 9.50 In addition, Option 3 is likely to prove more effective for competition because it uses a higher rollout obligation for spectrum assignments above 100 MHz. In terms of competition for FWA services, the higher obligation should provide the right incentives for operators to provide better services above certain assignment levels rather than use spectrum inefficiently. It also constrains operators from holding large amounts of spectrum to prevent the rollout of high speed services for broadband services more generally.
- A 9.51 In light of the above, ComReg is of the preliminary view that, on balance, Option 3 would have a more positive impact on competition than Options 1, 2 and 4.

Impact on Consumers

Option1

- A 9.52 From the perspective of consumers, whilst Option 1 is likely to make entry more attractive compared to the other options, it leaves the risk that spectrum will not be used or used inefficiently.

- A 9.53 FWA customers could prefer Options 2, 3 and 4 over Option 1 since any rollout obligation could act as a safeguard to protect existing services levels, and provide for an initial service level where an operator expands into a new territory.
- A 9.54 Finally, there would also be no obligation to rollout services on a geographic basis across any of the regions (i.e. 4 counties within a non-urban region) and no timeframe under which any rollout would take place (i.e. 3 years under Options 2, 3 & 4), as a result the rollout of services could be delayed.
- A 9.55 As a result, it is likely that either Option 2, 3 or 4 would, on balance, have a more positive impact on consumers than Option 1.

Option 4

- A 9.56 Consumers may therefore, on first impressions, prefer Option 4 as this provides for a high rollout obligation across the widest possible area. However, a high rollout obligation could restrict the extent to which existing providers including new entrants would be willing to participate in the award process and therefore provide services at all. Therefore, consumers would likely prefer a rollout obligation that maximised the extent to which operators provide services and rollout is provided across the widest possible area.

Option 2 v Option 3

- A 9.57 Competition for broadband services is likely to be influenced by the introduction of high speed fixed wireless services. In particular, and as indicated by the Plum Report²⁹⁷, the assignment of 100 MHz or more, to a single operator, could allow for speeds greater than 30 Mbps to be provided. A uniform rollout obligation for all quantities of spectrum under Option 2 creates the possibility of inefficient operators acquiring more spectrum than necessary thereby denying the same spectrum rights of use to an alternative provider who could use the spectrum more efficiently to deliver high speed services to consumers.
- A 9.58 Additionally, the positive impacts on competition for FWA services under Option 3, as outlined above, would in turn have positive impact on consumers.
- A 9.59 Therefore, consumers of FWA services may prefer Option 3 over Option 2 for the following reasons:

²⁹⁷ A report examining likely rollout considerations and timelines for the deployment of the technologies and potential services likely to be put into use for regional assignments in the 3.6 GHz band including equipment and rollout considerations from its technical consultants, Plum Consulting London

- The lower rollout obligation for lower quantities of spectrum in certain regions would likely result in more operators being willing to participate in the award process and therefore to provide services.
- It mitigates incentives for not using spectrum (denying services to consumers) and inefficient use of spectrum, by imposing:
 - a rollout obligation; and
 - a higher rollout obligation for spectrum assignments above 100 MHz.
- It increases the possibility of consumers being delivered high speed services.

- A 9.60 Option 3 is also less likely than Options 2 and 4, to prevent MNOs from providing services where demand exists. At the same time, the rollout obligation under Option 3 is also likely to be sufficiently high to prevent strategic bidding causing harm to other consumers.
- A 9.61 Finally, to the extent that the rollout obligation would be 4 or 5 years within the 3-5 year range, consumers would prefer Option 3 as services would likely be rolled out quicker.²⁹⁸
- 9.15 ComReg is of the preliminary view that Option 3 strikes the right balance between ensuring that spectrum is used efficiently and competition in the award process and downstream is not dampeden.

Preferred Option

- A 9.62 In light of the preceding discussion, ComReg is of the preliminary view that Option 3 is the preferred option in terms of the imposition of a roll-out obligation on new licensees.

The ‘Quality of Service’ (Voice Services) RIA

- A 9.63 This section sets out the RIA on Quality of Service (QoS) which assesses the appropriate minimum QoS that should be set as part of a QoS licence

²⁹⁸ ComReg observes that the timing of any rollout is the same across Options 3 and 4 therefore the extent to which there is an impact on competition and consumers is only relevant to Option 1 (no obligation) and was discussed above.

condition for the 3.6 GHz band. ComReg notes that such an obligation would only apply to operators providing voice services and would therefore only likely apply to MNOs. It would not apply to voice services provided using IP over FWA links.

