Commission for
Communications Regulation

Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands

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Chapter 1

1 Introduction

1.1 In its most recent strategy statement for electronic communications[1], the Commission for Communications Regulation (ComReg) stated that it intended to initiate a project to consult on the award of spectrum rights of use for radio spectrum suitable for the provision of wireless broadband, both mobile and fixed broadband. The purpose of this document is to outline ComReg's preliminary proposals on the details of an award process for spectrum rights of use in the frequency range 2500 to 2690 MHz (the "2.6 GHz band") (identified as the key band in the recent strategy statement for electronic communications) and other appropriate bands.

1.2 In arriving at its proposals 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 various international decision documents, technical documents relating to the spectrum proposed for inclusion in the award process (see Annex 3) and its most recent spectrum strategy statement[2].

1.3 This document considers:

- what additional spectrum bands, if any, might be considered for inclusion in such an award process;
- key aspects of the spectrum proposed for inclusion in the award ;process;
- the type of award mechanism that might be used;
- the proposed approach to setting fees for rights of use to the award process; and
- appropriate licence conditions.

[1] Strategy Statement for Electronic Communications 2014-16 – ComReg document 14/75 – published 17 July 2014 – see section 6.3.

[2] Strategy Statement - Strategy for Managing the Radio Spectrum: 2011 – 2013, ComReg document 11/89. For the avoidance of doubt, ComReg intends to shortly consult upon a new spectrum strategy statement, and the preliminary views expressed in this document are without prejudice to the position which may be articulated by ComReg on related matters in any future spectrum strategy statement resulting from the above mentioned consultation process or future processes.

1.4 ComReg is publishing, alongside this document, a report from its economic and award design consultants, DotEcon, as Document 14/102.

1.5 This document is structured as follows:

- **Chapter 2:** sets out some background on the 2.6 GHz band and identifies other bands that might be suitable for inclusion in this award process;
- **Chapter 3:** contains a preliminary assessment on potential additional bands which might be included in the award process, a draft regulatory impact assessment and an assessment of the Preferred Option against ComReg's functions, objectives and duties;
- **Chapter 4:** details some key aspects of the proposed award including band plans, technology and service neutrality, the non-exclusive assignment of spectrum and licence duration;
- **Chapter 5:** sets out ComReg's proposed award type and award format;
- **Chapter 6:** details the proposed methodology by which ComReg is considering to calculate and structure minimum spectrum fees that will apply to this proposed award of spectrum;
- **Chapter 7:** contains a high level discussion on applicable licence conditions that would apply to spectrum awarded through this process; and
- **Chapter 8:** details how to submit comments and the next steps in this process.
- **Annex 1**: contains a glossary and definitions;
- **Annex 2**: summarises ComReg's statutory functions, objectives and duties relevant to the management of Ireland's radio frequency spectrum;
- **Annex 3**: lists international decision documents and technical documents relating to the spectrum proposed for inclusion in the award process.

Chapter 2

2 Background and Potential Bands for Inclusion

2.1 This chapter sets out information on the 2.6 GHz band, on the actual and potential development of demand for wireless broadband ("WBB") services in Ireland and on other bands that might be suitable for inclusion in this award process.

2.1 The 2.6 GHz band

2.2 The 2.6 GHz band is currently licensed in Ireland for the provision of pay television services using a Microwave Multipoint Distribution System (MMDS).

2.3 On 27 March 2013, ComReg, by Decision D06/13[3], extended all MMDS licences in force in the 2.6 GHz band for a period of 2 years from 18 April 2014 until 18 April 2016 whereupon all licences would expire in full. Accordingly, new right of use for the entire band will be available for release from this date. The document in which that decision was published (Document 13/31) also noted ComReg's intention to consult on the details of a competitive award process for new rights of use in the 2.6 GHz band with the intention that these rights of use would commence following expiry of existing MMDS licences.

2.4 This chapter first sets out a brief overview of pertinent international developments in relation to the 2.6 GHz band, leading to a discussion on the identification of additional bands that could potentially be added to the 2.6 GHz award process as a possible multi-band award process.

2.1.1 International Developments in the 2.6 GHz band

2.5 This section contains an overview of pertinent international developments in relation to the 2.6 GHz band.

2.6 European Commission Decision 2008/477/EC (the "EC 2.6 GHz Decision"), adopted on 13 June 2008, requires that all Member States must, within six months of the decision, designate and subsequently make available on a non-

[3] Set out in Chapter 5 of ComReg Document 13/31 Renewal of the MMDS licences in force at 18 April 2014 in the 2.6 GHz band from 19 April 2014 to 18 April 2016: Response to Consultation and M/C Decision - published 27 March 2013.

exclusive basis the 2.6 GHz band for terrestrial systems capable of providing electronic communications services ("ECS").[4]

2.7 In doing so, the EC 2.6 GHz Decision sets out various technical conditions for enabling the provision of ECS in the band including:

- that assigned blocks shall be in multiples of 5 MHz;
- the applicable block edge masks for ECS deployment in the band; and
- the band-plan options for deployments in the band.

2.8 The EC 2.6 GHz Decision indicates that the 2.6 GHz band should be released on a technology and service-neutral basis in line with the Wireless Access Policy for ECS ("WAPECS") approach. This means that the 2.6 GHz band could be used to provide a range of services from, for example, WBB to TV services, provided such services comply with the technical conditions of the EC 2.6 GHz Decision.

2.9 However, ComReg notes that:

- the EC 2.6 GHz Decision states that services provided in this band "*should mainly target end-user access to broadband communications*";[5] and
- European Parliament and Council Decision 243/2012/EU[6] (the "RSPP Decision") makes specific reference to making the 2.6 GHz band available *"under conditions that allow consumers easy access to wireless broadband services".*[7]

2.10 In addition, the 2.6 GHz band is widely used in other Member States for the provision of WBB including International Mobile Telecommunications ("IMT"). In that regard, ComReg refers to European Communications Office ("ECO") Report 03, most recently updated in March 2014[8], which identifies a significant number of European countries which have granted rights of use in the 2.6 GHz band that can be used to provide WBB services.

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4 Ireland complies with this aspect of the EC Decision insofar as the 2.6 GHz band is licensed for the provision of ECS over MMDS networks. See: Radio Spectrum Committee Working Document RCSOM08-39 on "Explanatory Memorandum on MMDS in the 2500 to 2690 MHz band".

5 At Recital 2.

6 Decision 243/2012/EU of the European Parliament and of the Council of 14 March 2012 "establishing a multiannual radio spectrum policy programme".

7 Article 6(2).

8 ECO Report 03, The Licensing of 'Mobile bands' in CEPT, published 25 March 2014. Available at http://www.cept.org/eco/deliverables/eco-reports.

2.11 Furthermore, the 2.6 GHz band is a proven band for the deployment of LTE[9] technology and was the band utilised for the world's first commercial LTE deployment (in Sweden).[10] With multiple deployments worldwide for both LTE and WiMax[11] technologies, it is clear that the 2.6 GHz band is suitable for WBB and that there is equipment available for such use[12].

2.12 Accordingly, ComReg is of the view that future interest in the 2.6 GHz band is most likely to be in relation to the provision of WBB services and that the band should be released, on a service and technology neutral basis, in a manner that enables the provision of WBB services.

2.2 Wireless Broadband

2.13 WBB is a blanket term which covers high speed transmission of data over:

- terrestrial platforms both:
  - fixed – services to devices in permanent locations such as homes or offices; and
  - mobile – services to a mobile phone or another portable device including a portable modem; and
- satellite.

2.14 The WBB ecosystem in Ireland includes both mobile network operators ("MNOs") and fixed WBB operators, the latter being licensed under the Fixed Wireless Access Local Area ("FWALA") scheme. The convergence between wireless technologies used to provide mobile broadband and fixed broadband services means that spectrum bands ear-marked for WBB services may be of interest to both user groups.[13] This is particularly true of 'capacity' bands[14]

[9] Long Term Evolution ("LTE") is a wireless communication standard currently favoured by industry for the provision of high speed data services. An evolution of LTE, LTE Advanced ("LTE+"), has the capability of providing 4G services.

[10] GSMA, Wireless Intelligence Snapshot, 'TeliaSonera rolls out world's first LTE networks across the Nordics, available at: https://gsmaintelligence.com/files/analysis/?file=100429.pdf.

[11] Worldwide Interoperability for Microwave Access ("WiMax") is a wireless communication standard for the provision of high speed data services. WiMax has never been fully adopted by the mobile industry and was primarily utilised for the provision of fixed broadband services. There has been a decline in the rollout of WiMax services in the recent past due to the popularity of LTE services.

[12] The recent GSA, LTE Ecosystem report (28 July 2014) indicates that 582 LTE devices include capability to operate using 3GPP band 7 (2500 MHz – 2570 MHz and 2620 MHz – 2690 MHz FDD operation) and 278 LTE devices include capability to operate using 3GPP band 38 (2570 MHz – 2620 MHz TDD operation).

[13] Both mobile and fixed WBB providers are converging in terms of transmission standards, with both sectors moving towards adoption of LTE technology.

where assignments of large blocks of contiguous spectrum are possible, making those bands particularly suitable for data-only networks like, for example, FWALA networks.

2.2.1 Transmission modes and data asymmetry

2.15 Mobile cellular networks, using technologies such as GSM, UMTS and LTE, traditionally operate using frequency division duplex ("FDD") transmission mode. This means that every spectrum block (typically of 5 MHz) which is assigned for download purposes (base station to user equipment ("UE")), there is a 'paired' block (of the same size) assigned for uplink purposes (UE to base station). This symmetric spectrum assignment is suited to a voice driven service where the uplink and downlink traffic is similar. However, the growth of mobile broadband, especially for on-demand video services, means that there is a growing asymmetry between what the average user wants to download versus upload.[15]

2.16 Time Division Duplex ("TDD") transmission mode involves one block of spectrum being shared between uplink and downlink on a time basis. The network can vary the proportion of time in which the block is used for each. TDD has traditionally been utilised by fixed WBB networks utilising technologies such as WiMax. The development of TDD technologies for mobile use, such as UMTS-TDD and TD-LTE, has meant that mobile services utilising TDD in unpaired spectrum has become more common.[16] Such developments can generally be seen as promoting more efficient use of spectrum.

2.17 In a mobile environment where data traffic is tending towards being downlink-centric, supplementary downlink ("SDL") is intended to provide additional downlink capacity, usually in conjunction with another FDD structured band. Where spectrum blocks in a SDL band are designated for downlink only, they cannot be used for two way communications unless used in conjunction with other spectrum holdings. This concept is relatively new, with the 1.4 GHz band[17] being the first spectrum band harmonised for this purpose in Europe. The concept has become viable due to technological advances in

[14] For the purpose of this consultation paper, capacity bands refers to those bands above 700 MHz. See Section 2.2.2

[15] See ECC Report 188.

[16] The RSPG opinion, at page 13, notes that a primary reason for the lack of use of TDD spectrum in the 2.1 GHz band was that little research and development was focused on TDD technologies post 2000. However, the increasing asymmetry of WBB data has altered the focus in this regard.

[17] See section 3.1.1 of this paper.

communications infrastructure and transmission technologies which allows for carrier aggregation; meaning that the network and associated UE can aggregate data across multiple spectrum bands, thus increasing the network capacity available to a single user.

2.18 The EC 2.6 GHz Decision identifies the bandplan to be applied by Member States (see further at Section 2.1 of this document) which allocates spectrum blocks for both 'paired' (FDD) and 'unpaired' (TDD) use. Other spectrum bands have also been identified as suitable for WBB in either TDD, SDL or FDD modes, along with other relevant characteristics, which may make them suitable for inclusion in this award process (see Section 3.1).

2.2.2 Coverage and capacity bands

2.19 Higher frequency bands identified for WBB (i.e. those above 1 GHz) are, at least in the context of mobile broadband, often referred to as 'capacity' bands and lower frequency bands (i.e. those below 1 GHz) are often considered as 'coverage' bands. This informal categorisation is based upon differences in path loss characteristics, the likelihood of the availability of a greater quantum of contiguous spectrum [18] and the availability of band plans supporting asymmetric data requirements.[19] Due to the growth in demand for mobile data, a mobile network is likely to require a mix of both coverage and capacity rights of use.

2.3 Potential for a multi-band award process

2.20 Worldwide, WBB subscriptions continue to grow[20] and the demand for mobile data is increasing considerably year on year.[21] This growth in demand for data services has also been observed at a national level.[22]

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[18] Higher frequency bands generally comprise of a greater quantum of contiguous spectrum within each band. This reflects historical reasons and the manner in which these bands have been apportioned at international level. Large amounts of contiguous spectrum are very suitable for large channel deployments which technologies, such as LTE and LTE Advanced can utilise to provide very high data throughput.

[19] Higher frequency bands are more likely to be harmonised on a TDD or an SDL basis.

[20] As of January 2014, the Organisation for Economic Cooperation and Development (OECD) reports that wireless broadband subscriptions had experienced healthy growth (16.63%) from a year earlier, largely driven by continuing strong demand for tablets and smartphones. See http://www.oecd.org/sti/broadband/broadband-statistics-update.htm

[21] The Cisco Visual Networking Index ("VNI") Global Mobile Data Traffic Forecast Update reported that global mobile data traffic grew by 81% in 2013 (See http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html). Additionally, from an Irish perspective, ComReg's most recent

2.21 This ongoing growth in demand for wireless data services has led to a push at European level to identify and make available multiple spectrum bands suitable for WBB.

2.22 In considering whether to include additional bands in this award process, ComReg is guided, amongst other things, by developments at EU level (discussed below at Section 2.3.2). There are also other reasons why it may be appropriate to include multiple bands in this award process which are discussed below.

2.23 As this project considers the award of spectrum rights of use across multiple bands (potentially comprising bands above and below 1 GHz), ComReg will have due regard, to the extent appropriate, to the approach taken in the recent MBSA project which resulted in the award of spectrum across multiple bands.[23] This should, amongst other things, promote regulatory predictability by ensuring a consistent regulatory approach[24].

2.24 Notwithstanding, ComReg must be mindful of the dynamic nature of the ECS market generally and ever changing consumer needs and so will ensure that in arriving at any decisions in relation to the proposed award process that all current and pertinent facts will be considered.

2.3.1 Single versus sequential award processes

2.25 It may be beneficial when awarding the 2.6 GHz band to award other bands under the same process. Such an approach would introduce efficiencies over and above running multiple single band awards for other spectrum bands which are also available, or may become available in the near term, and which may be used for similar services to the 2.6 GHz band.

2.26 As noted by DotEcon in its report accompanying this document, when designing an award process it is desirable to ensure that:

Quarterly Report notes a rise in mobile data volumes by 48.1% in the year to Q1 2014 to reach 13,897 terabytes per month (See ComReg document 14/61)

[22] For example, in its response to ComReg's recent consultation on the Management and use of the UHF radio frequency band in Ireland, Telefónica Ireland noted that it has seen explosive growth in the use of data on smartphones in the past year, stating that "*data throughput on O2's network has grown by almost 60% in the second half of 2013"* (para 3.32 of Document 14/85).

[23] See ComReg Media Release 15 Nov 2012 - ComReg Announces Results of its Multi-Band Spectrum Auction - http://www.comreg.ie/_fileupload/publications/PR15112012.pdf

[24] In accordance with Regulation 16(2)(a) of the Framework Regulations 2011.

- interested parties have some visibility of future planned releases of spectrum, which would allow them to plan for their spectrum needs accordingly;
- operators have an opportunity to acquire in advance the spectrum they may need to meet future demand for their services (to promote investment);
- opportunities for speculative acquisition of spectrum are minimised; and
- unnecessarily fragmented assignments are avoided.

2.27 However, these benefits are unlikely to be achieved by offering different bands sequentially without providing clarity around future releases, as this could lead to many bidders acquiring small amounts of spectrum in each band rather than obtaining larger contiguous blocks in fewer bands.

2.28 Importantly, the release of spectrum bands which may be substitutable[25] or complementary[26] to the 2.6 GHz band for interested parties can lead to a more efficient use of spectrum and promote competition. As noted by DotEcon, demand interdependencies may give rise to strong economic efficiency reasons for combining bands into an integrated award process. This may reduce the risk for bidders and provide maximum opportunity for different types of bidders (with potentially different intended uses and technologies).

2.29 The following section discusses developments at EU level which are relevant to ComReg's consideration of other bands suitable for inclusion in this award process.

2.3.2 Identifying potential candidate bands - the RSPG Opinion

2.30 In April 2012[27], the European Commission requested the Radio Spectrum Policy Group ("RSPG")[28] to assess the possible solutions and options for

[25] The terms substitute/substitutable/substitutability in relation to the proposed award process 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.

[26] The terms complement/complementary/complementarity in relation to the proposed award process 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.

[27] RSPG12-415 – Final Request for an Opinion on Strategic Challenges facing Europe in addressing the Growing Spectrum Demand for Wireless Broadband.

[28] The RSPG is a high-level advisory group of EU Member States that assists the European Commission in the development of radio spectrum policy. See http://rspg-spectrum.eu/about-rspg/.

meeting the future demand for WBB services in the time frame 2013-2020. The RSPG was also requested to produce a common roadmap for WBB spectrum which would strengthen the single market, including options for future harmonisation.

2.31 In response to this request, on 13 June 2013 the RSPG published an "Opinion on the Strategic Challenges Facing Europe in Addressing the Growing Spectrum Demand for Wireless Broadband"[29] ("RSPG Opinion"). This opinion reviewed the current allocation of spectrum in Europe within the frequency range from 400 MHz to 6 GHz and identified the steps which need to be taken to make available the bands identified as suitable for WBB use.

2.32 The RSPG Opinion identifies bands already available and bands potentially suitable for WBB use. The bands identified by the RSPG include bands currently being used for terrestrial, satellite and WiFi purposes. The opinion categorises those bands in terms of bands which:

a) are currently designated for WBB use;

b) will likely be designated for WBB use in the near term (i.e. up until and including 2015);

c) will likely be designated for WBB use in the medium term (i.e. beyond 2015 and presumably before 2020);[30] and

d) may possibly be designated for WBB use in the very long term (i.e. presumed to be beyond 2020).

2.33 ComReg believes that the RSPG Opinion provides a useful list of bands, in the frequency range 400 MHz to 6 GHz, which might reasonably be considered for inclusion in the proposed award process alongside the 2.6 GHz band.

2.34 ComReg notes that uncertainty with regard to the designation of bands at a European level can undermine their substitutability with and/or complementarity to the 2.6 GHz band.[31] The identification of a band for a

[29] RSPG 13-521 rev 1 – RSPG Opinion on Strategic Challenges Facing Europe in Addressing the Growing Spectrum Demand for Wireless Broadband.

[30] The assumed 2020 timeline is in line with the timelines for Digital Agenda Europe.

[31] ComReg notes that there are other bands within the frequency range 400 MHz to 6 GHz that are not identified for WBB by the RSPG Opinion but which have, in the past, been assigned by ComReg to licensees following a competitive award process and that rights of use in some of these bands are due to terminate in the coming years. For example:

- Wideband Digital Mobile Data Services ("WDMDS") at 410-414 MHz paired with 420-424 MHz; and

particular purpose in Europe usually, subject to the outcome of sharing and compatibility studies, results in a European harmonised approach, which sets out the favoured bandplan and technical conditions for use of that band. The lack of such harmonisation, or at least an indication that work towards harmonisation is planned or underway at a European level, can:

- result in increased equipment costs, or lack of availability of equipment to exploit the spectrum; and
- create uncertainty around the technical conditions to be applied.

2.35 Releasing a spectrum band where there is uncertainty also presents the risk that the band in question will later be identified for a different purpose within Europe or become harmonised with different technical conditions, creating disparity within the European market.

2.36 Accordingly, those bands falling within Category (d) above are not being considered for inclusion in the proposed award process. The significant uncertainty around if and when those bands will be designated and harmonised for WBB use clearly undermines their substitutability with and/or complementarity to the 2.6 GHz band. The inclusion of those bands would not appear to accord with ComReg's statutory objectives including, for example, encouraging efficient use and ensuring the effective management of radio frequencies.

2.37 ComReg also observes that the RSPG Opinion "*focuses on the problems associated with the provisioning of wireless broadband in general and specifically with the spectrum requirements for* ***terrestrial*** *wireless broadband*" [emphasis added].[32] As noted previously, the 2.6 GHz band is harmonised for terrestrial systems only and the satellite bands identified for WBB in the RSPG Opinion are unlikely to be considered as substitutable or complementary to the 2.6 GHz band from the point of view of those interested parties likely to participate in the proposed award process. Accordingly, ComReg proposes to consider only those bands which have appropriate frequency allocations to terrestrial services (fixed and/or mobile) for inclusion in the proposed award process.