Policy issue and objectives

- A 9.64 The policy issue to be addressed is whether it is appropriate to impose QoS obligations to ensure that users are offered a minimum service level by operators who are granted licences for 3.6 GHz spectrum.
- A 9.65 ComReg's overall objectives in relation to this spectrum release process are set out in Annex 2. The most relevant objective in terms of QoS is to ensure that all users derive maximum benefit in terms of price, choice and quality from the spectrum to be made available in the release process.

Identifying the regulatory options

- A 9.66 ComReg has identified the following options:
- **Option 1:** Do not impose QoS licence conditions on voice services, provided using 3.6 GHz spectrum.
 - **Option 2:** Impose QoS conditions on voice services, provided using 3.6 GHz spectrum in line with Liberalised Use Licences with variations for VOIP services.

Impact on industry stakeholders

- A 9.67 An operator can guarantee a quality level for calls made between subscribers on its own network. However, it cannot guarantee call quality when its subscribers make/receive calls to/from a different network. As a voice call to or from a network can originate or terminate on a different network (either fixed or mobile), this makes it very difficult for operators to prove that the quality of voice calls it offers on its network is superior to the quality of voice calls provided by other networks, in the absence of minimum quality standards for calls across all operators.
- A 9.68 As a result of this feature of the market, non-imposition of a minimum standard for a voice call could create an incentive for a licensee (or other third party providers such as an MVNO) to engage in behaviour which resulted in the quality of its voice calls falling below the current standards (e.g. through lack of investment or poor network planning). In addition, other operators with higher quality standards would not be able to isolate the higher quality standards applied to voice calls on their own network from

the lower quality standards applied on other networks. Such high quality operators might then have less incentive to maintain this higher QoS and may allow the quality of their voice calls to fall. Such an overall reduction in quality for voice calls could result in lower consumer demand for voice calls, which in turn would negatively impact all providers of voice call services, though no individual provider would have an incentive to unilaterally increase quality back to previous levels

- A 9.69 The imposition of minimum QoS conditions for voice calls would prevent such a situation from arising, and ensure that all operators would be subject to the same minimum standard and, as such, each would be assured that no other operator could avoid meeting these minimum standards.
- A 9.70 ComReg acknowledges that Option 2 may involve compliance costs for licensees, which would not arise under Option 1. However, investments made by Licensees in voice call QoS on their own networks would not be jeopardised by the possibility of competing operators offering low quality voice call services. Furthermore, ComReg does not consider that the compliance costs involved for Licensees would be disproportionate in terms of the consumer protection objective to be achieved.
- A 9.71 With minimum QoS standards, licensees would be assured that no other licensee could avoid meeting these minimum standards.
- A 9.72 In light of the above, ComReg is of the preliminary view that, on balance, stakeholders would prefer Option 2 over Option 1.

Impact on competition

- A 9.73 Neither option is likely to materially impact on the level of competition between licensees or between licensees and third party competitors such as MVNOs, provided that all licensees are subject to similar obligations.
- A 9.74 Option 1 could, however, result in less competitive intensity in terms of voice call quality than would occur under Option 2, for the reason described above. QoS standards for voice calls is likely to improve competition , given:
- the inability for individual operators to isolate the higher quality standards applied to voice calls on their own network from the lower quality standards applied on other networks; and
 - that a consumer who experiences poor voice call quality cannot determine whether the problem relates to his/her own network or to the network of the person on the other end of the line

- A 9.75 Therefore ComReg is of the preliminary view that Option 1 would have the most positive impact on competition.

Impact on consumers

- A 9.76 Consumers will likely prefer any option which ensures that they receive a minimum quality of service (Option 2) over an option which relies solely on market forces or the goodwill of individual operators (Option 1), as long as the preferred option does not otherwise result in reduced benefits in terms of price, choice and quality. In this regard, ComReg does not see any downside to Option 2 with respect to consumer welfare.
- A 9.77 Consumers would be unlikely to prefer Option 1. While operators are likely to aim to prevent any disruption to service in order to retain and attract consumers there are situations where, due to information asymmetries, the setting of minimum QoS standards may be necessary in order to protect consumers. Without a minimum quality of service obligation determined by ComReg, consumers would be subject to a range of different quality of service assurances which would vary from operator to operator. Some consumers could enjoy a greater or lesser minimum QoS as a result. Additionally, assurance provided by operators offers consumers no recourse in the event of an unreasonable level of disruption.
- A 9.78 Consumers would likely prefer Option 2 as the ability to make or receive telephone calls remains a highly utilised service and a key priority for consumers. In Q3 2015, mobile minutes reached peak levels at just over 3 billion minutes for that quarter. As voice calls can originate and terminate on different networks, a consumer who experiences poor voice call quality cannot determine whether the problem relates to his/her own network or to the network of the person on the other end of the line. Setting minimum QoS standards for voice calls can safeguard the interests of consumers in these circumstances.
- A 9.79 Option 1 could result in consumers receiving lower voice call QoS than that to which they are currently accustomed, by reducing incentives for operators to maintain certain QoS standards. For these reasons, consumers would prefer Option 2 as this would ensure that the standards under current Liberalised Use Licences²⁹⁹ are maintained for future licences for 3.6 GHz spectrum.

²⁹⁹ The Liberalised Use Licences in the 800 MHz, 900 MHz and 1800 MHz Frequency bands.

A 9.80 Finally, Option 2 would ensure that consumers would be protected against an unreasonable level of disruption and increases the likelihood that ComReg becomes that their service provider did not meet its obligations.

Preferred Option

A 9.81 In light of the preceding discussion, ComReg is of the preliminary view that Option 2 is the preferred option in terms of the imposition of a QoS licence condition.

RIA on the Imposition of QoS on Network Availability

Objectives

A 9.82 The focus of this RIA is to identify the impact of the regulatory options under consideration on stakeholders (including existing operators, potential new entrants, and consumers) and on competition and, in so doing, to identify the option that would best achieve ComReg's objectives.

A 9.83 ComReg's statutory functions, objectives and duties in relation to radio frequency spectrum are set out in Annex 2 of this document. These objectives include: The promotion of competition, which includes:

- ensuring that users derive maximum benefit in terms of choice, price and quality;
 - encouraging efficient use and ensuring effective management of radio frequencies; and
 - ensuring that there is no distortion or restriction of competition in the electronic communications sector.
- Contributing to the development of the internal market; and
- Promoting the interests of EU citizens

A 9.84 ComReg, in pursuit of these objectives, must apply objective, transparent, non-discriminatory and proportionate regulatory principles as described in Annex 2 of this document. In addition, in determining its preferred option, ComReg must also have regard to relevant Policy Directions.

A 9.85 The various RIA guidelines provide limited guidance as to how much weight should be given to the positions and views of each stakeholder group. Accordingly, ComReg has been guided by its statutory objectives which it is obliged to seek to achieve when exercising its functions

Policy Issue

A 9.86 The policy issue to be addressed in this RIA is whether a network availability condition should be imposed on holders of liberalised licences in the 3.6 GHz band, in order to ensure that any periods during which a licensee's network is unavailable do not exceed a specified level.

Identifying the regulatory options

A 9.87 ComReg has identified the following options:

- **Option 1:** Do not impose minimum QoS conditions in respect of the availability of the network
- **Option 2:** Set minimum QoS conditions in respect of the availability of the network, based on current liberalised use license conditions, such that each licensee shall ensure that service unavailability shall be less than 35 minutes (based on weighting factors) per six month period.

Impact on stakeholders

A 9.88 Option 1 would allow operators full discretion over how often and how long their networks may be unavailable (e.g. for the purposes of systems upgrades etc.).

A 9.89 Option 2 may require operators to incur additional expenditure in their network to ensure compliance with obligations (e.g. back-up systems) over and above the level which they would choose to incur, absent the licence condition.

A 9.90 Six of the seven responses agreed that a QoS obligation as set out under Option 2 was necessary. Therefore operators may be of the view that Option 2 provides good incentives for all operators to minimise service unavailability. Operators may be of the view that such conditions improve the perception of the network and such benefits are likely to exceed any compliance costs.

A 9.91 3IHL was of the view that this type of obligation is not appropriate for the 3.6 GHz band, therefore to the extent that, 3IHL does provide services using the 3.6 GHz band, it may have a preference for the greater flexibility and avoidance of compliance costs associated with Option 1.