- WDMDS at 872-876 MHz paired with 917-921 MHz.

These bands may be assigned by way of a competitive award process in the future but are not deemed to be suitable for inclusion in this award process given that these bands are in no way substitutable or complementary with the 2.6 GHz band (or other proposed bands) for the provision of WBB services.

[32] See page 26 of the RSPG Opinion.

2.38 Of the bands highlighted in the RSPG Opinion for terrestrial WBB in Category (a) above, the 2.6 GHz band is the only band that Ireland has not, as yet, made available for WBB purposes. Category (a) also includes the bands 3400-3600 MHz and 3600-3800 MHz (collectively the "3.6 GHz band") which can also be considered for inclusion in the process as existing rights of use in that band terminate in 2017. All other terrestrial Category (a) bands have existing rights of use which are likely to remain in force until beyond 2020 and so are not considered as suitable for inclusion in the current proposed award process.

2.39 The RSPG Opinion identifies two bands with potential for WBB use in the near term i.e. Category (b) above. These bands are:

- 1452 - 1492 MHz (the "1.4 GHz band"); and
- 2300 - 2400 MHz (the "2.3 GHz band").

2.40 These bands will be considered for inclusion in the award process as they are expected to be harmonised within the anticipated timeframe for completion of this award process (i.e. within the next two years).

2.41 With the exception of one band considered below (the 700 MHz band), ComReg is not minded to consider Category (c) bands for inclusion in the award process as there is uncertainty around if and when these bands will be designated for WBB use which can lead to the aforementioned risks regarding premature release.

2.42 As noted above, there is one possible exception to the exclusion of category (c) bands from the award process, the 694-790 MHz band (the "700 MHz band"), as there is more certainty around the harmonisation of this band. This band is the subject of multiple work items at a European level which is likely to result in the harmonisation of technical conditions and channelling arrangements for this band during the course of 2016.[33] As such, in ComReg's view, it is appropriate to consider this band, in principle, for inclusion in the award process.

2.43 In that regard, ComReg notes that the future of the UHF band in Ireland (470-790 MHz), which includes the 700 MHz band, is the subject of a separate

[33] See Radio Spectrum Committee Document RSCOM12-37 rev3 - Draft Mandate to CEPT to develop harmonised technical conditions for the 694-790 MHz ('700 MHz') frequency band in the EU for the provision of wireless broadband and other uses in support of EU spectrum policy objectives.

consultation processes being conducted by both the DCENR[34] and ComReg[35]. Therefore, the in-principle views set out in this paper in relation to the 700 MHz band are wholly without prejudice to the outcome of those consultation processes, and any relevant policy statements, published by or on behalf of the Government or a Minister of the Government and notified to ComReg, to which ComReg is obliged to have regard[36]. Notwithstanding that these consultations are underway, given:

- that the UHF band consultation processes and cost/benefit analysis may take some time to complete; and
- the relatively tight timeframes involved in the present consultation process in light of the imminent expiration of licences in the 2.6 GHz band,

ComReg is considering and consulting upon the principle of including the 700 MHz band in the award to avoid undue delays to the present consultation/award process (e.g. additional consultation/s to separately consider the inclusion of the 700 MHz band) in the event that a change in use of the 700 MHz band and its inclusion in the proposed award process is ultimately supported[37].

2.3.3 Other Potential WBB bands outside of 400 MHz – 6 GHz

2.44 There are currently bands licensed in Ireland which might be suitable for WBB use but which are outside the 400 MHz – 6 GHz frequency range and which were not therefore considered in the RSPG Opinion, specifically the FWALA bands at 10.154 GHz – 10.672 GHz (the "10.5 GHz FWALA band"), 24.549 GHz – 25.781 GHz (the "26 GHz FWALA band") and 24.773 – 26.453 GHz (the "26 GHz band").[38]

2.45 ComReg has no current plans to discontinue the current FWALA licensing scheme in the 10.5 GHz and 26 GHz FWALA bands within the anticipated

[34] See DCENR Consultation on Spectrum Policy Priorities – published 24 July 2014 – section 7.2, specific question 7. The closing date for responses is Friday, 26 September 2014.

[35] See ComReg consultation document 14/13, response to consultation document 14/85, and the cost/benefit analysis that ComReg is conducting in respect of a potential change in use of the 700 MHz band (see, in particular, Annex 4 of ComReg Document 14/85).

[36] See section 12(4) of the Communications Regulation Act, 2002 (as amended).

[37] ComReg's final decision with regard to the spectrum bands to be included in this proposed award will take into account the availability or otherwise of the 700 MHz band.

[38] The 26 GHz FWALA band is not to be confused with the 26 GHz band utilised for point to point and point to multipoint national licences.

timeframe for completion of this award process. These bands are not therefore available for inclusion in this award process.

2.46 The 26 GHz band was previously released, by way of a competitive award process, on a national basis for point to point and point to multipoint services. These licences are due to expire in July 2018. This band may be assigned by way of a competitive award process in the future but is not considered to be suitable for inclusion in this award process as it has not been identified for WBB services at a European level.

2.47 Other bands above 6 GHz may be identified for WBB use in the future. In particular, those working on development of 5G technologies are looking at frequency bands up to 50 GHz and beyond. At this stage, however, it is too early to include such frequency bands as they have yet to undergo compatibility studies at the European or International Telecommunication Union ("ITU") level to determine the feasibility of these bands for next generation WBB.

2.48 The band 10.0-10.154 GHz (the "10.1 GHz band")[39] has previously been considered for fixed wireless access by ComReg.[40] However, that consultation indicated that there was "*very low interest*" from industry in the release of this band and accordingly ComReg is of the preliminary view that the 10.1 GHz band should not be considered further for inclusion in the proposed award process.

2.49 In light of the above, ComReg is considering the following bands for inclusion in the proposed award process for release alongside the 2.6 GHz band, the:

- 700 MHz
- 1.4 GHz;
- 2.3 GHz; and
- 3.6 GHz bands.

2.50 The suitability of each these bands for inclusion in the proposed award process is discussed further below.

[39] From a path loss and equipment availability perspective the 10.1 GHz band is similar to the 10.5 GHz FWALA band.

[40] See ComReg Documents 09/03 and 09/36.

Chapter 3

3 Assessment of the Suitability of Additional Bands to the Process and draft Regulatory Impact Assessment

3.1 This chapter sets out the ComReg's assessment of potential bands for inclusion in the proposed award process alongside the 2.6 GHz band. This assessment includes:

- a preliminary assessment of the appropriate bands to be considered for inclusion based on technical and market-based criteria; and
- for the bands found to meet those criteria, if any, a draft regulatory impact assessment (RIA) on their inclusion in the award process and on how best to assign the rights of use in those bands; and
- an assessment of Preferred Option identified in the RIA against ComReg's statutory functions, objectives and duties.

3.1 Preliminary assessment of bands suitable for inclusion in the award process

3.2 In considering what bands are suitable for inclusion in the proposed award process, it is necessary to identify the factors most relevant to substitutability with and/or complementarity to the 2.6 GHz band. Along with suitability of a band for WBB use, ComReg considers the following criteria to be the most relevant to such an assessment:

- degree of harmonisation;
- availability of spectrum;
- propagation characteristics; and
- equipment availability.

3.3 Set out below is a brief description of each band being considered for inclusion within the context of the above criteria and, in that light, ComReg's preliminary view of its suitability for inclusion in the award process.

3.1.1 The 1.4 GHz band

3.4 The 1.4 GHz band consists of 40 MHz of spectrum in the frequency range 1452 MHz to 1492 MHz.

Degree of Harmonisation

3.5 The usage of the 1.4 GHz band is harmonised by ECC Decision (13)03 (the "ECC 1.4 GHz Decision")[41]. The ECC 1.4 GHz Decision harmonises the band for mobile/fixed communications networks ("MFCN") supplementary downlink ("SDL"). The MFCN designation is an umbrella term which is associated with WBB services inclusive of both fixed and mobile usage. The ECC 1.4 GHz Decision, however, refers to MFCN SDL specifically as a mobile broadband system and calls it "*a strategic tool to tackle the growing mobile data traffic asymmetry*".

3.6 The ECC 1.4 GHz Decision includes a harmonised frequency arrangement and associated technical conditions.

3.7 The 1.4 GHz band is also the subject of an EC Mandate to CEPT "*to develop harmonised technical arrangements and conditions for wireless broadband usage of the 1452-1492 MHz frequency band as well as related harmonised sharing and compatibility conditions, wherever necessary, with incumbent services/applications in the same or in adjacent bands, including at the EU outer borders*". The final report to the EC in response to this mandate is expected by December 2014 and it is expected that an EC technical harmonisation decision will follow.

Availability of Spectrum

3.8 In Europe the 1.4 GHz band is designated for use by digital broadcast radio, specifically T-DAB and S-DAB. As with many countries in Europe, these services were never deployed in Ireland and so the spectrum band remains fallow. The entirety of the band is therefore available for assignment at present.

Propagation Characteristics

3.9 The 1.4 GHz band exhibits propagation characteristics most closely resembling the 1.8 GHz band currently licensed. As the 1.4 GHz band is above 1 GHz it is generally classified as a capacity band. It is however relatively close to 1 GHz, making it suitable also as complementary downlink

[41] ECC Decision (13)03 - The harmonised use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL) - Approved 8 November 2013.

for FDD networks operating sub-1 GHz spectrum. The band has also been successfully used to demonstrate the use of SDL technology on a mobile network by using the band as a supplementary downlink for the 2.1 GHz band.[42]

Equipment Availability

3.10 Equipment is not currently available in this band.[43] However, as noted by DotEcon in its report:

- a successful trial of SDL in this band has been carried out in France;
- a 3GPP work item is underway to standardise the band and corresponding E-UTRA and UTRA requirements for SDL operation; and
- the band is likely to be made available in other regions for WBB.

3.11 These points all indicate that equipment is quite likely to become available for the band within the timeframe of the award process.

Suitability for Inclusion

3.12 As noted by DotEcon in its report, at a European level, this band is relatively well developed from a regulatory perspective and the potential of the 1.4 GHz band for mobile broadband using SDL has been generally recognised. The recent harmonisation of the band, the on-going harmonisation updates and the expected availability of equipment may indicate a potential for substantial market demand even in the short term. However, given the likely attraction of this band for SDL purposes, the 1.4 GHz band is more likely to be considered a complement to other spectrum holdings that a bidder may wish to aggregate with these frequencies rather than a resource with standalone value in itself.

3.13 There may be some complementarity between the 1.4 GHz band and other bands being considered for release.

3.14 ComReg would agree with DotEcon that, overall, spectrum in the 1.4 GHz band appears to be a reasonably close substitute to unpaired 2.6 GHz spectrum because:

[42] http://www.orange.com/en/press/press-releases/press-releases-2013/Orange-Ericsson-and-Qualcomm-have-successfully-completed-the-world-s-first-live-demonstration-of-supplemental-downlink-technology-on-L-band-frequencies.

[43] See for example information on www.gsacom.com.

- within CEPT, this spectrum has recently been harmonised for advanced mobile services;
- technical studies at the EU level to determine harmonised technical conditions are advanced; and
- the amount of spectrum available in this band is comparable to that available as unpaired spectrum in the 2.6 GHz band.

3.15 ComReg would also agree with DotEcon's view that paired 2.6 GHz frequencies (as well as any other paired spectrum bands offered or already licensed) are a potential complement to 1.4 GHz spectrum. This will be the case where the value of acquiring usage rights for 1.4 GHz spectrum is dependent on whether usage rights for paired 2.6 GHz spectrum (or other paired spectrum bands offered or already licensed) are also acquired.

3.16 In light of the above, ComReg is of the preliminary view that the 1.4 GHz band should be considered for inclusion in the award process.

3.1.2 The 2.3 GHz Band

3.17 The 2.3 GHz band consists of 100 MHz of spectrum in the frequency range 2300 MHz to 2400 MHz.

Degree of Harmonisation

3.18 The 2.3 GHz band is nearing harmonisation within CEPT. The ECC 2.3 GHz Decision[44] harmonising the band for MFCN was adopted and published in June 2014. The ECC 2.3 GHz Decision sets out both the channelling arrangements and technical conditions for MFCN operating in the band.

3.19 The band has been identified for IMT use by the ITU since 2007. However, progress for the harmonisation of the band has been hampered due to a range of existing incumbent services operating in the band throughout Europe. ECC Report 172 presents co-channel and adjacent channel compatibility studies for WBB systems operating in the band. The report outlines that various mitigation techniques would be required for co-existence of WBB services and incumbent services in the band.

[44] ECC Decision ECC/DEC(14)02 on harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for Mobile/Fixed Communications Networks (MFCN).

3.20 The band is also the subject of an EC mandate[45] to "*develop common and minimal (least restrictive) technical conditions for wireless broadband usage of the 2300-2400 MHz frequency band*" and "*where appropriate develop common technical sharing solutions for the shared use of the 2300-2400 MHz band for WBB and incumbent services/applications*". The timeline to provide the deliverables for the mandate indicates that all work should be completed by July 2015. Draft ECC Report 55 addressing these issues is currently out for public consultation. The ECC is aiming to formally adopt the report by November 2014 prior to submitting it to the EC.

Availability of Spectrum

3.21 The majority of the band is currently unused in Ireland. Eircom currently operates a legacy rural wireless fill-in service for its fixed line network, namely Rurtel, in the band. Rurtel licences are limited to the frequency range 2300-2327 MHz, only operate in rural areas and are licensed on a rolling month to month basis in 45 locations in Ireland. If the 2.3 GHz band was to be included in the award process, it would be ComReg's intention to release, as far as possible, the entire 100 MHz on a service and technology neutral basis.

Propagation Characteristics

3.22 The propagation characteristics of the 2.3 GHz band are similar to those of the 2.6 GHz band given the relative close proximity of the two bands in terms of frequency. The band would also, in common with the 2.6 GHz band, likely be considered a capacity band from the perspective of mobile network operators.

Equipment Availability

3.23 As also noted by DotEcon in its report, the 2.3 GHz band has a reasonably well developed ecosystem for LTE. The harmonised channelling arrangements designate the entire band for TDD operation. According to a Global Mobile Suppliers Association ("GSA") report from March this year there were 269 LTE TDD devices compatible with the 2.3 GHz band, and this number has been growing fast.[46] In the medium term, it is expected that

[45] 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 - 8 April 2014. http://www.cept.org/Documents/fm-52/17474/FM52(14)17_Mandate-to-CEPT-on-2300-2400-MHz

[46] GSA, Evolution to LTE Report (March 2014), available at http://www.gsacom.com/downloads/pdf/GSA_Evolution_to_LTE_report_310314.php4

there will be widespread availability of devices with multi-band chipsets that include the 2.3 GHz band.

Suitability for Inclusion

3.24 ComReg agrees with DotEcon's observation that 2.3 GHz spectrum is likely to be a close substitute for unpaired 2.6 GHz spectrum given that the 2.3 GHz band:

- has similar propagation characteristics to the 2.6 GHz band;
- is likely to be harmonised under similar technical conditions to the 'unpaired' portion of the 2.6 GHz band; and
- while the interest in using this band for WBB services in Europe is relatively recent, it has been on a strong upward trajectory in the last two years. For example, it is being used to provide advanced mobile services in multiple regions, including China and India, which should ensure the availability of cost-effective equipment for the band.

3.25 In light of the above, ComReg is of the preliminary view that the 2.3 GHz band should be considered for inclusion in the award process.

3.1.3 The 3.6 GHz band

3.26 The 3.6 GHz band consists of 400 MHz of spectrum in the frequency range 3400 MHz to 3800 MHz.

Degree of Harmonisation

3.27 EC Decision 2014/276/EU[47] on the harmonisation of the 3.6 GHz band was adopted on 2 May 2014 (the "EC 3.6 GHz Decision"). This Decision amends existing EC Decision 2008/411/EC providing for new preferred channelling arrangements and technical conditions as well as broadening the scope of the Decision to incorporate a broader range of WBB services.

3.28 The technical amendments to the EC 3.6 GHz Decision are based on the findings of CEPT Report 49[48]. This report sets out the least restrictive

[47] Commission Implementing Decision of 2 May 2014 on amending Decision 2008/411/EC on the harmonisation of the 3 400-3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community (2014/276/EU).

[48] Report from CEPT to the European Commission in response to the Mandate: "Technical conditions regarding spectrum harmonisation for terrestrial wireless systems in the 3400-3800 MHz frequency band" - 8 November 2013.

technical conditions for the operation of MFCN in the band. This is a similar harmonisation approach to that taken for the 2.6 GHz band as well as the 1.4 GHz, 2.3 GHz and the 700 MHz bands.

Availability of Spectrum

3.29 The majority of this band has been licensed to FWALA service providers on a local area basis, a licensing framework which has helped facilitate the provision of WBB services in small towns and rural areas. However, all existing FWALA rights of use in the band are set to terminate in July 2017.[49] A portion of the band (3435-3475 MHz) is in use by State services and these services are likely to continue into the future beyond the anticipated timeframe of the award process. This means that 360 MHz of spectrum will potentially become available for award in July 2017.

3.30 In order to promote substitutability with the 2.6 GHz band and other potential bands included in the award process, ComReg proposes to grant rights of use under the award process on a national basis. DotEcon, however highlights in its report that, post 2017, there may be different expressions of demand for 3.6 GHz spectrum from different users and that it may therefore be appropriate to make available at least some of the spectrum in the band on a geographically limited basis. ComReg discusses this issue further in Section 5.6. However, for the purposes of this chapter 3, ComReg assumes that any rights of use in the 3.6 GHz band included in this award process will be made available on a national basis.

3.31 As such, any reference to the 3.6 GHz band hereafter should be read as excluding that portion of the band which is in use by State services and that portion which may be made available for future licensing on a local and/or regional basis. In considering whether the remaining spectrum in the 3.6 GHz band should be included in this award process, it will be assumed that such spectrum is to be awarded on a national basis as will be the case with the 2.6 GHz band and all other rights of use, if any, included in the award process.

Propagation Characteristics

3.32 The 3.6 GHz band is considerably higher in frequency than the 2.6 GHz band. As such the band has less favourable propagation characteristics especially in non-line of sight situations. Nevertheless, this band has been successfully used to provide fixed wireless access services in Ireland for many years.

[49] ComReg Document 10/29: Fixed Wireless Access Local Area Licensing, end date for FWALA licensing in the 3.6 GHz band.

From the point of view of MNOs, however, this band may be more suitable for urban deployment as hot spots or high capacity infill.

Equipment Availability

3.33 The availability of mobile equipment in the 3.6 GHz band remains limited given that the use of the band for mobile services is only in the early stages of evolution. The GSA indicates that only 17 LTE handsets are currently compatible with the 3.6 GHz band.[50] However, there are a number of reasons why this is unlikely to be an impediment to the band becoming a mainstream band for WBB services in the medium term. For example, a licensed FWALA operator has trialled LTE equipment in the band. In addition, as DotEcon also notes in its report:

- technical parameters of the band have recently been updated to include mobile use[51], a prerequisite for equipment makers to begin large-scale manufacture of equipment for the band for this purpose;
- timescales for requiring large amounts of additional capacity for mobile networks are in keeping with availability of this band i.e. not before 2017, and the potential market size for such equipment is large, creating greater certainty that this equipment will become cost-effective relatively quickly; and
- the band is of particular interest, both to mobile network operators and to equipment manufacturers, as it consists of a large quantity of contiguous spectrum. This increases the likely interest in the band further as (i) multiple operators would be able to acquire large amounts of contiguous spectrum, and (ii) this further increases the potential market for devices to include this band, as there may be multiple operators in a given country holding spectrum in this band.

Suitability for Inclusion

3.34 DotEcon, in its report, suggests that the band may not be fully substitutable with the 2.6 GHz band for reasons including:

- the less favourable propagation characteristics of the band given that the band is higher in frequency than the 2.6 GHz band; and

[50] See www.gsacom.com

[51] See ECC/DEC/(11)06, updated March 2014.

- the lack of significant deployments of advanced mobile services in this band to date.

3.35 On the other hand, ComReg notes that rights of use in the band will become available for release within the award process timelines, the lower part of this band is identified for IMT[52], and standardised equipment in the 3.6 GHz band is available.[53] This suggests that the 3.6 GHz band is of growing interest to WBB providers. Furthermore, as noted by DotEcon, the significant amount of bandwidth available in this band and the recent advances in European harmonisation makes it potentially very attractive for WBB providers in the medium term.

3.36 Furthermore, ComReg considers, taking into account DotEcon's views, that if at least some bidders are willing to substitute between this and other bands, it is beneficial to offer this band in the same award. In that regard, DotEcon notes that, from a general capacity perspective, 3.6 GHz spectrum is likely to become a partial substitute for 2.6 GHz spectrum. Both bands could provide incremental capacity for MNOs as part of a multi-band spectrum strategy, noting however the higher costs[54] associated with rolling out a mobile network using the 3.6 GHz band due to its poorer propagation characteristics. ComReg also notes that there has been considerable consolidation in the FWALA market since its inception and that some licensees hold multiple local licences which together represent regional, pan-regional and quasi-national service areas. This suggests that at least some FWALA operators may be interested in acquiring a national licence.

3.37 In light of the above, ComReg is of the preliminary view that the 3.6 GHz band should be considered for inclusion in the award process.

3.38 Notwithstanding the above preliminary view, ComReg is aware that, unlike other bands being proposed for inclusion in this award process, the 3.6 GHz band is essentially "brownfield" spectrum and recognises the role played by licensed services in that band in the provision of broadband services to customers in certain parts of the State. See Section 5.6 below in this regard.

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[52] The 3.4-3.6 GHz band is currently identified for IMT in Ireland and the identification of the 3.6-3.8 GHz band is likely to be considered at WRC-15.

[53] Within 3GPP, bands 42 and 43 refer to the TD-LTE standard in the 3.6 GHz band. Further the 3.6 GHz band has recently been used for the deployment of advanced mobile services. Commercial services using TD-LTE have been launched in the UK, Spain, Bahrain and Canada.

[54] However, ComReg agrees with DotEcon's observation that the key issue in determining substitutability is the extent to which some interested parties will be willing to switch between these bands in response to relative price differences (which would offset any additional costs of using this spectrum).

3.1.4 The 700 MHz band

3.39 The 700 MHz band consists of 96 MHz[55] of spectrum in the frequency range 694 MHz to 790 MHz.

Degree of Harmonisation

3.40 The 700 MHz band has been the subject of considerable focus at both a European level and globally following the outcome of the World Radio Conference 2012 ("WRC-12")[56], at which two resolutions relevant to the band were adopted:

- Resolution 232[57], which resolved to give a co-primary allocation to mobile services (excluding aeronautical services) in the 700 MHz band, alongside the existing primary allocation for broadcasting services, and to identify this frequency band for IMT. This allocation is effective immediately after WRC-15 which is due to take place in November 2015, and the studies being undertaken as a result of this resolution will inform agenda item 1.2 at WRC-15; and

- Resolution 233[58], which resolved to study the additional spectrum requirements of IMT and other terrestrial mobile broadband services and the potential candidate frequency bands, and then consider the results of the above studies and take appropriate actions at WRC-15. This is agenda item 1.1 at WRC-15.

3.41 In relation to agenda item 1.2 of WRC-15 concerning the 700 MHz band, Europe has already begun its preparations for the implementation of the 700 MHz allocation. In 2013, the European Commission issued a mandate to CEPT. The mandate asks CEPT to develop harmonised technical conditions for the 700 MHz band in the European Union for the provision of WBB ECS and other uses (i.e. Programme Making and Special Event ("PMSE") services and Public Protection and Disaster Relief (PPDR) services) in support of EU spectrum policy priorities. The timetable in the mandate envisaged CEPT

[55] See Figure 6. Proposed 700 MHz bandplan in chapter 4 of this document.

[56] WRCs are held periodically by the ITU which is an agency of the United Nations.

[57] Resolution 232 (WRC-12): Use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service in Region 1 and related studies.

[58] Resolution 233 (WRC-12): Studies on frequency-related matters on International Mobile Telecommunications and other terrestrial mobile broadband applications.

delivering two reports (Report A and Report B) to the European Commission as outlined below:

- the aim of Report A is to, among other things, set out the preferred technical (including channelling) arrangements and to identify the common and minimal (least restrictive) technical conditions for WBB use. Report A is to be delivered to the EC by November 2014 and is currently undergoing a public consultation as draft CEPT Report 53; and

- the aim of Report B is to assess the need to refine the conditions set out in Report A in light of international developments such as the outcome of WRC-15. Report B is to be delivered to the EC by July 2016.

3.42 This work at a European and International level suggests that the harmonisation of the 700 MHz band should be formalised during the course of 2016, and there should be relative clarity around the technical conditions and channelling arrangements to be applied in Europe by November 2014.

Availability of Spectrum

3.43 The band is currently licensed for the provision of digital terrestrial television ("DTT") and is also used on a temporary basis for PMSE licences. Two DTT Public Service Broadcasting (PSB) Multiplex licences have been issued to RTÉ. These licences, which expire in 2019, include assigned spectrum rights of use across the UHF band, including the 700 MHz band[59].

3.44 In February 2014, ComReg published a consultation[60] on the management and use of the UHF radio frequency band in Ireland (470-690 MHz), which includes the 700 MHz band. In the consultation, ComReg raised the possibility of making the 700 MHz available for other uses including WBB prior to 2019. ComReg published its response to consultation (Document 14/85) in August 2014 in which it committed to conduct a fully reasoned cost/benefit analysis of the likely costs and benefits (economic, social, and cultural) of RTÉ and PMSE users migrating out of the 700MHz band and into the remainder of the UHF band.

3.45 ComReg also notes the publication of a report to the European Commission on the "Results of the work of the High Level Group on the Future use of the UHF Band (470 – 790 MHz)" which includes a proposal that the 700 MHz band should be re-purposed to WBB in the EU with a target date 2020,

[59] The Broadcasting Act 2009 Act places an obligation on ComReg to provide two DTT multiplex licences to RTÉ on request.

[60] See ComReg document 14/13.

allowing for earlier release of the band in certain Member States. An earlier release from 2018 or a later release up until 2022 may be permitted in justified national cases.

3.46 Further, and as noted in Chapter 2 above, the future of the UHF band is also the subject of a separate consultation process by the DCENR and the 'in-principle' views set out in this paper in relation to the 700 MHz band are wholly without prejudice to the outcome of that consultation process and the cost/benefit analysis being carried in respect of a potential change in use of the 700 MHz band.

Propagation Characteristics

3.47 The 700 MHz band, as it is below 1 GHz, is considered to be a coverage band. The propagation characteristics of the band mean that it provides good in-building propagation and can, more cost-effectively, be utilised to serve a wide geographical area.

3.48 As the only coverage band being considered for inclusion in the award process, its inclusion would present bidders with the opportunity to acquire spectrum suitable for the deployment of macro cells for wide area services.

Equipment Availability

3.49 As the harmonisation of the 700 MHz band in the EU has yet to be finalised, particularly in terms of channelling arrangement, the availability of equipment for Europe is still not certain. The likelihood is however, that the EU will adopt a similar channelling arrangement to the existing Asia-Pacific Telecommunity ('APT').[61] This approach should expedite the availability of both base station equipment and particularly user handsets.

3.50 A recent report from Realwireless for Ofcom relating to the band plan options for the 700 MHz band in Europe[62] states that "*the majority of the handset makers, predictably, support the adoption of APT700, which would improve their economics"* and that *"less than half of original equipment manufacturers (OEMs) interviewed would consider supporting an EU-only band (i.e. a band that was not compatible with APT). Vendors with a European focus would still*

[61] CEPT's preferred channelling arrangement for the 700 MHz band, as consulted upon in Draft CEPT Report 53, has proposed a channelling arrangement based on the lower duplexer of the APT 700 MHz band plan thereby maximising inter-regional harmonisation and economies of scale.

[62] Realwireless, "Terminal capabilities in the 700 MHz band - Final Report for Ofcom", published October 2013, available at; http://stakeholders.ofcom.org.uk/binaries/consultations/700MHz/annexes/30_Terminal_capabilities_in_the_700MHz_band.pdf

support the band, but potentially in only a few handset models. Consumers would have a smaller choice of handsets than those in other regions"[63]. The same study goes on to state that "*by 2020 we expect a majority of handsets available in the EU to support APT700 even if this spectrum cannot be used in the EU*"[64].

3.51 The sufficient availability of equipment is therefore dependent on the adoption of channelling arrangement that is compatible with APT 700. As this is likely to be the case, the availability of equipment for this band should match the timelines proposed for the award process.

3.52 Furthermore, the 700 MHz band is already being made available in important markets outside Europe. For instance, the band has been used for the provision of WBB services in the US[65] since 2008[66]. Other key markets include Japan and other countries in the Asia-Pacific region. An important benefit for the adoption of a similar approach in Europe is that operator and consumer equipment will be readily available.

Suitability for Inclusion

3.53 While recognising that there is still uncertainty around the availability of the 700 MHz band, ComReg notes and agrees with DotEcon's observation that spectrum in this band may be highly complementary to the 2.6 GHz band and other capacity bands that may be included in the award, at least for some interested parties.

3.54 The inclusion of the 700 MHz band offers prospects for new entry into the WBB sector by an MNO which other bands being considered do not. For example, its inclusion would provide a good opportunity for any potential entrant to acquire a spectrum portfolio that allows it to deploy a cost-effective network providing wide-area coverage and capacity boosts in high-traffic

[63] Ibid, page 6

[64] Ibid, page 60

[65] Currently in the US, the 700 MHz band is 698 – 806 MHz. In Ireland, the band is 694-790 MHz.

[66] The US 700 MHz band plan concerns several uplink and downlink configurations and, whilst these configurations are unlikely to be broadly adopted, it seems that Canada does intend to adopt it. The more favoured bandplan is currently the APT bandplan consisting of 2 times 45 MHz uplink-downlink. The APT bandplan is likely to be adopted in Mexico and Brazil (the government of Brazil plans to have mobile broadband access in all Municipalities by 2014 (although this plan is primarily predicated on licensing processes in the band 2,500 to 2690 MHz along with other bands (See http://www.gsma.com/latinamerica/gsma-report-mobile-heart-brazil-transformation)

areas. Existing MNOs could also benefit from the inclusion of this band for the same reasons.

3.55 Furthermore, the 700 MHz band has already been made available in important markets outside Europe which means that operator and consumer equipment will be readily available.[67]

3.56 Overall, the benefits of including the 700 MHz band for consideration in the award process may be attractive enough to warrant its inclusion despite the existing uncertainties surrounding its harmonisation and availability. Indeed, other Member States appear to be proceeding on that basis. For example, the UK has begun a consultation on the release of this band for mobile broadband services, and is even exploring whether an award could be fast tracked to take place as early as 2016, whereas other Member States, e.g. France and Germany, have indicated that they would begin consulting on the release of the 700 MHz band in the near future.

3.57 In light of the above, and while recognising that there is uncertainty around the availability of the 700 MHz band, ComReg is of the preliminary view that it should be considered for inclusion in the award process should it become available.

3.1.5 Outcome of preliminary assessment

3.58 The 1.4 GHz, 2.3 GHz and 3.6 GHz bands all meet the preliminary assessment criteria regarding suitability for inclusion in the award process. While there is still uncertainty around the availability of the 700 MHz band for inclusion in the award process, ComReg is of the preliminary view that, should it become available, it should be considered for inclusion.

3.59 The following section sets out a draft RIA on the inclusion of each of the above bands in the award process and on how best to assign the rights of use in those bands. Section 3.3 then assesses the Preferred Option identified by the draft RIA against ComReg's statutory functions, objectives and duties.

3.2 Draft RIA on inclusion of additional bands

3.60 Provided in the following section is a short explanation of the RIA framework. ComReg then sets out the specific policy issues to be addressed and relevant objectives (i.e. Step 1 of the RIA process set out in ComReg's RIA

[67] For example, in July 2014, there were 33 LTE devices for the APT 700 MHz band (Source www.gsacom.com)

Guidelines[68]). This leads to the identification of two fundamental policy issues. ComReg then considers these two policy issues separately in accordance with the four remaining steps of the RIA process. For the avoidance of doubt, all references to "RIA", "this RIA" and "the RIA" in this document should be read as meaning the "draft" RIA.

3.2.1 RIA Framework

3.61 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.

3.62 This section sets out ComReg's RIA on two fundamental policy issues: first, what, if any, additional bands should be included with the award of the 2.6 GHz band and, secondly, what type of assignment process should be used.

Structure of a RIA

3.63 As set out in ComReg's RIA Guidelines, there are five steps in a RIA. These are:

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

3.64 The focus of Step 3 is to assess the impact of the proposed regulatory options available to ComReg on stakeholders. Stakeholders consist of two main groups:

i. Consumers (for the purposes of this RIA, consumers includes both business and residential end users of spectrum), and

[68] See Document 07/56a - Guidelines on ComReg's approach to Regulatory Impact Assessment - August 2007.

ii. Industry stakeholders.

3.65 There are a number of different industry stakeholders:

- one group of industry stakeholders is comprised of companies with spectrum rights of use in the bands being considered for inclusion in the award (e.g. FWA providers);
- another group of industry stakeholders is comprised of those with spectrum rights of use in other bands for whom the spectrum being considered for inclusion in the award may be of particular interest given its suitability to satisfy existing and potential demand (e.g. mobile network operators or other WBB providers); and
- a final group of stakeholders is comprised of potential new entrants that may be considering entry into the WBB sector in the State. This group may include companies that are already otherwise engaged in the electronic communications sector in the State, in other Member States or further afield.

3.66 Prior to receiving submissions on ComReg's various proposals, 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 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.

3.67 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 functions, objectives and duties which are relevant to the issue of competition (see Annex 2).

3.68 Of themselves, the various RIA guidelines and the RIA Policy Direction provide little guidance on how much weight should be given to the positions and views of each stakeholder group (Step 3), or the impact on competition (Step 4). Accordingly, ComReg has been guided by its statutory objectives which it is obliged to seek to achieve when exercising its functions. ComReg's objectives in managing the radio frequency spectrum, as set out in Annex 2, include:

- the promotion of competition;
- contributing to the development of the internal market; and

- the promotion of the interests of EU citizens.

3.69 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 has no bearing on their respective importance 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.

RIA: Policy Issues to be Addressed, and Relevant Objectives (Step 1)

Policy Issues

3.70 As noted previously, existing rights of use in the 2.6 GHz band expire in April 2016, following which ComReg has committed to issuing new rights of use pursuant to an award process (see ComReg Document 13/31). As outlined above, ComReg is considering which additional bands, if any, might be included in this award process and, in light of that assessment, how rights of use in those bands might be awarded.

3.71 Based on the discussion in the previous section, ComReg considers that the following bands could reasonably be considered for inclusion in an award process for 2.6 GHz spectrum, the:

- 1.4 GHz;
- 2.3 GHz;
- 3.6 GHz; and
- 700 MHz bands.

3.72 Within the context of the RIA framework, ComReg is considering which of the above bands, if any, should be included in this award process. Having assessed what bands should be included in the award process, ComReg must then assess how best to assign rights of use in those band(s).

Note on the 2.6 GHz, 700 MHz and 3.6 GHz bands

3.73 As noted in Chapter 2, by Decision D06/13, ComReg extended all MMDS licences in force in the 2.6 GHz band for a period of 2 years from 18 April 2014 until 18 April 2016 whereupon all licences would expire in full. New

rights of use for the entire band will be available for release from this date. The document in which that decision was published (Document 13/31) also noted ComReg's intention to consult on the details of a competitive award process for new rights of use in the 2.6 GHz band with the intention that these rights of use would commence following expiry of existing MMDS licences. This draft RIA should be read in that context.

3.74 While it is by no means certain that the 700 MHz band will be available for inclusion in the award process, for the purposes of this draft RIA it is assumed that the band in its entirety will have been vacated by the existing DTT licensee within the timeframe of the proposed award process and is available for inclusion and the draft RIA should be read in that context. There would not appear to be any benefit in delaying a RIA in respect of the 700 MHz band. Indeed, ComReg's approach would avoid any unnecessary delays later in this consultation process, should the 700 MHz band actually become available for inclusion in the award process.[69] For the avoidance of doubt and as noted previously, the in-principle views set out by ComReg herein in relation to the 700 MHz band are wholly without prejudice to the outcome of the UHF consultation processes being carried out by ComReg and DCENR including, for example, the outcome of the cost/benefit analysis that ComReg is conducting in respect of a potential change in use of the 700 MHz band. Insofar as this draft RIA includes the 700 MHz band, the draft RIA's analysis might be regarded as conditional and contingent on these other processes.

3.75 As also noted previously, there may be different expressions of demand for 3.6 GHz spectrum from different users and it may therefore be appropriate to make available at least some of the spectrum in the band on a geographically limited basis. Furthermore, ComReg is aware that, unlike other bands being proposed for inclusion in this award process, the 3.6 GHz band is essentially "brownfield" spectrum and recognises the present role played by licensed services in that band in the provision of broadband services to customers in certain parts of the State. ComReg discusses this issue further in Section 5.6 of Chapter 5. However, for the purposes of this chapter 3, ComReg assumes that any rights of use in the 3.6 GHz band included in this award process will be made available on a national basis.

[69] If the 700 MHz band does not become available for inclusion, ComReg will revisit what, if any, impact that could have on the draft RIA in the context of the bands to be included in the proposed award process.

Policy Issues

3.76 ComReg is of the view that there are two primary policy issues to be considered in relation to the assignment of liberalised rights of use in the 2.6 GHz band:

a) whether to include the 1.4 GHz, 2.3 GHz and/or 3.6 GHz bands (hereafter the "Capacity Bands" when referred to cumulatively) and/or the 700 MHz band with the 2.6 GHz band in the proposed award process, and

b) in light of the response to the above question, how best to assign rights of use in the proposed award process.

3.77 ComReg takes the view that these two important issues, while related, are sequential in nature and can therefore be considered separately.

3.78 In relation to the first policy issue, given that the 2.6 GHz band is likely to be sought, at least by MNOs, for capacity purposes in areas where their networks experience constant or periodic spikes in demand (e.g. in urban areas), the Capacity Bands can be considered substitutable with the 2.6 GHz band. The 700 MHz band on the other hand has relatively favourable propagation characteristics and is likely to be sought, at least by existing or potential new MNOs, for coverage purposes. For that reason, the 700 MHz band is more likely to be seen as a complement to capacity based bands like the 2.6 GHz band rather than as a substitute.

3.79 In relation to the second policy issue, a range of possible assignment procedures are available to ComReg in determining how best to assign rights of use in these band(s). For example, rights of use could be selected on the basis of administrative assignment, following a comparative selection procedure (e.g. beauty contest) or following a competitive selection procedure (i.e. auction). Each type of award process has its own relative merits and drawbacks and one approach may, on balance, be more suitable than the others depending on the rights of use to be included in the award process (i.e. the outcome of the assessment under the first policy issue). These policy issues before ComReg are also reflected in the relevant options set out below.

Objectives

3.80 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 still allowing ComReg to achieve its objectives.

3.81 ComReg's immediate objective is to assign liberalised rights of use in the 2.6 GHz band and, if appropriate, one or more of the Capacity Bands and/or the 700 MHz band, as soon as possible, in line with:

- EC Decision 2008/477/EC and other relevant legislation;
- the timing of licence expiry in the 2.6 GHz band (see ComReg Document 13/31);
- the likely availability of spectrum in the Capacity Bands and the 700 MHz band; and
- the interests of the economic development of the State and the electronic communications sector.

3.82 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.

3.83 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 EU citizens. 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.

3.84 Having identified the above policy issues and objectives, the remainder of the RIA is divided between the two stand-alone primary policy issues identified above. Consideration of these policy issues is set out below with a separate assessment of the four remaining steps in the RIA process. They are referred to as the 'Spectrum for Award' RIA and the 'Assignment Process' RIA, respectively.

3.2.2 The 'Spectrum for Award' RIA:

Regulatory Options (Step 2)

3.85 In light of the preceding discussion, ComReg considers the following to be the spectrum band award options available to achieve the objectives identified above:

- Option 1 – Assign rights of use in the 2.6 GHz band in a stand-alone assignment process ;

- Option 2 – Include one or more of the Capacity Bands in the 2.6 GHz band assignment process; and
- Option 3 – Include the Capacity Bands identified under Option 2, if any, and the 700 MHz band in the 2.6 GHz band assignment process.

3.86 In respect of Option 3 and as noted previously, the in-principle views set out by ComReg below in relation to the 700 MHz band are wholly without prejudice to the outcome of the UHF consultation processes being carried out by ComReg and the DCENR including, for example, the outcome of the cost/benefit analysis that ComReg is conducting in respect of a potential change in use of the 700 MHz band.

The 'Spectrum for Award' RIA: Impact on Stakeholders and Competition (Steps 3 and 4)

3.87 The focus of this section of the draft 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.

3.88 Prior to carrying out the comparative analysis for this RIA, ComReg first briefly sets out some useful background information concerning the characteristics of, and developments in, the demand for the spectrum bands under consideration. Such developments are relevant when considering the likely attitudes of industry stakeholders and consumers to the inclusion of certain spectrum in the proposed award. ComReg notes that it intends to further develop this draft RIA in light of feedback from respondents to this consultation.