A 9.92 Notwithstanding, most operators are likely to have a preference for Option 2.

Impact on Competition

- A 9.93 Neither option is likely to impact materially on competition as any conditions imposed would apply equally to all licensees. Option 1 could, however, result in less competitive intensity in terms of network availability than would occur under Option 2, for the reason described in the above Voice Call RIA.

Impact on Consumers

- A 9.94 Network availability is of fundamental importance to consumers. If any network is unavailable, subscribers on that network cannot use services. Consumers face serious disruption if the network to which they are subscribed is unavailable. The longer the period of unavailability, the greater the level of disruption. Setting a licence condition relating to network performance would safeguard the interests of consumers against operators who might otherwise have an unacceptably high level of network unavailability;
- A 9.95 Option 2 would ensure that consumers would be protected against an unreasonable level of disruption to services. Under Option 2, customers could refer the matter to ComReg if their service provider did not meet its obligations. ComReg would act as a watchdog for consumers by ensuring that the overall duration of network unavailability is within the specified range.
- A 9.96 Under Option 1, operators may, amongst other things, have an incentive to undertake lower levels of investment in their networks in terms of operability than would otherwise be the case, or to impose unreasonable levels of disruption on their customers when undertaking systems upgrades, etc.
- A 9.97 The QoS obligation imposed under Option 2 would apply to licensees which means, in turn, that licensees would need to ensure that third parties using their network assist it in achieving compliance as appropriate. As a result, all consumers regardless of the provider would benefit from the obligation.
- A 9.98 For these reasons, consumers would most likely prefer Option 2 whereby all Licensees are required to ensure that the overall duration of network unavailability does not exceed a specified level.

Preferred Option

- A 9.99 Having considered the impacts on stakeholders, competition and consumers, ComReg considers Option 2 to be the better option by which to achieve its objectives.

Annex 10: Correspondence between Imagine and ComReg

Jeremy Godfrey,
Chairman,
Commission for Communications Regulation,
Block DEF,
Abbey Court,
Irish Life Centre,
Lower Abbey Street,
Dublin 1.

Dear Commissioner,

With reference to the Consultation on Proposed 3.6 GHz band award, in the Information notice (ComReg 15/76 dated 10 July 2015) we note that ComReg confirm that "*to the extent that interested parties have views on how ComReg's spectrum award proposals may, in their view, better align with the NBP (including when more detailed information becomes available about the NBP), then ComReg remains open to consideration of such views in the context of ComReg's own statutory remit.*"

While we have responded in detail to the consultation clearly setting out our views there is a significant issue which needs to be brought to your attention and as it is a matter of Government Policy and direction, to that of the Minister.

In the "*Consultation on Proposed 3.6 GHz Band Spectrum Award - ComReg 15/70*" ComReg states that "*in identifying the Preferred Option*".

"3.168 Section 12(4) of the 2002 Act requires ComReg, in carrying out its functions, to have regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to it, in relation to the economic and social development of the State. Section 13 of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources ("the Minister") as he or she considers appropriate to be followed by ComReg in the exercise of its functions.

3.169 ComReg considers below those Policy Directions which are most relevant in this regard (and which have not been considered elsewhere in this chapter)."

With regard to what ComReg consider the current Policy Direction Number 3 ComReg state:

"ComReg shall, in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers."

"The purpose of this policy direction was to ensure that the regulatory framework for electronic communications plays its part in contributing to the achievement of the Government's objectives regarding the rollout of broadband networks."

"ComReg is cognisant of the fact that the three year objective described in this policy direction has now expired making this direction less relevant currently. In any case, ComReg is of the view that the Preferred Option is aligned with this Government objective, insofar as it is most likely to maximise utilisation of the available radio frequency spectrum for WBB services."

It is clear from this position that "*in identifying the Preferred Option*" ComReg, in considering compliance with its obligations under Section 12(4) and 13 of the 2002 Act, refers to a previously notified and expired policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources ("the Minister").

It appears clear that, notwithstanding the importance of the NBP and ComReg's awareness and role, at the time of your review the Minister either had not notified or had not issued to ComReg any updated policy direction on the National Broadband Plan or obligations under the State Aid Guidelines and in the absence of such a notification that ComReg did not consider the NBP objectives "*in identifying the Preferred Option*".