Demand for spectrum

3.89 Consumer demand for mobile broadband (a sub-set of WBB) has grown significantly in recent years[70] and is expected to grow exponentially over the coming years. For example, globally, mobile data traffic is expected to increase 11-fold between 2013 and 2018, growing three times faster than

[70] See, for example, Section 5.4 of ComReg Document 14/13: Management and use of the UHF radio frequency band in Ireland.

fixed IP traffic.[71] The spectrum bands under consideration in this draft RIA are all suitable for the provision of mobile broadband. Given the nature of mobile broadband demand (and its likely evolution) it is expected that individual mobile operators will require significantly more capacity based spectrum than they did previously to provide the services that consumers will demand in the future. This would support the inclusion of more capacity based spectrum in the award process alongside the 2.6 GHz band. Spectrum in contiguous blocks will also continue to have a particular utility to MNOs.

3.90 The asymmetric development of traffic volumes for WBB providers caused by the growth in downloading of data hungry services such as streaming video services, also supports the inclusion of the 1.4 GHz band which is available for downlink traffic only and which might otherwise not be substitutable with the 2.6 GHz band.

3.91 In respect of MNO demand, optimal network configuration also often involves a mix of both coverage and capacity bands and ComReg understands that operators should be enabled, where possible, to obtain spectrum which allows them to configure an optimal network. This would support the inclusion of sub-1 GHz spectrum where possible.

3.92 As noted above, optimal network configuration often involves a mix of both coverage and capacity bands. Existing MNOs already have significant spectrum holdings of sub and above 1GHz spectrum. However, this would not be the case for a potential new MNO entrant. Thus, there may be merits in including a suitable mix of sub-1 GHz and capacity based spectrum in the award process where possible, in order to facilitate new entry.

3.93 The limited coverage range of cells operating at higher frequencies such as the 2.6 and 3.6 GHz bands make them more suitable for deployment in high demand areas like shopping malls, railway stations and airports, where large numbers of users congregate and require access to a localised capacity site. In fact the large bandwidth available at these higher frequency bands make them especially suitable for this purpose.

3.94 In light of the above characteristics of, and developments in, the demand for radio frequency spectrum in Ireland, 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.

[71] See Cisco VNI Global IP Traffic Forecast, 2013 – 2018 (June 2014).

Impact on industry stakeholders

3.95 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 (2.6 GHz only) vs. Option 2 (2.6 GHz + one or more Capacity Bands)

General

3.96 As noted above, it is expected that WBB providers, in particular MNOs, will require significantly more capacity based spectrum than they did previously to provide the services that consumers will demand in the future.

3.97 As also discussed above, potential participants in the award process would likely consider the Capacity Bands to be substitutable with the 2.6 GHz band. As noted by DotEcon in its report, 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).

3.98 The rules governing a simultaneous award involving a mix of bands and which takes account of interdependencies between those bands may be substantially more complex than when bands are offered in separate awards. However, as DotEcon points out, this is simply a reflection of the complexity of the underlying demand and supply structure and the need to allow reasonable flexibility for bidders. Opting for separate awards when there are demand interrelationships simply shifts the complexity onto bidders when making their decisions. Indeed, while awarding such bands simultaneously would allow bidders to express their demand across bands taking account of any dependencies, offering the spectrum in separate awards would require bidders to make their decisions on the basis of their expectations on the availability of and demand for bands that would be awarded at a later date. Outcomes may be inefficient if bidders' expectations are wrong (which may well prove to be the case).

3.99 As noted by DotEcon, there may be significant costs associated with using spectrum in many capacity bands. Therefore, it may be preferable to give parties interested in capacity spectrum the opportunity to acquire large blocks of spectrum in one or a small number of bands (instead of a small amount of

spectrum in each of the capacity bands) if this was their preference. This would facilitate the outcome being as efficient as possible.

3.100 Furthermore, assigning available spectrum in a single award rather than in one or more sequential awards would likely facilitate the planning of spectrum portfolios by existing and potential new entrants in a manner which allows them to acquire an appropriate mix of spectrum for efficient network deployment.

3.101 While including greater amounts of spectrum in the proposed award process increases the potential that spectrum may go unsold, ComReg notes that this and any associated consequences can be minimised through the design of the award process.

Scarcity of unpaired spectrum

3.102 As outlined earlier, the asymmetric development of traffic volumes for WBB providers supports the inclusion of unpaired spectrum which better addresses such developments by facilitating more appropriate downlink to uplink ratios.

3.103 DotEcon observes that the scarcity of TDD spectrum in the proposed award process might lead to some users being unable to acquire the unpaired spectrum they need. In a worst case scenario, some users who wish to acquire unpaired spectrum might switch to, and acquire, FDD spectrum instead as a substitute for unpaired spectrum. However, such users may not make full use of both uplink and downlink capacity, while at the same time they may displace other users who require FDD spectrum.

3.104 From the point of view of industry stakeholders, the relatively limited amount of unpaired spectrum in the 2.6GHz band would arguably further support the inclusion of the 1.4 GHz, 2.3 GHz and 3.6 GHz bands in this award process.

3.105 In light of the above, ComReg considers it is likely that, on balance, industry stakeholders would prefer the inclusion of all of the Capacity Bands in the award process.

Option 2 (2.6 GHz + one or more Capacity Bands) vs. Option 3 (2.6 + one or more Capacity Bands + 700 MHz)

3.106 As discussed in the previous section, participants in the award process, in particular existing or potential MNOs, would likely view the 700 MHz band as being complementary to the 2.6 GHz band.

3.107 When there are complementarities between bands, then the value that a bidder attributes to spectrum in one band will be, to some degree at least, dependent on whether it acquires complementary spectrum in other bands. In

these cases, it may be appropriate to evaluate bids or applications jointly across all bands in an award, rather than separately for each band. However, offering different bands in separate awards would clearly not allow for this.

3.108 As noted previously, including the 700 MHz band in the award process may be an attractive option for MNOs at least, as it would allow interested parties to seek a combination of low and high frequency spectrum. Unlike the 2.6 GHz band and the Capacity Bands, the 700 MHz band is very well suited to providing a wide coverage network and good indoor penetration.

3.109 While it is less clear whether existing MNOs (all of which currently hold existing rights of use in sub-1 GHz spectrum) would prefer the inclusion of 700 MHz spectrum in the award process, a potential new entrant to the Irish mobile network market would likely prefer a sufficient mix of low and high frequency spectrum to facilitate a cost effective network build in order to compete effectively with existing MNOs. However, even if no new entry resulted from its inclusion in the award process, the 700 MHz band, given Ireland's relatively low population density, is likely to be of significant value to existing operators in the WBB sector.

3.110 It is therefore likely that, on balance, industry stakeholders would prefer that the 700 MHz band is included in this award process, should it become available for inclusion.

Impact on competition

3.111 As noted previously, 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.

3.112 Encouraging the efficient use and ensuring the effective management of available spectrum should, in turn, promote competition on the relevant downstream markets.

Option 1 (2.6 GHz only) vs. Option 2 (2.6 GHz + one or more Capacity Bands)

3.113 Where there is significant existing and/or potential demand (see discussion under heading 'Demand for Spectrum' above) for capacity based spectrum from existing MNOs, other operators and potential new entrants, satisfying such demand through the release of available suitable spectrum should permit

such operators to maintain quality of service, offer enhanced and varied data services and to compete more vigorously on relevant downstream markets.

3.114 As noted previously, there are significant costs associated with using spectrum in many capacity bands and giving parties the opportunity to acquire large blocks of spectrum in one or a small number of bands facilitates the outcome being as efficient as possible and promotes competition. Furthermore, assigning available spectrum in a single award rather than in one or more sequential awards would better facilitate the planning of spectrum portfolios to address the growth in data traffic and, in turn, enhanced services by successful participants in the award process. Furthermore, it allows bidders to prepare a more balanced bid strategy by giving visibility of all bands in an award.

3.115 The release of unpaired spectrum also allows existing operators to tackle and mitigate the negative effects of the development in asymmetric traffic flows. This would facilitate the more efficient use of spectrum and, in turn, promote competition.

3.116 In terms of new entry by fixed wireless operators, given the likely interest in capacity based spectrum from MNOs alone, the inclusion of 2.6 GHz spectrum only in the award process is unlikely to facilitate new entry. However, the inclusion of one or more of the Capacity Bands in the award process could facilitate such new entry at least from fixed wireless operators.

3.117 In light of the above, ComReg is of the preliminary view that, on balance, the inclusion of all of the Capacity Bands would have a positive impact on competition.

Option 2 (2.6 GHz + one or more Capacity Bands) vs. Option 3 (2.6 GHz + one or more Capacity Bands + 700 MHz)

3.118 Spectrum in the 700MHz band is suitable for providing cost-effective wide-area and indoor coverage, not only as a capacity boost. As such, it may be highly complementary to the 2.6GHz band and other capacity bands that may be included in the award, at least for some interested parties.

3.119 ComReg is of the view that interested parties should be enabled, where possible, to obtain spectrum which allows them to configure an optimal network. As noted previously, in respect of MNO demand, optimal network configuration often involves an appropriate mix of both coverage and capacity bands.

3.120 On these grounds, should the 700 MHz band become available it would be desirable to offer it alongside at least some capacity spectrum. This would

provide a good opportunity for any potential entrants to acquire a spectrum portfolio that allows them to deploy a cost-effective network providing wide-area coverage and capacity boosts in high-traffic areas. Promoting efficient and effective new entry should, in turn, promote competition.

3.121 Notwithstanding any potential for new entry, the 700 MHz band, given Ireland's relatively low population density, is likely to be of significant value to existing operators in the WBB sector.

3.122 In light of the above, the inclusion of the 700 MHz band in the award process would, on balance, appear to have a positive impact on competition.

Impact on consumers

3.123 It can be assumed that what is good for competition 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. As outlined previously, consumer demand for mobile broadband (a sub-set of WBB) has grown significantly in recent years and is expected to grow exponentially over the coming years. The spectrum bands under consideration in this RIA are all suitable for the provision of mobile broadband.

3.124 It should be noted that, in terms of the impact on consumers of Option 3, the ComReg UHF consultation process[72] along with the cost / benefit analysis being carried out in conjunction with that process, is already considering the impact of a change of use of the 700 MHz band on consumers. Accordingly, this RIA does not consider the impact of a change of use of the 700 MHz band on consumers. Instead, it assumes that the 700 MHz band is available for inclusion in the award process and assesses only the impact of its inclusion on consumers.

Option 1 (2.6 GHz only) vs. Option 2 (2.6 GHz + one or more Capacity Bands)

3.125 As noted in the previous section, ComReg is of the preliminary view that the inclusion of the Capacity Bands in the award process will, on balance, have a positive impact on competition. As such, ComReg is of the preliminary view that the inclusion of these bands will also have a positive impact on consumers, particularly in urban areas and in other areas of high demand. For example, with access to greater quantities of capacity based spectrum in

[72] See ComReg 14/85 - Response to Consultation 14/13 on the management and use of the UHF radio frequency band in Ireland - published 20 August 2014.

those areas, operators will be less constrained in terms of the quality and speeds of WBB services that they are in a position to offer consumers. This should facilitate greater competition amongst operators in terms of price, choice and quality to the ultimate benefit of end users.

Option 2 (2.6 GHz + one or more Capacity Bands) vs. Option 3 (2.6 GHz + one or more Capacity Bands + 700 MHz)

3.126 ComReg is of the preliminary view that the inclusion of the 700 MHz band in the award process will, on balance, have a positive impact on competition. As such, ComReg is of the preliminary view that the inclusion of that band will also have a positive impact on consumers, by either facilitating new entry or enabling the acquisition by existing players of complementary coverage spectrum in parallel with capacity spectrum. Use of this spectrum by a new entrant or an existing operator or operators should, in turn, bring with it enhanced price and non-price competition and consumer benefits in terms of price, choice and quality of service in the WBB sector in rural as well as urban areas.

The 'Spectrum for Award' RIA: Assessment and the Preferred Option (Step 5)

3.127 In light of the above, ComReg is of the preliminary view that all of the Capacity Bands and the 700 MHz band should be included in the 2.6 GHz award process.

3.128 Where there may be a significant delay in the availability of any particular band, ComReg may reconsider the inclusion of that and other related bands in the proposed award process (see, for example, paragraph 3.86 above in respect of the 700 MHz band).

3.129 Therefore, ComReg is of the preliminary view that Option 3 is the Preferred Option for this part of the draft RIA.

3.2.3 The 'Assignment Process' RIA

Regulatory Options (Step 2)

Background Information

3.130 As noted earlier, Step 1 of the RIA (Policy Issues and Objectives) is common to both the 'Spectrum for Award' RIA and the 'Assignment Process' RIA.

3.131 Before setting out the specific options under review in the ‘Assignment Process‘ RIA, it is useful to provide some background information regarding the different ways in which spectrum-use rights can be assigned and the various proposals which are associated with these different assignment mechanisms.

3.132 In circumstances like those currently faced by ComReg, two main methods are used to assign rights of use of spectrum:

a) administrative assignment, whereby the regulator determines who gets what spectrum and how much. Assigning spectrum usage rights using an administrative process can take different forms and can be used to address specific concerns or deliver specific policy objectives.

b) auction, whereby, subject to objective and transparent constraints set ex ante by the regulator, the market determines who gets what spectrum and how much.

3.133 Each of the two main methods is discussed in more detail below.

Administrative Assignment Process

3.134 Assigning spectrum-usage rights using an administrative process can take different forms and can be used to address specific concerns. For example, a ‘beauty contest’ can be used if there is a particular objective in mind, whereby the regulator selects the licence holder(s) based on a number of pre-defined criteria (e.g. quality of proposed services or extent of network and services roll-out). An administrative process can also take the form of an extension/renewal of an existing licence, or an administrative assignment of spectrum usage rights to particular operators, for a particular period of time. An administrative process can be used for all or part of the spectrum being awarded, or relate to particular locations within a band.

3.135 While each type of administrative assignment process has characteristics which are common across all types (e.g. significant involvement of the regulator in determining the outcome), different processes also have characteristics which may be unique to that process (e.g. unlike a licence extension or outright assignment of spectrum, a ‘beauty contest’ will involve a degree of competition between participants). As such, the observations in the following and subsequent paragraphs should be read in light of each type of administrative assignment process as appropriate.

3.136 Administrative processes were commonplace in the past to award spectrum-usage rights, but are now less common - particularly in cases where valuable

spectrum is to be released to commercial operators and where demand is expected to exceed the supply of spectrum. For example, an administrative approach like a 'beauty contest' may have been used so as to secure wide-area coverage or with the development of infrastructure as an overarching goal. Often, beauty parades as a form of administrative assignment played an important role in developing and new markets. Equally, their purposes and frequency often diminish as a market matures with natural competitive tensions.

Auctions

3.137 Auctions by their nature involve a competitive process to determine the winner(s) and are used in a variety of different contexts. Spectrum auctions are now commonplace, and have become highly sophisticated in their design and execution. They have a number of benefits as a spectrum rights of use assignment mechanism, especially in established markets. By ensuring that those bidders who value the spectrum the most obtain the rights of use of the spectrum, auctions result in an efficient outcome in terms of assignment. This, in turn, tends to promote competition in the downstream retail market, to the benefit of consumers. Using an auction to assign spectrum-usage rights removes much of the risk of the regulator making incorrect decisions, as a result of not having access to all relevant information, which could have long-standing negative effects on the market.

Setting out the options

3.138 The following options are set out in the context of a multi band award of the 2.6 GHz band, the Capacity Bands and the 700 MHz band, the preferred option of the 'Spectrum for Award' RIA above. ComReg is of the view that there are two regulatory options available to it for the purposes of releasing spectrum in this award process:

- Option 1: Some form of administrative assignment process along the lines of that discussed above
- Option 2: Assignment of all available spectrum using an auction mechanism

3.139 As part of any assessment of the impact of the above options on industry stakeholders, competition and consumers, it is appropriate to note relevant comments set out in ComReg's published strategy for managing the radio

frequency spectrum[73] and made by DotEcon in its report accompanying this consultation document.

ComReg's Strategy for Managing the Radio Spectrum

3.140 In its most recent spectrum strategy statement, ComReg notes that it does not favour any specific approach for awarding spectrum rights, but prefers to consider each award on its merits. However, in all cases the selection criteria must be objective, transparent, non-discriminatory, proportionate, and consistent with its statutory objectives and duties. In making such an assessment ComReg balances, amongst other things, the size and scale of the Irish market, public policy considerations, social considerations, economic and market considerations, legal factors and, where relevant, expected demand and use in order to determine the most appropriate assignment method to deliver an efficient assignment outcome.

3.141 However, ComReg also notes that, in recent years (including most recently for its MBSA award) it has found it beneficial to use auctions as an award mechanism for certain bands where the number of licences to be awarded was limited and it appeared that demand could exceed supply. Auctions have proved to be a quick, fair and transparent method for assigning spectrum rights and a suitably designed auction is equally appropriate in both 'greenfield' and 'brownfield' settings, as appropriate design can address matters germane to the circumstances.

3.142 ComReg also makes the following observations in relation to the use of auction mechanisms, particularly in circumstances where, for instance, spectrum rights of use are likely to be scarce, there is likely to be considerable demand for particular spectrum rights and/or where access to particular spectrum rights is important to the nature and dynamic of competition in the relevant downstream retail market:

- auctions have proven in Ireland and abroad to be a fast, fair, effective and transparent assignment mechanism. One reason which may explain this is that they avoid any perceived subjective element that may be associated with comparative selection procedures, and avoid difficulties related to administrative assignments, such as where the spectrum manager does not have access to complete information;

[73] Strategy Statement - Strategy for Managing the Radio Spectrum: 2011 – 2013, ComReg document 11/89. As noted previously, ComReg intends to shortly consult upon a new spectrum strategy statement, and the preliminary views expressed in this document are without prejudice to the position which may be articulated by ComReg on related matters in any future spectrum strategy statement resulting from the above mentioned consultation process or future processes.

- auctions also allow firms which most value the spectrum rights to obtain access to same. By doing so, auctions promote innovation and investment in new infrastructures and contribute to the efficient use of the spectrum rights assigned by providing real economic incentives for winners to make use of the spectrum rights obtained. This also ensures that consumers and citizens derive the maximum benefit in terms of the provision of end-services using that spectrum; and

- auctions also promote, amongst other things, regulatory certainty, competition (both for spectrum rights and in downstream markets), and the internal market by ensuring there is no favourable treatment of particular undertakings thereby providing fair opportunities for new entry from within the State and throughout the EU.

3.143 ComReg notes that the current proposed award process could be characterised as one where there is likely to be considerable demand for particular spectrum rights, where demand is likely to exceed supply and access to those rights is important to the nature and dynamic of competition in the relevant downstream retail market(s). As such, many of the observations set out in ComReg's spectrum strategy statement as summarised above are likely to be relevant to the present award process.

Observations by DotEcon

3.144 DotEcon notes that awarding spectrum licences using an administrative award might be appropriate in the case that there is no excess demand for spectrum in any of the bands. However, given the rapid growth of demand for WBB data in recent years this seems an unlikely scenario at least for the 2.6 GHz band. Demand for 2.6 GHz spectrum across Europe has been strong, both from MNOs and other WBB providers, and there is no reason to believe that this might not be the case in Ireland.

3.145 In this context, an administrative award may fail to ensure an efficient assignment. For example, assigning spectrum on a first-come, first-served basis cannot ensure that the spectrum is assigned to those applicants who can generate greatest value from using the spectrum. Similarly, using a beauty contest type of award would involve some challenges for ComReg in assessing the likely value of alternative uses of the spectrum when making a decision on alternative candidate licensees.

3.146 DotEcon notes that auction mechanisms promote outcomes where licences are awarded to bidders with the highest willingness to pay. In that regard, they have not identified any market failure that would undermine the

assumption that an operator's willingness to pay should reflect that operator's ability to generate value using the spectrum. Therefore an auction should provide a good instrument to maximise the value of spectrum use which in turn should encourage the efficient use of spectrum.

3.147 DotEcon also notes that an auction mechanism would be desirable even if, owing to the inclusion of additional capacity bands in the award, there were no excess demand for spectrum overall but there was excess demand for a particular band. In this context, an auction mechanism would allow ComReg to determine the appropriate assignment of specific frequencies, and thus which users would get access to which bands, on the basis of the preferences for specific bands expressed by bidders.

3.148 DotEcon notes that ComReg should be prepared for potential low participation scenarios where there may be no excess demand, or where applicants may be willing to switch to other bands so that all users may be accommodated. However, ComReg notes that such concerns can be addressed through the design of the auction.

3.149 In light of the above, DotEcon recommends using an auction mechanism for the award of rights of use in the present circumstances as this should promote the assignment of licences to those users who value them most, which in turn can be expected to lead to an efficient use of the spectrum.

Assessment of Options

3.150 Having regard to the preliminary observations made above, this section considers the impact of the possible options on:

- stakeholders, including existing mobile operators, other existing operators and potential new entrants;
- competition; and
- consumers.

3.151 As noted in the 'Spectrum for Award' RIA above, consumers, as a stakeholder group, are discussed after the impacts on competition are outlined.

Impact on industry stakeholders

3.152 It is likely that all existing operators including MNOs would prefer some form of administrative assignment if it meant assignment of a desired amount of spectrum at a price which was lower than that which might otherwise have to be paid at auction (i.e. lower than the market value). However, potential new entrants (either to the bands or to the WBB sector) would clearly prefer an

assignment mechanism which facilitates new entry. This could involve either an auction mechanism or an administrative assignment process as long as the option chosen provided for a sufficient mix and amount of spectrum at the right price.

3.153 However, as noted previously there is likely to be excess demand at least for certain bands whereby it will not be possible to administratively assign all interested parties the type and amount of spectrum they require. As such, an administrative assignment including new entrants would likely either leave existing operators or potential new entrants unhappy with the type and amount of spectrum administratively assigned.

3.154 In light of the above, it is arguable that an administrative assignment would, by definition, leave some parties unhappy. Notwithstanding this, those parties guaranteed an assignment of sufficient spectrum of the type they desire would presumably prefer an administrative assignment process over an auction. However, ComReg notes that such an assumption is largely hypothetical in the absence of certainty around which operators should be assigned spectrum (in what band and how much) and whether such assignment meets their requirements.

3.155 ComReg is therefore of the preliminary view that, on balance, existing operators would prefer an administrative assignment (subject to their receiving their desired amount and type of spectrum) whereas potential new entrants would prefer an assignment process which best facilitates new entry (which could be either an administrative assignment or auction).

Impact on competition

3.156 Before proceeding to the analysis of competition, it is worth pointing out a number of connections between the various sections in this 'Assignment Process' RIA. The references to new entrants in the section above on stakeholders are highly relevant for the analysis of the impact on competition that follows, which in turn is also intrinsically linked to the impact on consumers (see next section). The option which would deliver the most positive impact on competition would also likely deliver the best outcome for consumers.

3.157 The Capacity Bands are highly important in the mobile market in Ireland given their technical properties and the benefits associated with liberalising this spectrum. The 700 MHz band is equally important to the question of new entry and the cost of network rollout.

3.158 The impact on competition is assessed at two levels which are highly interconnected: competition in the auction itself and competition in the

downstream/retail market between the existing/winning operators. Ensuring competition at the retail level is promoted is the primary goal because this is what ultimately drives benefits to consumers and promoting competition in the auction can be seen as a means to that end.

3.159 An efficient and optimal outcome in the auction is where the spectrum ends up with the operators who value it the most and which, in turn, will ensure the efficient use of spectrum. In so doing, an efficient outcome in the auction will deliver the best outcome for competition downstream and ultimately maximize the benefits for consumers. Ensuring that the spectrum is awarded to those operators that value the spectrum the most will ensure that competition in the advanced service market is enhanced. On the other hand, using an administrative assignment mechanism would not guarantee an efficient outcome in terms of spectrum holdings and an inefficient outcome would inevitably impact on the outcomes in the downstream retail market over the licence duration. This could occur due to the fact that inefficient entry has been encouraged or an operator that may otherwise have exited the market is preserved through the grant of spectrum rights in advance. This would both reduce the capacity of other efficient operators to provide services (as the inefficient new entrant is holding spectrum) and may take many years before this is addressed by the market.

3.160 The award of licences in the 2.6 GHz band, the Capacity Bands and the 700 MHz band is critical to setting the initial conditions for the next phase of development in the WBB market in Ireland. Therefore, in this phase of market development it is important that the spectrum award process delivers the appropriate competitive environment to facilitate an optimum level of competition in the downstream retail market.

3.161 In that regard, ComReg considers, taking into account DotEcon's views, that an auction mechanism for the award of rights of use should promote the assignment of licences to those users who value them most, which in turn can be expected to lead to an efficient use of the spectrum. This should, in turn, promote competition in terms of price, choice and quality to the benefit of end users.

Impact on consumers

3.162 An auction will assign spectrum to those bidders who value it most which should in turn promote competition which should benefit end users in terms of price, choice and quality.

3.163 A form of administrative assignment would not necessarily ensure that spectrum is assigned to operators who value it the most and may serve to

favour market incumbents simply by virtue of their incumbency to the detriment of a new entrant. In turn, this could deprive consumers of greater variety and choice in terms of services and service providers.

Preferred Option (Step 5)

3.164 In light of the above, ComReg is of the preliminary view that an auction would be, on balance, the most appropriate mechanism for assigning spectrum rights of use in this award process. In other words, Option 2 is the Preferred Option in this part of the draft RIA.

Overall Preferred Option

3.165 In light of the preceding discussion, ComReg is of the preliminary view (subject to any pre-conditions noted in that discussion) that the 2.6 GHz band, the Capacity Bands and the 700 MHz band should be assigned by way of auction.

3.166 The following section assesses the above Preferred Option for compliance with ComReg's statutory functions, objectives and duties.

3.3 Assessment of Preferred Option against ComReg's statutory functions, objectives and duties

3.167 The preceding draft RIA considered a number of options potentially available to ComReg within the context of the RIA analytical framework as set out in the ComReg's RIA Guidelines (i.e. impact on industry stakeholders, impact on competition and impact on consumers). It necessarily also involved an analysis of the extent to which various options would serve to facilitate ComReg in achieving certain statutory objectives in the exercise of its functions. In particular, it involved an analysis of the extent to which the various options would serve to promote competition and ensure that there would be no distortion or restriction of competition in the electronic communications sector, whilst at the same time encouraging efficient investment in infrastructure, promoting innovation and ensuring the efficient use and effective management of the radio frequency spectrum. This would enable ComReg to ensure that users would derive maximum benefit in terms of choice, price and quality.

3.168 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.

3.169 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;
- promotion of the interests of EU citizens;
- 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.

3.3.1 General Provisions on Competition

3.170 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.[74]

3.171 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 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.

3.172 Based on the draft RIA described earlier in this chapter, ComReg considers that the Preferred Option is the one that would best safeguard and promote competition to the benefit of consumers. In particular, it would maximise competition both within the proposed assignment process as well as in the downstream retail markets by facilitating new entry and avoiding potentially inefficient administrative assignment of spectrum. In identifying the Preferred

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

Option, ComReg has applied objective, transparent, non-discriminatory and proportionate criteria and principles. In that light, ComReg is of the preliminary view that, in identifying the Preferred Option, it has also complied with the obligations contained in the above statutory provisions and General Policy Direction.

3.173 As noted in the draft RIA above, the alternative options of excluding one or more of the Capacity Bands and/or the 700 MHz spectrum band from the proposed award process may not achieve the above general objectives concerning competition to the same extent, if at all. In particular, excluding those spectrum bands from the award process (absent appropriate justification for their exclusion, such as unacceptable delay in availability) would result in a comparatively less competitive award process by reducing the likelihood of new entry and/or enhanced competition.

3.174 ComReg also considers that the alternative of using an administrative process to assign spectrum to particular operators would not achieve its general objectives concerning competition to the same extent as the Preferred Option, if at all. In particular, ComReg notes the observations made by DotEcon in Section 3 of its report that, where there is excess demand for spectrum, using an administrative assignment process may fail to ensure an efficient outcome.

3.3.2 Contributing to the development of the Internal Market

3.175 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 Decision[75] (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

[75] 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.

not distorting or restricting, entry to the Irish mobile market by Electronic Communication Services providers based or operating in other Member States; and

- 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

3.176 In relation to the first factor identified above, it is ComReg's view that the Preferred Option will result in a timelier award of spectrum rights in those bands which are suitable for inclusion in the award process and which are the subject of existing or impending European harmonisation measures. In this regard, ComReg will better promote the use of radio frequency spectrum in a manner consistent with the relevant decisions of the European Commission with respect to harmonisation across the EU. For example, a beauty parade process is slower and there is therefore a risk that standards evolve over time or that spectrum is not used as per prevailing standards for a longer period of time.

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

3.177 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 opinion, satisfy the requirements of this objective.

3.178 In this regard, ComReg refers to the draft RIA and its preliminary finding that the Preferred Option is the one most likely to be preferred by potential new entrants. 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

3.179 In relation to this aspect of contributing to the development of the internal market, ComReg continues to cooperate with other NRAs, including closely monitoring developments in other Member States to ensure the development of consistent regulatory practice and consistent implementation of the relevant EC harmonisation measures and relevant aspects of the Common Regulatory Framework.

3.180 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 band in the award process;
- harmonisation developments in relation to potential candidate bands;
- equipment availability in the potential candidate bands;
- licence durations for spectrum rights in the relevant spectrum bands; and
- licence fees (and benchmarking in particular).

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

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

3.3.3 The Promotion of the Interests of EU Citizens

3.183 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.

3.184 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.

3.3.4 Efficient Use and Effective Management of Spectrum

3.185 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 in Section 3.3.6 below). Importantly also, in pursuing its objective to promote competition under section 12(2)(a), ComReg must 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.

3.186 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.

3.187 In relation to the Policy Direction No. 11, the 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, and 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.

3.188 Based on the findings of the draft RIA, ComReg is of the view that the Preferred Option would best encourage efficient use of spectrum. For example, the inclusion of the additional capacity bands and the 700 MHz band would minimise the significant aggregation risk for bidders that could otherwise exist if these bands were excluded from the proposed assignment process. In addition, the spectrum assignment process preferred (an auction) should facilitate 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 caps, those who value the spectrum the most will win it and are the most likely to use the spectrum efficiently. As noted in Section 3 of DotEcon's report, choosing an alternative spectrum

assignment process which restricts the number of possible outcomes in the proposed auction may reduce the ability of the auction to produce an efficient outcome and, in turn, optimal use of the spectrum.

3.189 In that light, ComReg is of the preliminary view that the Preferred Option complies with the obligations contained in the above statutory provisions. ComReg considers that the alternative of assigning rights of use in frequency bands individually and separately (with attendant aggregation risks and potential inefficient outcome) or by means of an administrative assignment of the relevant spectrum-usage rights to particular operators, would fail to satisfy the above provisions to the same extent, if at all.

3.3.5 Regulatory Principles

3.190 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:[76]

- 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

3.191 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.

[76] 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.

3.192 In the present context, ComReg considers the following 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 similar approach to the award of spectrum in this award process as that taken in the recent MBSA, which ComReg notes was carried out successfully to the satisfaction of all award participants.

3.193 In relation to the first objective, ComReg notes that an award process including both the additional capacity bands and the 700 MHz spectrum band would give the market the utmost transparency and predictability in terms of the availability of spectrum rights substitutable and/or complementary to those in the 2.6 GHz band. The alternative of excluding these bands would not, in ComReg's view, contribute to the promotion of regulatory predictability in that those bands that would subsequently be made available would fall to be assigned on an indeterminate timescale and in a piecemeal manner.

3.194 In relation to the second objective, ComReg considers that the alternative options would not promote regulatory certainty due to the inherent uncertainties in terms of administratively determining such key parameters, 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 fully 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 auctions processes and the use of such processes should contribute to regulatory predictability. In addition, ComReg considers that the Preferred Option would better minimise the risk of award participants failing to win their desired spectrum assignments for reasons other than competitive tension within the award.

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

Promoting Efficient Investment and Innovation in New and Enhanced Infrastructures

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

- has the capacity to facilitate a fully competitive, joint release of the relevant bands. Providing clarity around the availability of these bands as well as the opportunity to acquire rights of use in a single award process, ensures that winners of such rights in these bands are appropriately incentivised to invest in new and enhanced infrastructures, to deploy new technologies and to provide advanced communications services to end users, while avoiding the potential costs, uncertainties and inefficiencies associated with sequential releases of such rights. In this regard, ComReg is of the view that an alternative option of excluding currently or soon-to-be available substitutable and/or complementary spectrum would not be consistent with this regulatory principle to the same extent, if at all; 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

3.197 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 attach to rights of use in the relevant spectrum bands and (b) existing local area FWALA services being provided in the 3.6 GHz band. ComReg has not yet come to any firm view on a proposed position in relation to these issues but shall take this policy direction into account when doing so.

3.3.6 Relevant Policy Directions and Policy Statements

3.198 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.

3.199 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.

3.200 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

3.201 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*."

3.202 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.

3.203 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. The Preferred Option, which promotes the introduction of infrastructure based competition in the WBB sector, would also complement other schemes aimed at ensuring the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis such as the proposed National Broadband Scheme.

3.204 ComReg does not consider that (absent objective reasons) excluding the additional capacity bands and/or the 700 MHz band from the current assignment process would facilitate the development of broadband infrastructure and services to the same extent as the Preferred Option. WBB and, in particular, the mobile market has, in recent times, experienced ever

greater demand for higher bandwidth services. As discussed in the draft RIA, such demand will be better satisfied by the inclusion of the Capacity Bands and the 700 MHz band should it become available for inclusion in this award process. Indeed, ComReg is of the view that, failure to include these bands, where available, would run contrary to this policy direction.

3.205 The greater quantity of spectrum available under the Preferred Option should allow both existing and potential new entrants to deploy, or augment the deployment of, enhanced WBB services throughout the country, utilising a range of existing and emerging technologies, than would be the case under alternative options.

3.206 In addition, the proposed auction process should result in greater competitive tension than in the case of an administrative assignment, which can be expected to positively impact on downstream retail markets in the deployment, or augmented deployment, of enhanced services in terms of bandwidth.

3.207 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

3.208 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*."

3.209 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 business cycle at the time such decisions are taken [77].

3.210 ComReg observes that this policy direction concerns the industry as a whole rather than just the position of individual players. ComReg considers that an open auction which facilitates greater participation on a non-discriminatory basis facilitates the sustainability of the industry as a whole.

[77] In the context of this award process, the business cycle for existing services offered in the 2.6 GHz band i.e. MMDS, is more than likely reaching end of life and potential new services such as WBB provided via LTE and LTE Advanced are in expansion due to the requirement of greater WBB capacity.

3.211 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 related issue of the duration of spectrum rights of use. ComReg has and shall have regard to this policy direction when devising 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

3.212 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*."

3.213 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.

3.214 In preparing the draft RIA, ComReg has considered the Preferred Option in light of the interests of various categories of industry stakeholders and consumers.

3.215 ComReg is of the preliminary view that it has complied with this requirement in preparing the draft 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.

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

3.216 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.

3.217 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.

3.218 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.

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

3.220 Below, ComReg sets out its understanding of these principles along with an assessment of the extent to which the Preferred Option and certain other options accord with those principles.

Objectivity

3.221 In terms of spectrum management and reasons for undertaking this consultation process, ComReg has had careful regard to its general statutory obligations in relation to spectrum management and its obligation to ensure that the harmonisation of the use of radio frequency spectrum across the EU is promoted (including meeting the requirements of EC harmonisation decisions).

3.222 ComReg is also of the preliminary view that the Preferred Option has been objectively justified in the draft RIA and in this document generally and in terms of ComReg's statutory objectives, various public policy considerations and the prevailing facts and circumstances.

Transparency

3.223 In accordance with this principle, the Preferred Option can be fairly characterised by predictability, clarity and openness and contributes to regulatory predictability generally.

3.224 More generally, the RIA is in draft format and is published in this document for public consultation, allowing interested parties to provide input which will be

addressed in the next consultation phase. Furthermore, all inputs from interested parties received by ComReg regarding the RIA and its outcomes will also be published [78] allowing for a fully transparent RIA process.

Non-discrimination

3.225 The principle of non-discrimination requires that comparable situations are not treated differently and that different situations are not treated in the same way.

3.226 ComReg is of the preliminary view that the Preferred Option is non-discriminatory in nature. For example, the method proposed for assigning spectrum (an auction) would be open to all interested parties without discrimination.

3.227 In contrast, an administrative assignment in favour of, for example, incumbents is open to the risk of issues of discrimination or the perception thereof.

Proportionality

3.228 ComReg notes that, simply put, the purpose of the draft RIA is to identify the most proportionate measure while still achieving the intended objectives. In this regard, the draft RIA itself, along with the public consultation process, constitutes a test for proportionality of the Preferred Option.

3.229 As demonstrated throughout this chapter, ComReg considers that the Preferred Option is suitable and necessary to achieve its statutory objectives. In particular, the making available of valuable rights of use on a non-discriminatory basis by way of a market based mechanism is best suited to promoting competition to the ultimate benefit of end users in terms of price, choice and quality. ComReg considers that the alternative of sequential award processes would, on balance, be a more burdensome and therefore disproportionate means of achieving these objectives.

[78] Subject to concerns of confidentiality relating to such material.

Chapter 4

4 Key Aspects of the Proposed Award Spectrum

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 The remainder of this chapter discusses other key aspects of the rights of use to be awarded under the proposed award process, in particular:

- the proposed band plans or frequency arrangements for the bands identified in chapter 3 above for inclusion in the proposed award process;
- the principle of technology and service neutrality;
- the principle of non-exclusivity; and
- the potential duration of the rights of use to be released in this award process.

4.1 Band plans

4.3 This section sets out the band plans or frequency arrangements that ComReg proposes to use for the 2.6 GHz band and the other bands that could potentially be included in the award process. These proposals are based on harmonised band plans or bands plans that are in the process of being harmonised. For each of the bands below, the minimum block size is 2 × 5 MHz for FDD ('paired') or 5 MHz for TDD and SDL ('unpaired') bands.

4.1.1 The 2.6 GHz band

4.4 The EC 2.6 GHz Decision defines the band plan arrangements for the 2.6 GHz band, and provides for both FDD ('paired') and TDD ('unpaired') blocks of 5 MHz.

4.5 The primary band plan set out in the EC 2.6 GHz Decision (see Figure 2 [79]) consists of:

- 12 FDD blocks of 2 × 5 MHz, with 120 MHz duplex gap: 2500 – 2570 MHz paired with 2620 – 2690 MHz; and
- 10 TDD blocks of 5 MHz: 2570 – 2620 MHz.

4.6 This band plan has been utilised for the release of the 2.6 GHz band in the majority of European countries which have released the band.

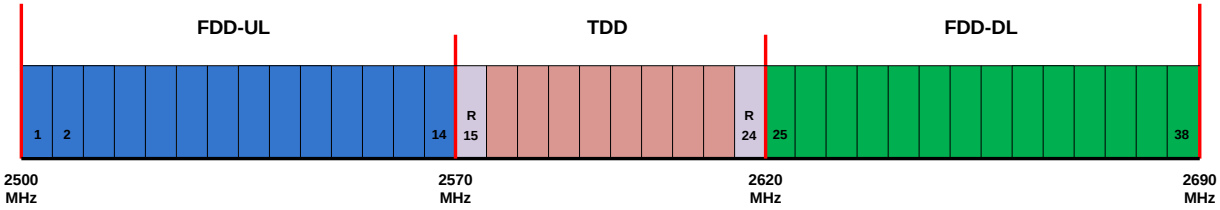

Figure 2 Primary 2.6 GHz bandplan

4.7 The EC 2.6 GHz Decision allows for flexibility in the band plan. The Decision allows member states to decide that a greater number of TDD blocks can be included while maintaining the 120 MHz duplex gap for FDD blocks (Figure 1 is an example of one such alternative band plan)

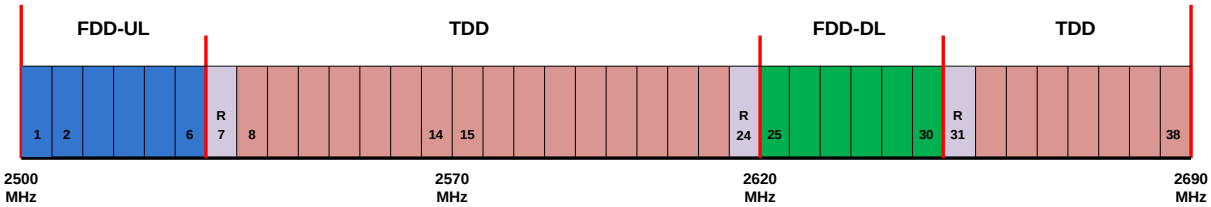

Figure 1 Flexible 2.6 GHz bandplan

4.8 A number of countries have released this band with a band plan where market demand in the award process determined the number of TDD blocks assigned.