As set out in our response to your consultation - and also in our response to the DCENR's public consultation on the Draft Intervention Strategy - to remain in compliance with SAG there is an obligation on the State to use any legislative and regulatory measure specifically including regulatory intervention and the (re) allocation of spectrum to facilitate NGA service delivery and investment prior to any proposed intervention to minimise any distortion of the market. If the Minister has not issued ComReg with a policy direction with regard to these obligations which oblige ComReg to award spectrum required for NGA this would be a serious breach of the SAG guidelines with significant consequences for the NBP.

So that there is clarity on this very important matter I must ask that you confirm back to me:

- If the Minister has issued and notified ComReg of any policy direction regarding the National Broadband Plan
- If the Minister has made ComReg aware of obligations that arise under State Aid Guidelines in the context of the National Broadband Plan
- If ComReg has taken cognisance of its obligations under SAG as an agent of the State in the formulation of its "*Preferred Option*" for the allocation of the 3.6GHz spectrum

I believe it is essential that there be clarity on this issue prior to your finalisation of an award mechanism for the 3.6GHz spectrum and in this regard perhaps it would be useful for ComReg to liaise with the Minister and DCENR so that there is alignment on all parties' obligations and thereby avoid a more complex and difficult progression for both the NBP and the spectrum award.

Yours Sincerely,



Sean Bolger,
Executive Chairman,
Imagine Communications Group



Commission for
Communications Regulation
Coimisiún Um
Rialáil Cumarsáide

from the chairperson

11 November 2015

Mr Sean Bolger
Executive Chairman
Imagine Communications Group Ltd.
Communications House
Barrow Street
Dublin 4

Dear Sean,

I refer to your letter of 29 October 2015 regarding ComReg's consultation on the proposed 3.6 GHz band award, the contents of which are noted. In particular, I note your request for clarity on a number of issues identified in your letter prior to the finalisation of the award mechanism.

The matters raised in your letter relate to and are an expansion of Imagine's existing submission to ComReg Document 15/70.

ComReg's practice is to deal with issues raised in connection with consultation exercises when we publish responses to consultation rather than by entering into detailed private correspondence with individual stakeholders. Accordingly, we will address the issues you raise when we respond to the consultation on ComReg Document 15/70. When our response is published, interested parties will have a further opportunity to submit their views in advance of the finalisation of the award mechanism.

In the meantime, I can confirm that ComReg is, of course, fully aware of the State Aid Guidelines in relation to the rapid deployment of broadband networks, and of the public statements made by the Department for Communications Energy and Natural Resources in relation to the National Broadband Plan. You will also be aware that ComReg attends, as an observer, meetings of the Department's National Broadband Plan Steering Committee.

ComReg is treating your letter as a further submission by Imagine in response to ComReg Document 15/70. As with other submissions received, we intend to publish a non-confidential version of your letter on our website in due course. Your letter is not marked as confidential but if you consider any of the information in it to be confidential, please provide representations to that effect in accordance with the procedures set out in ComReg Document 05/24. Such representations should be made by close of business on 18 November 2015. In this regard, please contact Zeeshan Nazneen at Zeeshan.nazneen@comreg.ie or by telephone to (01) 804 9763.

Yours sincerely

Marie Curran
PP Jeremy Godfrey
Chairperson

An Coimisiún um Rialáil Cumarsáide
Commission for Communications Regulation

Abbey Court Irish Life Centre Lower Abbey Street Dublin 1 Ireland
Telephone +353 1 804 9642 Fax +353 1 804 9645 Email chairperson@comreg.ie Web www.comreg.ie

Jeremy Godfrey,
Chairman,
Commission for Communications Regulation,
Block DEF,
Abbey Court,
Irish Life Centre,
Lower Abbey Street,
Dublin 1.

20th November 2015

Dear Commissioner,

Your letter of the 11th November refers.