[79] The blocks containing the 'R' are restricted blocks which are explained in paragraph 4.10 below

4.9 ComReg proposes to release the band in line with the primary band plan with no flexibility for altering the plan, because:

- the band plan is the primary band plan in the EC 2.6 GHz Decision;
- the majority of European countries have released the band in this manner, which should mean greater availability of equipment for this frequency arrangement; and
- as ComReg's preliminary proposal is to include in the award process a large amount of substitutable TDD spectrum in the 2.3 and 3.6 GHz bands, this would largely negate a need for additional TDD blocks in the 2.6 GHz bands.

4.10 Finally, a 5 MHz block must be used as either:

- a restricted block;[80] or
- a guard band block

between TDD and FDD blocks (and also between unsynchronised TDD networks[81]). The TDD portion of the band has been offered in many countries as 9 blocks of 5 MHz (corresponding to the lower 45 MHz of the centre band). Each winning bidder of this spectrum is required to operate its lowest block under restricted conditions. The uppermost block of the centre band (2615 – 2620 MHz) may be left unassigned as a guard band or assigned to the licensee of the neighbouring TDD block subject to usage restrictions.

4.11 ComReg has yet to settle on the best approach to the treatment of restricted blocks or guard blocks in the 2.6 GHz band or other TDD bands (see 2.3 GHz and 3.6 GHz bands below) and invites interested parties to submit their views on this issue.

[80] The restricted block edge mask (BEM) is set out in the Annex to the EC 2.6 GHz Decision.

[81] Synchronised networks are networks operating in adjacent blocks where no simultaneous uplink and downlink occurs. ComReg would encourage network synchronisation where possible but such arrangements must be made between operators. ECC Report 216 sets out practical guidance for TDD networks synchronisation.

4.1.2 The 2.3 GHz band

4.12 The ECC 2.3 GHz Decision sets out the harmonised frequency arrangement for the 2.3 GHz band (see Figure 3).

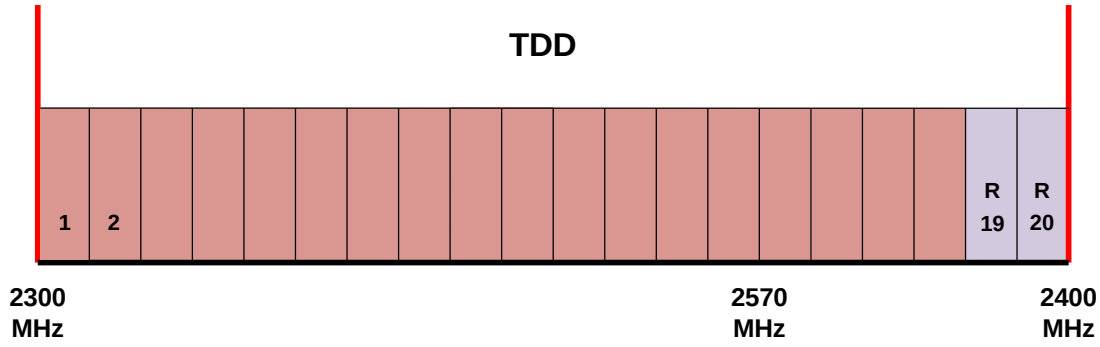

Figure 3. Harmonised 2.3 GHz bandplan

4.13 The band plan consists of 20 TDD blocks of 5 MHz.

4.14 Similar to the TDD portion of the 2.6 GHz band, guard blocks or restricted use blocks of at least 5 MHz[82] are required between assignments of different users (unless the networks are synchronised) to ensure compatibility. ComReg intends on deciding how this is implemented in the award process at a later date and, again invites the views of interested parties in this regard.

4.15 It is also important to note that the in-block power limits for MFCN base stations in the upper two blocks of the band (i.e. 2390 – 2400 MHz) are more restricted[83] than other blocks, to ensure coexistence with systems above 2400 MHz.

4.16 As noted in Chapter 3, the band is subject to an EC mandate to CEPT to develop technical harmonisation measures for the 2.3 GHz band, and an EC technical harmonisation Decision may be adopted for this band in the future. A first draft report (draft CEPT report 55[84]) has been submitted to the EC, and a final report is due in July 2015.

4.17 ComReg proposes to adopt the band plan as set out above and in the ECC 2.3 GHz Decision for this award process.

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[82] The ECC 2.3 GHz Decision sets out that the guard band should be anything between 5 to 10 MHz

[83] 45 dBm / 5 MHz as opposed to 68 dBm / 5 MHz in non-restricted scenarios.

[84] Draft CEPT Report 55 at http://www.cept.org/files/1051/Tools%20and%20Services/Public%20Consultations/2014/CEPT%20Rep55.docx.

4.1.3 The 1.4 GHz band

4.18 The ECC 1.4 GHz Decision harmonises the frequency arrangements for the 1.4 GHz band (see Figure 4.)

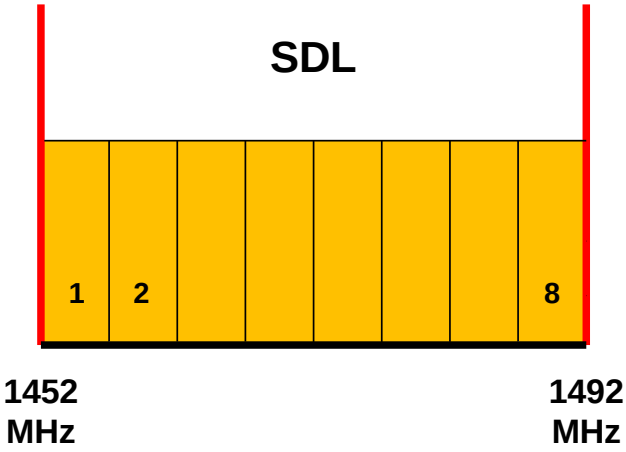

Figure 4. Harmonised 1.4 GHz bandplan

4.19 The 1.4 GHz band consists of 8 blocks of 5 MHz.

4.20 The 1.4 GHz band is harmonised for SDL meaning that available blocks can be used for downlink only. Accordingly, no intra-band guard bands are required.

4.21 There is no prescribed MFCN base station power limit[85] for this band in order to allow operators to aggregate the band with FDD coverage bands in lower frequencies. However, in order to ensure compatibility with services in adjacent bands and to comply with cross-border obligations base stations may be required to comply with out of block BEM limits in-band and out-of-band as defined in ECC 1.4 GHz Decision.

4.22 As noted in Chapter 3, the band is subject to an EC mandate to CEPT to develop technical harmonisation measures for the 1.4 GHz band, and an EC technical harmonisation Decision may be adopted for this band in the future. A final report on this mandate is due in December 2014.

4.23 ComReg proposes to adopt the band plan as set out above and in the ECC 1.4 GHz Decision for the proposed award process.

[85] ComReg notes that Member States are permitted to impose restrictions in this regard and that the ICNIRP Guidelines will apply in any event. ComReg has not, as yet, decided whether it is appropriate to impose limits on EIRP which may, in any event be imposed by the anticipated harmonisation decision.

4.1.4 The 3.6 GHz band

4.24 The EC 3.6 GHz Decision harmonises the frequency arrangements for the 3.6 GHz band.

4.25 The EC Decision sets out that preferred duplex mode for the 3400 – 3600 MHz portion of the band is TDD and that the duplex mode 'shall' be TDD for the 3600 – 3800 MHz portion of the band.

4.26 The EC Decision also allows that an FDD band plan may be implemented in the 3400 – 3600 MHz for specific purposes[86]. However, ComReg notes that none of those purposes are particularly applicable in the Irish context and so is minded to make the entire band available[87] on a TDD basis.

4.27 Figure 5 below sets out the proposed TDD band plan for both sub-bands for the proposed award process.

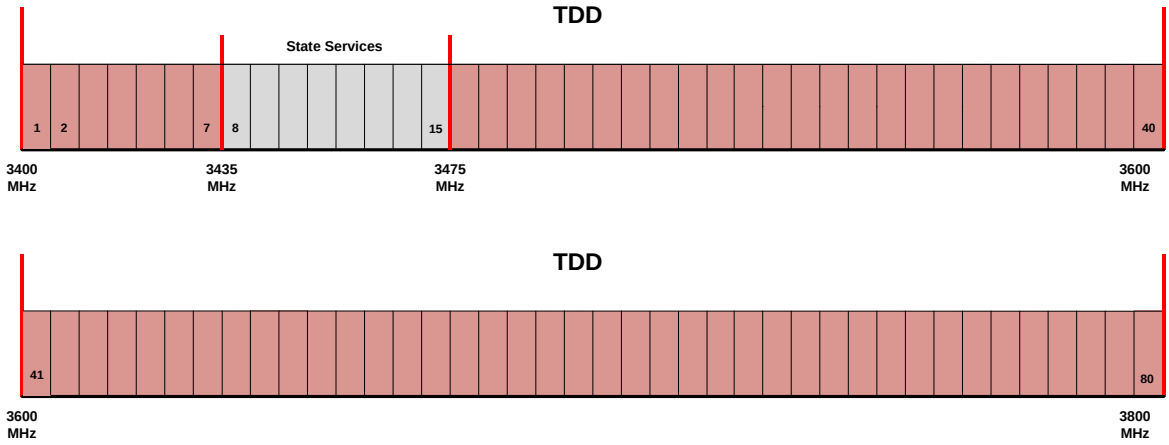

Figure 5. Proposed TDD bandplan

4.28 In total, the 72 TDD blocks of 5 MHz are available for release in this band.

[86] Three specific purposes are listed in the EC 2.6 GHz 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

b) protecting existing uses or avoiding interference; or

c) coordination with non-EU countries.

[87] ComReg notes that there are State services operating between 3435 – 3475 MHz and this spectrum will not be available in the proposed award process.

4.29 As with other bands in this process, guard bands or restricted blocks of at least 5 MHz will be required between assignments of unsynchronised networks.

4.30 ComReg proposes to adopt the band plan as set out above and in the EC 3.6 GHz Decision for the proposed award process.

4.1.5 The 700 MHz band

4.31 ComReg notes that the 700 MHz band has not yet been harmonised in Europe and no final decision has been made with regards to the frequency arrangements of the band.

4.32 However, as mentioned in Chapter 3, an EC Mandate has been issued to CEPT regarding the harmonisation of the band. CEPT Report 53 (i.e. Report A), in response to the mandate and including preferred frequency arrangements, is to be delivered to the European Commission by November 2014.

4.33 Report A is currently in draft format but nevertheless sets out a preferred channelling arrangement (see Figure 6).

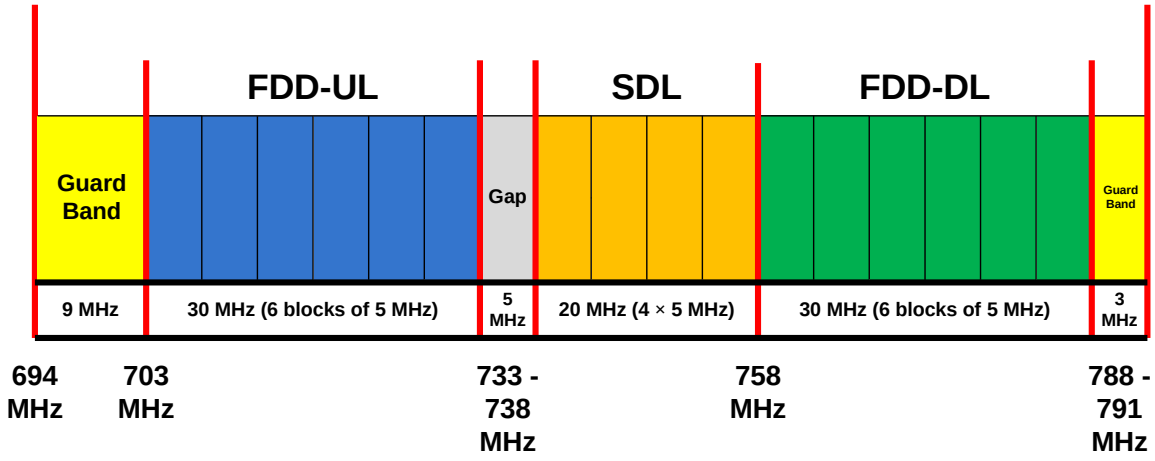

Figure 6. Proposed 700 MHz bandplan

4.34 The proposed band[88] plan consists of;

- 6 FDD blocks of 2 × 5 MHz, with a 55 MHz duplex gap: 703 – 733 MHz paired with 758 – 788 MHz; and

[88] Please note that the usage of guard bands and of the duplex gap of the paired band plan (733-758 MHz) may be decided at a national level.

- Up to 4 SDL blocks of 5 MHz: 738 – 758 MHz (this may be decided at a national level)

4.35 ComReg notes that, should the 700 MHz band become available for inclusion in the award process, the frequency arrangement (and technical conditions) will be finalised at a European level well in advance of this proposed award process.

4.2 Technology and Service Neutrality

4.36 Technology and Service Neutrality is the principle that spectrum rights of use, and the conditions applied thereto, should not require or preclude any specific service and/or technology.[89]

4.37 In the MBSA process, ComReg applied a technology and service neutral approach in line with the relevant EC Decisions.[90] The relevant EC Decisions set out the technical parameters that facilitate the co-existence of services and technologies, such as the channelling arrangements and the BEM.

4.38 EC and CEPT Decisions relating to the harmonisation of frequency bands in the recent past have tended to follow the principle of technology and service neutrality. In this award process, ComReg notes that the frequency bands under consideration are either currently subject to an EC or CEPT Decision[91], or a decision is currently being developed. All of these decisions follow a service and technology neutral approach.

4.39 ComReg therefore intends to apply a technology and service neutral approach to the licensing of the bands in question.

4.3 Non-exclusive Assignment of Spectrum

4.40 Wireless telegraphy licences in Ireland are generally issued on a non-exclusive basis. As such, it is standard practice that many spectrum bands licensed to particular licensees are also made available to other wireless telegraphy apparatus on a non-interference and non-protected basis. For example, spectrum in the 900 MHz and 1800 MHz bands has been made available to other applications using wireless telegraphy apparatus, such as

[89] Provided, of course, that there is compliance with certain technical pre-conditions of use (normally specified at EU level).

[90] See Annex 2 of ComReg document 12/25a.

[91] There is an existing EC Decision for the 2.6 GHz and 3.6 GHz bands. See Annex 3.

Short Range Devices (Document 02/71R9), Mobile Communications on Aircraft (MCA) services and Test and Trial apparatus.

4.41 Furthermore, ComReg notes that, across Europe, it is standard practice for spectrum bands to be made available to other wireless telegraphy apparatus at the same time, provided such apparatus is operated on a non-interference and non-protected basis. Indeed, a number of the EC Decisions relating to the harmonisation of spectrum bands, including the EC Decisions relating to some of the bands being proposed for inclusion in this award process[92], require that Member States must make available frequency bands on a non-exclusive basis.

4.42 ComReg is of the preliminary view that it is appropriate that all spectrum bands in the proposed award process are offered on a non-exclusive basis, including those bands for which there is not yet an explicit requirement under any EC Decision, for the following reasons:

- to provide for consistency across rights of use offered under the same award process;
- it is standard practice that many spectrum bands licensed to particular licensees are also made available to other wireless telegraphy apparatus on a non-interference and non-protected basis. This, for example, allows for other valuable services such as MCA and test and trial to operate across all bands, on a non-interference, non-protected basis; and
- to make provision for future EC Decisions which may include obligations to make spectrum available on a non-exclusive basis.

4.43 However, the above proposal is without prejudice to ComReg's existing or future practice in respect of other spectrum bands or ComReg's future obligations under Irish or EU law in respect of the bands to be included in the proposed award process.

4.4 Licence Duration

4.4.1 General

4.44 Spectrum rights of use do not constitute ownership of the radio frequency spectrum by the operator as they are part of the national domain, and rights of

[92] See, for example, Article 2.1 of the EC 3.6 GHz Decision (2014/276/EU) and Article 2.1 of the EC 2.6 GHz Decision (2008/477/EC).

use can, therefore, be seen as a concession given by the State to the operator. As a result, rights of use are generally of limited duration although a very small number of countries (e.g. the UK, USA and Argentina) assign rights of use of indefinite duration.[93]

4.45 The duration of a right of use is a key component of its attractiveness to any prospective licensee who requires some assurance that the duration will be adequate for it to see a reasonable return on investment. Very short licence terms, with uncertainty regarding renewals, can have a negative impact on investment decisions.[94] However, rights of use of very long or indefinite duration can potentially cement the market structure and limit potential market entry with a negative impact on competition.

4.46 In addition, rights of use of very long or indefinite duration could limit the regulator's flexibility to ensure the efficient use and effective management of spectrum, particularly in the context of innovation-driven markets characterised by ongoing technological progress where the nature of potential users and uses can be expected to evolve relatively quickly over time.

4.47 This section discusses the appropriate duration for rights of use to be assigned under this proposed award process. It also considers the related issue of whether such rights of use should co-terminate.

4.4.2 Relevant Legislation

4.48 Regulation 10(1) of the Authorisation Regulations provides that ComReg may attach conditions to a spectrum right of use including a condition on maximum duration which must be specified in accordance with Regulation 9 (subject to any changes in the national frequency plan). In that regard, 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. Regulation 10(2) also requires that any attachment of conditions under Regulation 10(1) must be non-discriminatory,

[93] ECC Report 169 - Description of Practices Relative to Trading of Spectrum Rights of Use - Paris, May 2011, see Section 2.2.1.

[94] See, for example, GSMA Report - Licence Renewal in Latin America – 12 February 2014 (Section 3B).

proportionate and transparent and in accordance with Regulation 17 of the Framework Regulations[95].

4.4.3 Relevant Considerations

Licences of Indefinite Duration

4.49 ComReg's current position regarding indefinite licences is set out in Sections 3.4.2 of Document 11/88 and 4.3 of Document 11/89[96]. In summary, ComReg favours spectrum licences of finite duration because it:

- promotes competition, spectrum efficiency and the internal market;
- is wholly compatible with the Common Regulatory Framework;
- 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 a co-ordinated approach to the bands. This is particularly important where a co-ordinated approach is necessary to introduce new and innovative services to a band; and
- ensures that there can be a co-ordinated approach to bringing about the desired change without perverse incentives emerging for incumbent firms to hold out strategically with a view to gaining more rents.

4.50 ComReg also notes that adopting a consistent approach in this regard across similar award processes contributes to regulatory predictability. Therefore, ComReg's preliminary view is that rights of use assigned under the proposed award process should be of finite duration.

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95 Regulation 17 concerns the management of radio frequencies and requires ComReg to, amongst other things, ensure the effective management of radio frequencies and to ensure that restrictions on the use of infrastructure or the provision of services are limited in accordance with that Regulation.

96 Strategy Statement - Strategy for Managing the Radio Spectrum: 2011 – 2013. As noted previously, ComReg intends to shortly consult upon a new spectrum strategy statement, and the preliminary views expressed in this document are without prejudice to the position which may be articulated by ComReg on related matters in any future spectrum strategy statement resulting from the above mentioned consultation process or future processes.

Licence Duration

4.51 As noted previously, spectrum rights of use are generally of limited duration although a very small number of countries assign rights of use of indefinite duration. In that regard, ComReg also notes the following relevant points:

- broadly similar rights of use to those being considered to be made available under the proposed award process (at least in terms of actual and expected application by operators at EU and international level) were assigned under the MBSA process. The licence duration attached to the rights of use assigned under the MBSA ranged from 15 years to approximately 17 years and 5 months.[97] Furthermore, UMTS (or "3G") licences were issued for a period of 20 years and older GSM mobile licences for a period of 15 years;
- in its response to consultation on the release of the 2.3 GHz band (Document 09/76), ComReg was of the view that a licence duration of 15 years would be appropriate; and
- while, in CEPT countries, rights of use assigned by means of auctions have been granted for anywhere between 5 and 20 years[98], the GSMA report an average duration of mobile licences for a selection of countries worldwide as being approximately 17 years with those used most frequently globally being either 15 or 20 years[99].

4.52 The above domestic and international practice would therefore appear to suggest an appropriate licence duration of somewhere in the range 15 to 20 years.

Co-termination

4.53 In considering the appropriate duration for rights of use assigned under the proposed award process, ComReg has considered whether those rights of use should (i) co-terminate with each other and, if so, (ii) co-terminate with the existing rights of use awarded under the MBSA (i.e. 12 July 2030) or terminate on some other date.

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97 Fifteen years, if the licensee won spectrum in Time Slice 2 only, or 17 years and 5 months if the licensee won the same spectrum in both Time Slices 1 and 2. Where a successful bidder acquired rights of use in Time Slice 1 only (having acquired no spectrum rights of use in Time Slice 2), the maximum duration would be 2 years and 5 months. However, the latter outcome did not arise.

98 ECC Report 169 - Description of Practices Relative to Trading of Spectrum Rights of Use - Paris, May 2011, see Section 2.2.1.

99 GSMA Report - Licence Renewal in Latin America – 12 February 2014 (Section 3B).

4.54 In terms of (i) above, i.e. co-termination of all bands within the proposed award process, this would be desirable for the same reasons justifying the inclusion of these bands in the current award process. These reasons are set out in Chapter 3 above and include that:

- these bands are considered to be substitutable and/or complementary with one another from the point of view of interested parties and co-termination would allow these bands to be released at the same time in any future award;
- ComReg is of the preliminary view that a single award process involving such spectrum is preferable over sequential award processes; and
- a suitable mix of low and high frequency spectrum should promote competition.

4.55 Similar arguments might also be made in support of having those bands co-terminate with existing rights of use awarded under the MBSA, i.e. (ii) above. However, there are reasons why co-termination with the rights of use awarded under the MBSA process may not be appropriate.

4.56 For example, there may be merit in maintaining a temporal separation between the future releases of spectrum previously released under the MBSA process on the one hand and that spectrum proposed for inclusion in this award process on the other, for the purposes of safeguarding business continuity and promoting competition. Awarding what would amount to a significant proportion of the most valuable and suitable spectrum for WBB services in a future single award process risks locking existing operators and potential new entrants out of the market and cementing the market structure for a substantial period of time thereafter. Indeed, holding sequential awards of this size and mix of spectrum may be particularly beneficial in the case of innovation-driven markets characterised by ongoing technological progress where the nature of potential users and uses can be expected to evolve relatively quickly over time. Furthermore, with sequential award processes of this nature, existing operators can react to evolving technology, services and demand to adjust their amount and mix of spectrum holdings over time, particularly if alternatives like spectrum trading and/or business acquisitions do not provide the same level of certainty/opportunity.

4.57 In addition, the 2.6 GHz band will not become available for assignment until April 2016. It is also likely that some of the other rights of use being considered for inclusion in this award process will only become available after that date (e.g. the 3.6 GHz band which only becomes available in July 2017). As such, if rights of use assigned under this award process were to co-

terminate with the MBSA rights of use, the maximum duration for such rights of use would be approximately 14 years or potentially even shorter[100]. As described earlier, this would not be entirely consistent with domestic and international practice where the average duration of mobile licences globally appears to be approximately 17 years with the licence duration used most frequently being either 15 or 20 years. Concerns could also be raised as to whether such a short period[101] would be an appropriate period for investment amortisation for all potential licensees (including new entrants) in accordance with Regulation 9(6) of the Authorisation Regulations.

4.58 In light of the above, ComReg is of the preliminary view that co-termination with the rights of use awarded under the MBSA process is not an appropriate option for the proposed award process.

4.4.4 Proposals on Licence Duration

4.59 In light of the above, ComReg is of the preliminary view that an appropriate duration for rights of use assigned under this award process is somewhere in the range of 15 to 20 years. This would accord with both domestic and international practice. In addition ComReg is of the view that all rights of use assigned under this award process should co-terminate on the same expiry date. Under this proposal, rights of use would expire sometime between 2031 and 2036, assuming a licence commencement date of April 2016.

4.60 ComReg is of the preliminary view that, a longer licence duration would be unnecessary and would risk undermining competition and the effective management and efficient use of the radio frequency spectrum.

[100] Other bands proposed for inclusion in the award process such as the 3.6 GHz and 700 MHz bands are likely to become available for award later than the 2.6 GHz band meaning that co-termination, with MBSA rights of use, in those bands, is likely to lead to a licence duration shorter than 14 years.

[101] While Time Slice 1 in the MBSA was for a period of 2 years and 5 months and licences could theoretically have been awarded for that length of time (where a successful bidder acquired no spectrum rights of use Time Slice 2), ComReg notes that this anomaly was a result of fragmented termination dates for the then existing rights of use for some MBSA spectrum. ComReg also notes that this outcome did not in any case arise in the MBSA and that such a short licence duration need not be replicated in this award process or indeed in future award processes for the spectrum assigned under the MBSA process.

Chapter 5

5 Award Type and Format

5.1 On the basis of the draft RIA set out in Chapter 3, ComReg believes that an auction mechanism is the most appropriate mechanism with which to award rights of use in the proposed award process. In light of this, it is necessary to consider and determine what auction characteristics, in this specific case, would best meet ComReg's statutory objectives and, in particular, ensure the efficient use and effective management of the radio spectrum.

5.2 In that regard, this chapter is structured as follows:

- considerations for this award process;
- the preferred auction format for this award process;
- the pricing mechanism;
- packaging of available spectrum;
- frequency generic or frequency specific lots; and
- competition caps and new entry.

5.1 Considerations for this Award Process

5.3 Radio spectrum auctions in the past have been run using various auction formats. DotEcon, in Section 3 of its report, identifies and examines a number of auction formats including the:

- standard simultaneous multiple-round ascending (SMRA) auction;
- simple clock auction (SCA);
- combinatorial clock auction (CCA); and
- sealed-bid combinatorial (SBC) auction formats.

5.4 It is not proposed to fully repeat DotEcon's discussion and analysis of these formats; rather, stakeholders are invited to review the mechanics of each of the auction formats set out in the DotEcon Report which accompanies this consultation.

5.5 In order to assess which of the aforementioned auction formats is best suited to the proposed award process, it is necessary to consider a number of risks outlined by DotEcon as likely to arise, and determine which auction format best mitigates those risks while ensuring that spectrum is awarded to those users who value it the most. These risks are:

- common value uncertainty;
- collusion and strategic demand reduction;
- substitution risks;
- aggregation risks; and
- complexity.

5.1.1 Common Value Uncertainty

5.6 Common value uncertainty occurs when bidders are faced with uncertainty as to the actual market value for the spectrum being made available. The valuation ascribed to spectrum by bidders can be affected by uncertain factors common to all bidders such as future technologies and market demand on downstream markets. This uncertainty leaves bidders exposed to either bidding significantly more or less than other bidders for the spectrum as a result of their views on such common factors differing from those of other bidders. Common value uncertainty can lead to inefficient outcomes. This may occur because winning bidders may be those who valued spectrum based on the most optimistic treatment of those uncertainties, and these winning bidders may not necessarily be the same as those bidders who can generate the greatest economic value from the spectrum.

5.7 Given that the MBSA was completed relatively recently, ComReg is of the view that common value uncertainty is likely to be relatively small in relation to the 700 MHz band which has similar characteristics to sub-1 GHz spectrum assigned under the MBSA like the 800 MHz and 900 MHz bands and is likely to be highly substitutable with those bands.

5.8 For the Capacity Bands, however, DotEcon has noted that there is likely to be significant common value uncertainty in the proposed award process.[102] This arises due to uncertainty around the commercial plans of certain operators

[102] For example, in relation to this award, there remains uncertainty around the level of industry demand for SDL in the 1.4 GHz band and mobile deployment in the 3.6 GHz band as these are new applications for these bands.

relative to others, the variance in prices paid in other jurisdictions for similar spectrum rights of use and the large amount of capacity spectrum potentially available in this Award Process

5.9 Operators are likely to be influenced to some extent by the value ascribed to similar bands in other jurisdictions. However, the value of spectrum licences assigned across the Capacity Bands has varied substantially across a number of countries.[103]

5.10 Different auction formats provide varying degrees of information that allow bidders to refine their bids depending on the willingness of others to bid for spectrum at a given price level. Price discovery within an auction mitigates against common value uncertainty to the extent that bidders gain some information about the valuation ascribed by other bidders.

5.11 Sealed bid auctions, such as the SBC, do not have a price discovery mechanism. Instead, bidders have only one opportunity to submit their maximum willingness to pay for the lots auctioned, and the winning bids and bidders are determined on the basis of just one round of bidding.

5.12 Common value uncertainty can be reduced by allowing bidders to observe the bidding behaviour of competitors. With multi-round auction formats including the SMRA auction and the CCA, the open rounds of bidding provide bidders with an indication about the value others place on the spectrum, and in a multi-band auction, the approximate relative value of spectrum in different bands. These observations help reduce this uncertainty and the corresponding risk that one or more bidders will maintain expectations about common factors significantly at odds with the view of the market about these same factors.

5.13 In an SMRA auction, activity rules can constrain bidding behaviour so that, as bid amounts increase, bidders can only maintain or reduce their demand. A consequence of this is that it is not possible for bidders to hide their demand in the early stages of the auction. This facilitates price discovery during the auction.

[103] There has also been just one auction of the 1.4 GHz band, in the UK in 2008. There are few auctions of 2.3 GHz spectrum in Europe with only Norway auctioning rights of use. Elsewhere, in Canada, New Zealand, Singapore, Hong Kong, India and Nigeria, prices vary widely across these jurisdictions. Observations in the 3.6 MHz band are dated with the most recent being in Portugal in 2010. As such, much of these observations may not present a contemporary view of the likely value particularly in light of the recent roll out of LTE.

5.14 In both a CCA and an SCA, the clock facilitates price discovery as bidders simply indicate whether they would be prepared to pay the price on the clock in that round. The purpose of the primary bid rounds is for price discovery; given that bids in the primary bid rounds are binding, information about the valuations of bidders emerges over the open rounds, as bidders get to see if there is still excess demand for lots at the prevailing clock prices.

5.15 While the clock also facilitates price discovery in the SCA, because only final round bids are committing, bidders may be able to hide demand by bidding on low value lots (or simply lots that are not its target lots) in the early rounds to moderate prices of its target lots and switching preferences in later rounds. The risks associated with this strategy are minimal if there is reasonable certainty that the auction will not close during the rounds in which the low value bids are placed. However, where this behaviour takes place, this compromises the price discovery element of the early rounds of the auction under the SCA format. In the CCA, all bids in both the clock rounds and the supplementary bids round are committing, exposing any bidders who try to hide demand to the risk of being awarded lots for which it has little value for other than to hide its demand in the auction.

5.16 The CCA is generally used in situations where bidders typically have valuations for a range of packages that are synergistic (i.e. the package is likely worth more in total than its component lots if acquired separately). The attraction of the CCA in this case is that, bidders are able to move their demand between packages as prices for different lots change. Allowing this type of switching promotes price discovery where there are multiple lot categories. Without facilitating switching, bidders might observe price changes that mean they want to switch their bidding to alternative lots but are not able to do so, which may reduce the efficiency of the auction outcome.

5.1.2 Strategic Demand Reduction

5.17 Collusion is an important concern in spectrum auctions. Collusion can result in bidders artificially reducing the price of spectrum and reducing the extent of competition in downstream markets. Poor auction design can facilitate collusion between firms by providing too much information to bidders about the value attached by other bidders in the auction. Collusion in this award process could involve bidding methods designed to signal intentions to other bidders.

5.18 Collusion can take the form of demand reduction whereby bidders collectively reduce competition in an auction by reducing the quantity of spectrum

demanded to less than their optimum amount but pay lower prices on that quantity as a result of not competing for more spectrum.[104]

5.19 Strategic demand reduction can also be engaged in by a bidder acting alone. This occurs where a bidder perceives that reducing its own demand will likely have an effect on how much it pays. There is an incentive to strategically reduce demand if the surplus acquired from winning a smaller number of lots at a low price is greater than the lost opportunity to win more lots.[105] This may inhibit bidders that compete for a larger numbers of lots.

5.20 Strategic demand reduction can lead to reduced competition and inefficiency as bidders are sacrificing lots they have value for in order to pay less for a subset of their true demand. Strategic demand reduction is more likely to occur when bidders require multiple lots and where those lots are substitutable. Strategic demand reduction is also more likely in linear price settings (where bidders pay the same price for all lots in a category). This is because in order to compete for additional lots in a lot category, a bidder must raise the price of all of lots it wishes to win in that category and with no guarantee of success.

5.21 DotEcon considers that strategic demand reduction is an important factor to consider in the choice of format for this Award Process for the following reasons:

- there is a large amount of spectrum available. This raises the issue of whether one or more bidders can act strategically to satisfy a lower demand at a lower price instead of competing normally;
- there is likely to be at least some asymmetry between bidders, allowing one or more weak bidders to act as an early focal point for weak bidding which others follow;
- bidders seeking capacity spectrum are likely to be more flexible in relation to the total bandwidth they acquire, which means that they may have greater scope for reducing demand with the prospect of a cost saving; and

[104] In essence, a bidder seeking multiple lots has the incentive to bid less than its true valuation on a marginal unit in order to lower the price on an inframarginal unit.

[105] Section 3.2.3 of DotEcon's report provides a worked example to illustrate the problems posed by strategic demand reduction.

- strategic demand reduction could lead to less competitive downstream markets as having less capacity may increase marginal costs (increasing retail costs downstream) and reduce incentives to compete.

5.22 The SBC auction offers the greatest level of protection against collusive behaviour such as strategic demand reduction:

- The presence of a sealed bid ensures that bidders cannot signal to other bidders about their intentions during the auction.

- The SBC does not impose linear pricing, so the incentive to reduce demand to potentially get lower prices per lot on a smaller package as a result of a reduction in demand is removed.

- If a second price rule is used (where bidders pay not the price that they bid but the amount that they would have had to bid to beat the competition for the lots they win), then reducing its demand, or not expressing demand for larger packages, will have no effect on what it pays for what it wins.

5.23 The high level of transparency associated with an SMRA type auction makes it susceptible to strategic demand reduction because bidders can apply bidding strategies unilaterally. In addition, it may be possible to use various forms of signalling to establish tacitly collusive arrangements for reducing competition. The SMRA also imposes linear pricing, so the incentive to compete for more lots is reduced because the incremental cost of winning additional lots is high relative to settling for fewer lots at low prices. Each of these possibilities has the potential to seriously jeopardise the efficiency of the auction.

5.24 The CCA may be susceptible to collusive behaviour when not specifically addressed in the auction design; however, a CCA can include rules restricting transparency about other bidders' bidding behaviour during the auction. Such an approach might for example reveal information about aggregate demand but not other bidders' individual bids. This creates a risk for bidders that their estimated reduction in bidding across bidders in line with its own demand reduction is wrong, resulting in an outcome that leaves it dissatisfied. The CCA[106] also provides less of an incentive to reduce demand because its demand will factor into the prices paid by other bidders and does not typically increase its own final price. Therefore, the risks of collusive behaviour in an appropriately designed CCA are relatively small.

[106] The CCA typically uses a second price rule.

5.1.3 Substitution risks

5.25 Substitution risks arise when a bidder or bidders view an alternative package of lots as substitutes but cannot switch due to some impediment to switching. Substitution risk can result in a bidder obtaining one package, when at prevailing prices it had a higher utility for another package. This leads to inefficiencies as a bidder or bidders could end up with packages that do not reflect the greatest available value to that bidder.

5.26 In an SBC auction, the bidder would be able to express valuations for a number of different options in a single sealed bid but would be unable to switch demand across those options in response to information about relative prices. A bidder could end up buying one package when they would have preferred a different package at the end prices.

5.27 On the other hand, in an open auction,[107] a bidder can switch between lots depending on relative prices. Notwithstanding this, DotEcon notes that switching is not straightforward in an SMRA[108]. While a SMRA can be augmented to facilitate switching, these impediments to switching cannot be removed altogether and adjustments to facilitate switching result in an increased scope for strategic behaviour and gaming.

5.28 The SCA provides for substitution between packages in response to a change in the relative price of lots at a later stage in the auction, assuming it has eligibility to do so based on its previous bids.

5.29 A CCA with a series of activity rules allows bidders to switch their demand between different categories of spectrum (subject to not breaching eligibility rules).[109] This means that bidders can select their preferred combination of lots in response to changes in the relative prices of lots in different bands. In this way, bidders can switch to preferred lots, subject to eligibility, without significantly increasing the scope for gaming behaviour.

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[107] An open auction is one where bidders get to observe the bidding as it proceeds and includes a SCA, SMRA and a CCA.

[108] See ComReg Doc 14/102 section 3.2.3.

[109] An eligibility based activity rule is used to determine the bidding rights for bidders during the auction. The purpose of activity rules is to ensure that as the price increases bidders can only maintain or reduce their demand.

5.1.4 Aggregation Risks

5.30 Aggregation risk refers to the risk that bidders may only partly satisfy their demand for certain spectrum. Where a bidder has a minimum spectrum requirement, it may be exposed to winning unwanted subsets of its demand. This is particularly serious where rights of use above a certain minimum are necessary in order to be of value to that user.

5.31 DotEcon considers this to be an important issue in this award process for the following reasons:

- in recent awards, spectrum has been awarded in lots of 5 MHz or 2 × 5 MHz, however, the minimum amount of spectrum required by a bidder may be far higher than this;
- new technologies will benefit from larger amounts of contiguous spectrum. For example, with the move to technologies such as LTE-Advanced, operators may require a minimum 20 MHz in order to meet network demand;
- existing FWA operators are currently using blocks larger than 5 MHz; and
- new business propositions that require a large amount of spectrum could emerge.

5.32 DotEcon considers that SMRA auctions are not suitable where aggregation risks are likely to arise. In a SMRA auction, bidders bidding on a combination of lots may end up winning some but not all of the lots that they require. This creates serious inefficiencies in the award process and bidders could end up with spectrum they have no value for, which could be inefficiently denied to other users.

5.33 By way of example, it is possible that a bidder could value 2 × 10 MHz of spectrum at more than twice 2 × 5 MHz because of the synergies a larger combination creates but may not raise bids to reflect their synergy value because of the risk of being stranded with one lot at the end of the auction. The problem of aggregation risk is more acute where there is complementarity between the bands or where a bidder requires a minimum amount of spectrum within one band. If a potential new entrant requires both coverage and capacity spectrum that bidder could be left with either coverage or capacity spectrum, but not both, and would be unable to launch a new service efficiently without access to both types of spectrum.

5.34 Aggregation risks are removed entirely by using an auction format in which bidders make bids for packages of lots. As such, aggregation risks do not arise in combinatorial auctions as bidders can only win packages of lots rather than individual components. In this way bidders can express their full value for preferred packages without facing aggregation risks. Any of the combinatorial auctions described by DotEcon eliminate aggregation risks. An SMRA is a non-combinatorial format, therefore, aggregation risks only arise in respect of this auction format and are eliminated entirely for SBC, SCA and CCA.

5.1.5 Complexity

5.35 In terms of complexity within an auction format, a distinction should be made between the complexity of rules and assignment mechanisms (auctioneer's complexity)[110] and the complexity of decisions faced by bidders before and during the auction (bidders' complexity). Complexity is an important consideration because it can lead to inefficient outcomes whereby the bidder who places the highest value on the spectrum fails to acquire that spectrum because of a failure to adequately understand the assignment mechanism and the interaction of bids between it and other operators.

5.36 DotEcon notes that bidders' complexity in an auction becomes a more important consideration in the event that:

- the costs to bidders in time and money of preparing for an auction become a material proportion of the value of the spectrum for award, as this risks deterring potential bidders. Such a scenario is likely only for low value spectrum or where the licence duration associated with the spectrum is short; or
- there is the possibility that small bidders or potential new entrants may lack auction experience and the resources to invest in substantial auction preparation and development of bid strategy.

5.37 ComReg agrees that both of these factors may be relevant considerations in the proposed award process because:

- while the value of spectrum in the Capacity Bands is likely to be far in excess of any bidder's costs of preparing for an auction, particularly where that bidder is interested in a range of spectrum bands, it is conceivable that a potential bidder may require only relatively small amounts of

[110] This is generally on the auctioneer's side although it can still introduce complexity on the bidder's side due to the level of understanding required for some auctions.

spectrum within a specific band or bands. That bidder would still be required to understand the auction rules and procedures and the complexity of the process may affect its incentives to participate; and

- while certain operators such as those who participated in the MBSA process have developed a body of knowledge in relation to auctions, certain smaller operators lack this experience, and may also have limited resources in terms of auction preparation and development of bid strategies.

5.38 Therefore, the design of the proposed award process should, to the extent possible, seek to minimise the complexity for bidders'. However, ComReg notes that this should not act to the detriment of the proposed award process and should be appropriately balanced against the risks identified above.