By letter of the 29th October 2015 I requested the following;

"So that there is clarity on this very important matter I must ask that you confirm back to me:

- *If the Minister has issued and notified ComReg of any policy direction regarding the National Broadband Plan*
- *If the Minister has made ComReg aware of obligations that arise under State Aid Guidelines in the context of the National Broadband Plan*
- *If ComReg has taken cognisance of its obligations under SAG as an agent of the State in the formulation of its "Preferred Option" for the allocation of the 3.6GHz spectrum*

I believe it is essential that there be clarity on this issue prior to your finalisation of an award mechanism for the 3.6GHz spectrum and in this regard perhaps it would be useful for ComReg to liaise with the Minister and DCENR so that there is alignment on all parties' obligations and thereby avoid a more complex and difficult progression for both the NBP and the spectrum award."

In your response you state the following;

"I can confirm that ComReg is, of course, fully aware of the State Aid Guidelines in relation to the rapid deployment of broadband networks, and of the public statements made by the Department for Communications Energy and Natural Resources in relation to the National Broadband Plan. You will also be aware that ComReg attends, as an observer, meetings of the Department's National Broadband Plan Steering Committee."

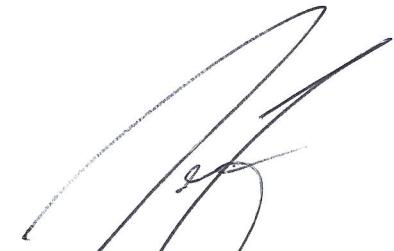
Your response does not address the clarifications requested. For the reasons set out in my previous letter whether the Minister has issued an updated policy direction to ComReg regarding the NBP and whether ComReg is abiding by such a policy direction is fundamental to the progression in a timely manner not just of the award process and your current consultation but also the NBP in terms of the States obligations under the State Aid Guidelines.

Whether the Minister has or has not *a)* issued and notified ComReg of any policy direction regarding the National Broadband Plan and or *b)* made ComReg aware of obligations that arise under State Aid Guidelines in the context of the National Broadband Plan is simply a request for information and not in itself an issue which is relevant or not to the current consultation.

There can be no basis for withholding this information on the basis of the current consultation and I again request that you clarify the position by return.

The separate issue of, *If ComReg has taken cognisance of its obligations under SAG as an agent of the State in the formulation of its "Preferred Option" for the allocation of the 3.6GHz spectrum, will become apparent in the consultation.*

Your Sincerely,



Sean Bolger
Executive Chairman
Imagine Communications Group



10 December 2015

Mr Sean Bolger
Executive Chairman
Imagine Communications Group Ltd
Communications House
Barrow Street
Dublin 4

Dear Sean

I refer to your letter of 20 November 2015, which was in response to my letter to you of 11 November 2015 and in connection with ComReg's consultation on the proposed 3.6 GHz band award.

As noted in my letter of 11 November, ComReg's practice is to deal with issues raised in connection with a consultation process in our published responses and not by entering into detailed private correspondence with individual stakeholders.

However as you have stated that the questions you raise in your latest letter are of interest to you for reasons that are wider than the current consultation, and as you have expressed concern that your requests for clarification be addressed as a matter of urgency, I am happy to respond to your queries.

Policy directions given by the Minister under Section 13 of the Communications Regulation Act are a matter of public record. The Minister must publicly consult on the draft of any proposed direction and the final version is published in *Iris Oifigiúil*. The last time such a policy direction was issued was in 2004, many years before the current National Broadband Plan was contemplated. Accordingly, there is no policy direction that refers specifically to the National Broadband Plan. I can also confirm that ComReg made reference to all the relevant ministerial policy directions in the recent 3.6 GHz consultation.

I am not quite clear what additional information you are seeking with regard to the State Aid Guidelines. These guidelines are a matter of public record and ComReg has long been aware of them – including the matters where the guidelines envisage consultation with the expert National Regulatory Authority. I can confirm that the Department has consulted with ComReg, as envisaged under the State Aid Guidelines.



Please note that ComReg is treating your letter as a further submission by Imagine in response to ComReg Document 15/70. As with other submissions received, we intend to publish a non-confidential version of your letter on our website in due course. Your letter is not marked as confidential but if you consider any of the information in it to be confidential, please provide representations to that effect in accordance with the procedures set out in ComReg Document 05/24. Such representations should be made by close of business on 17 December 2015. In this regard, please contact Zeeshan Nazneen at Zeeshan.nazneen@comreg.ie or by telephone to (01) 804 9763.

Yours sincerely

A handwritten signature in blue ink, appearing to read "J. Godfrey".

Jeremy Godfrey
Chairperson