5.39 Combinatorial auctions such as the SBC and CCA are more complex to implement than traditional SMRAs as they require some mechanism for collecting multiple package bids from individual bidders. However, much of this complexity resides with the auctioneer and has little effect on bidders. Moreover, as noted by DotEcon, designing an effective bidding strategy for an SMRA with many lots organised into categories is also complex and will depend on assumptions about the behaviour of others. Furthermore, sophisticated rules are required in order to minimise aggregation and substitution risks. These rules not only increase the complexity of the auction, but also make the bidding process much more complex.

5.40 In terms of combinatorial auctions, the SBC is a relatively straightforward process as it requires just one round of bidding[111] to determine the winning bidders.[112] This is a relatively simple bidding process, making it easier to understand and reduces the costs of participation for bidders.

5.41 DotEcon notes that combinatorial auctions such as the SBC and CCA have a number of relatively complicated elements such as the use of algorithms for winner determination and pricing. However, as noted above, this complexity is primarily on the auctioneer's side, and facilitates the adoption of a simple bid strategy. Once the mechanics of the model and the second price rule[113] are understood, bidders simply have to generate their valuations for different

[111] Where the SBC uses a second price, this will require bidders to understand the effect this has on its bidding strategy.

[112] If the auction is frequency generic it will require an additional assignment stage.

[113] The second price rule is discussed below.

packages of lots and bid according to these values in the auction itself where the process of bidding to reflect these valuations is relatively straight forward.

5.42 Finally, and as it has done in the past, ComReg would assist all bidders in developing an understanding of the auction rules through the running of workshops and providing tools necessary for bidders to simulate auction conditions. Given this, ComReg does not consider that the mechanisms of combinatorial auctions are a significant impediment to their adoption in this award process.

5.2 ComReg's Preferred Auction Format

5.43 In selecting a suitable auction format, and in consideration of the above, ComReg aims to ensure an efficient outcome in which spectrum is awarded to users who will use it most efficiently to the benefit of end users. In that regard, the selected auction format should be the one that, on balance, best achieves the following objectives:

- the auction should be transparent and easily understood by potential bidders;
- the auction should encourage participation in the process, and avoid outcomes where spectrum goes unsold despite efficient demand existing for that spectrum;
- the auction should minimise common value uncertainty which may exist among bidders who may want to use spectrum to deploy different or new technologies;
- the auction should allow bidders to switch their demand across bands where such a switch leads to a bidder obtaining their preferred assignment of spectrum, in light of the price that other bidders are willing to pay for certain rights of use;
- the auction format and rules should minimise the risk of inefficient outcomes for bidders; and
- the auction should promote incentives for bidders to engage in a manner expected of normal competition, and not to engage in strategic or collusive behaviour.

5.44 ComReg is of the view that the SBC auction would be the least complex and most easily understood by bidders. It is also best suited to preventing tacit

collusion occurring within the award process. However, this process does not deal with common value uncertainty and provides for no switching after the initial bids, both important factors in ensuring the efficient allocation of a large amount of spectrum amongst users in a competitive award process. Furthermore, there are no proven mechanisms that can be implemented that would minimise these risks. Therefore, ComReg is of the preliminary view that a sealed-bid combinatorial auction is unsuitable for the proposed award process.

5.45 The SMRA provides for price discovery and allows bidders good certainty on the valuation attached to their lots relative to other bidders. However, the high level of transparency makes it susceptible to strategic behaviour and tacit collusion. Furthermore, the aggregation risks associated with this award type are significant, and substitution risks are also present given the standing high bidder principle and the impediment it creates for switching between different packages of lots. Each of these factors could lead to a sub-optimal outcome. While the SMRA can be modified to take account of some of these concerns, these modifications result in a complex auction process leading to only marginal improvements to the said risks. Therefore, ComReg is of the preliminary view that a SMRA is also unsuitable for the proposed award process.

5.46 The SCA deals with some of the concerns outlined above as it is easily understood, does not involve aggregation risks and additional rules can be used to discourage strategic bidding such as collusion. However, and as noted by DotEcon in its report, if bidders have a minimum requirement of multiple lots or at least some bidders have increasing returns for additional lots then there is a significant risk that multiple lots will go unsold. In addition, where a bidder might be willing to accept a number of alternative packages of lots to meet its demand for spectrum, it would not have the opportunity to express its range of interests. Further, as with the SMRA, the SCA imposes linear pricing (where all lots of the same type are sold at the same price); thus, it is susceptible to strategic demand reduction by one or more bidders even without tacit collusion. These features could substantially affect the efficiency of the award outcome. As these scenarios could well arise during the proposed award process, ComReg is of the view that a simple clock auction is unsuitable for the proposed award process.

5.47 In light of the foregoing and having considered the DotEcon report as a whole and its statutory functions, objectives and duties, ComReg is of the view that a CCA is the auction format best suited to deal with the considerations outlined by DotEcon. In particular, the CCA:

- avoids aggregation and substitution risks associated with the SMRA by offering spectrum in suitably sized packages and across a number of different bands allowing bidders the opportunity to acquire their preferred mix of spectrum at given prices;
- results in an appropriate balance between the benefits of an open auction in terms of promoting price discovery and the risks in terms of strategic behaviour that weakens competition;
- is also less vulnerable to strategic demand reduction than the SMRA, because marginal bidders are not exposed to higher prices if they bid up to their value;
- allows the flexibility to facilitate bidding on key parameters such as percentage of population coverage if required;
- allows for activity rules to allow bidders to switch demand in response to relative price changes; and
- can eliminate the problem of inefficiently unsold lots through a supplementary bids stage.[114]

5.48 In summary, this award format offers sufficient flexibility to deal with the concerns outlined by DotEcon without compromising the efficiency of the award process. ComReg is, therefore, of the preliminary view that a CCA is the most appropriate auction format for the proposed award process.[115]

5.3 Pricing mechanism

5.49 Once the winners are determined, there are two types of pricing mechanisms available for consideration in the design of auctions:

- the first price rule provides that the price to be paid by winning bidders is set at the level of the winning bids in the award process. That is, winning bidders simply pay the amount that they bid for a particular package; and

[114] The supplementary round is a sealed bid round and allows bidders to express their final valuations for a range of packages. This can involve raising bids for packages already bid for in the clock rounds and making new bids for packages not yet bid on. Once the round is completed, the highest value combination of bids and prices for each winning bid is identified.

[115] DotEcon also recommends that, having selected an auction format, reasonable steps should be taken to try and prevent price driving strategies (DotEcon Report section 3.2.3).

- the price derived from using the second price rule is potentially lower and is at a level that ensures that the winning bidder covers at least the opportunity cost of ComReg assigning the spectrum to it rather than to any other bidders. This pricing mechanism sets the prices at the lowest level at which the winning bidder could have still have won those lots given what other bidders bid.

5.50 The major advantage of a first price rule over a second price rule is the ease of understanding. However, the first price rule can lead to inefficient outcomes as the user who values the spectrum most may not be assigned rights of use to that spectrum. This is because, under the first price rule, bidders will form expectations about what other bidders may bid in order to acquire a surplus from the bidding process.[116] Bidders, essentially, will bid what they believe is the lowest amount necessary to win rather than at their actual valuation. This introduces the possibility that those valuing the spectrum the most will not win it because their expectations about what they need to bid to beat their competition for their desired package of spectrum are wrong.

5.51 The second price rule allows a bidder to focus on expressing its own valuation across different packages while largely ignoring the bidding strategies of its rivals. This is because the price a winning bidder will have to pay is determined based on the concept of opportunity cost, and reflects the value that could have been generated by allocating the lots won by it to other bidders. The winning price reflects the minimum amount that the bidder needs to pay to win given competition from rivals. This approach provides good incentives for straightforward bidding behaviour, as expressing its full value for packages of lots typically will not affect how much it will have to pay for those lots. A consequence of this is that the pricing mechanism will not be responsible for the inefficient award of spectrum.

5.52 The potential for inefficient outcomes is greater where a first price rule is used in conjunction with a CCA because bidders will need to decide on a potentially large number of bids for different packages, and what a bidder would need to bid for a particular package of lots in order to outbid the competition for those lots is difficult to estimate.

5.53 Importantly, the second-price rule largely eliminates the potential for strategic demand reduction because it removes the incentive to bid significantly below valuation or for fewer lots than are actually desired in order to reduce winning prices. If a bidder competes for a larger amount of spectrum in line with its

[116] The surplus is the difference between the price paid and their actual valuation.

preference and does not win, this does not drive up the cost of acquiring an amount of spectrum lower than its preference.

5.54 ComReg is therefore of the preliminary view that a second price rule would be the most appropriate pricing mechanism as it would encourage truthful bidding while ensuring that the bidder who values the spectrum the most is assigned rights of use to that spectrum.

5.4 Packaging of available spectrum

5.55 Offering spectrum in small blocks provides bidders with greater flexibility to aggregate spectrum blocks to fit a bidder's demand profile. Bidders can choose the exact amount of spectrum that they wish to acquire and reduce this amount in relatively small increments if necessary as market prices become more apparent.

5.56 As an alternative to offering the spectrum in 2×5 MHz or 5 MHz lots, the lot size could be increased into larger blocks. DotEcon has assessed whether it may be possible to use larger blocks without unduly restricting the range of potential outcomes and disadvantaging some potential users.

5.57 ComReg notes that the relevant European harmonisation measures for mobile broadband use of the candidate bands specify frequency arrangements formed of 5 MHz blocks.[117] This requires that spectrum blocks in the 2.6 GHz band be assigned in multiples of 5 MHz. In respect of the 2.6 GHz band, DotEcon notes that most countries have responded to this by defining the smallest possible lot size (2×5 MHz for paired and 5 MHz for unpaired spectrum).[118]

5.58 DotEcon's assessment concluded that there is no clear reason for deviating from the standard building blocks of 5 MHz or 2 × 5 MHz. There is no obvious larger block size that can be expected to be equally preferable and suitable to all technologies and potential bidders. DotEcon observed that:

- observations from other 2.6 GHz auctions are inconclusive as to what constitutes the optimal lot size;

[117] EC decision 2008/477/EC, EC Decision 14 (BB) (draft), ECC Decision 13 (03) and EC Decision (11)06.

[118] There have been exceptions. For example, in the Belgian 4G auction, paired spectrum was offered as two 2 × 5 MHz lots and six 2 × 15 MHz lots, while unpaired spectrum was offered as a single 45 MHz lot.

- increasing the lot size to 20 MHz might remove some aggregation risks, but this would only be worthwhile if an SMRA-type auction was used;
- increasing the lot size could create asymmetries amongst bidders to the extent that this might only be a suitable building block for some but not all bidders. This would not be aligned with the objective of technology neutrality;
- creating different lot sizes could introduce restrictions on switching between different lot sizes creating further auction design challenges and complexity of bid decisions for bidders in an auction; and
- spectrum in the 3.6 GHz band is currently licensed for different technologies (FDD and TDD) and in blocks of different sizes. Smaller lot sizes accommodate both types of users in that band.

5.59 ComReg is of the preliminary view, taking account of DotEcon's analysis, that spectrum should be offered using lot sizes of 2 × 5 MHz or 5 MHz. Such lot sizes best accommodate all types of users and technologies since the auction design can provide for smaller lots to be aggregated to satisfy larger demand profiles.

5.5 Frequency Generic v Frequency Specific Lots

5.60 The lots made available in the proposed award process can be offered on either a frequency specific or frequency generic basis.

5.61 In a frequency specific auction, bidders bid on lots where each lot is assigned a specific radio frequency within a spectrum band. The winning bidder is assigned rights of use to that frequency lot and has no opportunity to be assigned rights of use to a different part of the band at a later stage.

5.62 In a frequency generic auction, bidders bid on lots in a given band independent of the position of those lots within the band. Where lots are assigned in this fashion, the auction requires an assignment round[119] for determining the specific frequencies assigned to each winner of the frequency generic lots.

[119] An assignment round allows winning bidders to place a value on the location of its winning lots in the band.

5.63 The advantage of frequency specific lots is that it allows bidders to take the value of specific frequencies into account in their demand. The adoption of a frequency specific approach, by allowing the placement of bids on specific lots, removes the risk of a bidder acquiring lots of no, or lesser, value to them as a result of any assignment stage.

5.64 ComReg, however, considers that the likelihood of a bidder acquiring lots of no, or lesser, value to them as a result of an assignment stage is low because the value difference between different positions within any of the bands included in the award process is likely to be marginal.

5.65 The frequency generic approach is particularly useful when there are a large number of frequency lots for release in that it can greatly reduce the number of bid combinations available to bidders initially, thereby simplifying the bidding process. This may be particularly relevant in this award process since given the large number of lots potentially available for assignment. Where any bidder requires a certain position in the band, it will have an opportunity to reflect that preference in the assignment stage.

5.66 The frequency generic approach also allows for the imposing of rules on assignments within a band where such rules are feasible. Most importantly, assignment of generic lots can in many cases allow the auctioneer to guarantee winning bidders of multiple lots within a band that they will be assigned frequencies corresponding to lots they have won in a single contiguous block.

5.67 ComReg is therefore of the preliminary view that a frequency generic approach is the most suitable approach for this award process. As such, ComReg proposes that the auction will include an assignment round where those bidders who won spectrum in the primary round will be able to bid for specific frequency ranges.

5.5.1 Spectrum Caps and New Entry

5.68 ComReg is of the preliminary view that it is important to limit the amount of spectrum that each bidder could acquire through the proposed award process. Spectrum caps should ensure that extremely asymmetric award outcomes are avoided while also ensuring that the distribution of spectrum is determined by competition amongst bidders. Where spectrum caps are employed, it is also important that they are high enough to enable bidders to acquire sufficiently large blocks of spectrum to meet their long term requirements. Spectrum caps can also be designed to facilitate new entry. New entry could also be achieved by setting aside spectrum for new entrants. ComReg notes that it applied spectrum caps in the MBSA process.

5.69 The extent to which a band-specific cap or a multi-band cap[120] or both, should apply depends on the amount of spectrum available for award and the extent to which these bands may be regarded as substitutes for one another.

5.70 Where spectrum in multiple bands is substitutable, an overall cap across those bands both avoids extreme asymmetric outcomes while maintaining flexibility in bidding choices across those substitutable bands.. In this scenario, a range of band-specific spectrum caps could artificially restrict the range of efficient outcomes available to bidders.

5.71 Where bands are complementary, band-specific spectrum caps may be needed to promote entry. This is because an overall cap, as opposed to band-specific caps, would allow incumbents to acquire a significant amount of spectrum in a certain band, e.g. the 700 MHz band, without which effective new entry may be precluded, without breaching the overall cap. In this scenario, the amount of spectrum remaining may not be sufficient to support a new entrant.

5.72 If both complementary and substitutable spectrum is to be assigned in the same award, a combination of band-specific and multi-band caps may be necessary in order to ensure that any bidder can obtain an appropriate aggregate amount of spectrum across all bands and a minimum amount of spectrum in certain bands. This can involve either a cap that is specific to one band and/or two or more bands together, where spectrum is sufficiently substitutable.

5.73 As outlined in Chapter 3, the 700 MHz is complementary to the Capacity Bands, therefore, should the 700 MHz band be included in the proposed award process, which ComReg notes is as yet uncertain, this may necessitate a band specific or sub-1 GHz spectrum cap in order to promote entry and, in turn, competition.

5.74 ComReg will consider, following receipt of views of interested parties on this matter:

i. what type of spectrum cap(s) if any should be applied in the proposed award process; and

ii. if any caps set should include current spectrum holdings of bidders taking part in the award process.

[120] A multiband cap could apply to a number of bands or to all bands (where it is normally referred to as an overall cap).

5.6 Sub-national licences at 3.6 GHz

5.75 DotEcon has noted that, given the likely interest from different types of users of this spectrum from 2017, it may be appropriate to award a subset of the 3.6 GHz spectrum on a regional or local basis.

5.76 In particular, DotEcon noted that this may be necessary for those operators currently holding a local licence or multiple local licences who have no demand for services in large parts of the country, and therefore have no need for a national licence.

5.77 DotEcon outlined that offering some licences on a regional basis would provide an opportunity for such users to express their demand individually in the award process.

5.78 As it might not be efficient to be overly prescriptive about the amount of spectrum that should be made available on a regional basis, DotEcon suggests that regional licences could be offered alongside national licences to allow for:

- a national operator to acquire a combination of regional licences across the whole country if there is excess demand for regional licences; or
- a regional bidder to bid for national licences if the price premium to be paid over a regional licence is sufficiently small.

5.79 ComReg is aware that, unlike other bands being proposed for inclusion in this award process, the 3.6 GHz band is essentially 'brownfield' spectrum in that licensed services are currently being provided to, an albeit relatively small, number of customers in that band.[121] ComReg also recognises the role played by such licensed services in the provision of broadband services to customers in certain parts of the State where there has been no alternative wire line provision of such services. ComReg will, of course, consider available options to identify the most appropriate mechanism for releasing spectrum in this band having regard to its obligations in respect of the management of the radio frequency spectrum. ComReg welcomes views in this regard.

[121] FWALA operators currently provide broadband access to 58,984 customers with 37,342 of those customers attributed to the 3.6 GHz band.

Chapter 6

6 Fees

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

- considers minimum prices and their relevance to the proposed award process;
- considers various possible approaches for setting a minimum price;
- sets out ComReg's preferred approach to setting a minimum price; and
- considers a minimum price structure most appropriate for the proposed award process.

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

- **Reserve Price/Minimum Spectrum Access Fee ("SAF") –** This is the minimum bid for a lot for such a lot to be allocated. The reserve price in an auction is an established price floor below which a lot will not be sold. If an auction is uncompetitive, lots may be sold at the reserve price if they are sold at all. In this document, the reserve price is also referred to as a minimum SAF;
- **Spectrum Usage Fee ("SUF") –** Annual fees which a successful bidder must pay in respect of spectrum rights of use assigned in the proposed award process. The SUF is an on-going fee payable throughout the duration of the licence and is additional to the amount that would be payable upfront at the conclusion of the auction. These on-going fees affect the value of a spectrum licence to bidders in terms of the expected net present value of a licence and can be expected to lower the upfront SAF achieved at the time of an auction; and
- **Minimum Price –** This is the price per lot in a lot category at the beginning of the auction. This price is the combination of the Reserve Price and SUF. For ComReg, the minimum price represents the lowest overall price subject to which it will grant rights of use in relation to the spectrum concerned. For bidders, the effective minimum price is the sum of the upfront reserve price and the discounted stream of annual SUFs.

6.1 Relevance of minimum prices to the proposed award process

6.3 The purpose of this section is to explain the role of a minimum price and consider whether the application of minimum prices is necessary for the proposed award process.

6.4 DotEcon notes that low participation levels are a necessary consideration in spectrum auctions. Low participation levels could lead to less intense competition especially if bidders have incentives to bid conservatively to keep prices low. DotEcon, therefore recommends that the application of minimum prices may be necessary in the proposed award process in order to:

- provide some guarantee that the spectrum will not be sold to low value users inefficiently due to low participation; and
- reduce the potential gains associated with withholding competition and tacit collusion, as encouraging bidders to compete promotes efficient outcomes.

6.5 Taking into account the DotEcon analysis, ComReg is 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. Such an opportunity provides bidders with an incentive to keep the price of spectrum artificially low.

6.6 ComReg is mindful of the need to ensure that the spectrum proposed for inclusion in the award process is assigned in a way that best ensures the efficient use of spectrum. Furthermore, given ComReg's statutory objective of promoting competition, the proposed award process should minimise the ability and incentive for participants to engage in any collusive behaviour which could compromise the proposed award process and lead to distortions of competition in downstream markets. A minimum price is therefore used to provide for the efficient allocation and use of spectrum by ensuring that the spectrum is awarded to those users that value it the most. For the reasons stated above, and in consideration of the DotEcon analysis, ComReg is of the view that the application of minimum prices is necessary for the proposed award process.

6.7 In respect of the level at which a minimum price should be set, a number of factors which should inform that decision and that are relevant to the proposed award process, include that:

- the minimum price should not be set so high as to choke off demand of serious bidders;
- the minimum price should not be set so low that there is participation by frivolous bidders;
- the minimum price in a multi-band award should not distort relative demand for different spectrum bands; and
- the minimum price should not facilitate collusive behaviour (whether tacit or explicit) or otherwise fixing demand;

6.2 Possible Approaches for setting the minimum price

6.8 This section considers four possible approaches that can be used to set minimum prices in the proposed award process.

6.9 ComReg, firstly, considers two approaches that are unrelated to the market value of the spectrum, namely the low but non-trivial approach and the administrative cost approach. Two approaches recommended by DotEcon are then considered, business modelling and international benchmarking, both of which aim to set a minimum price based on an estimate of the market value of the spectrum.

6.2.1 Low but non-trivial and Administrative costs

6.10 Under the low but non-trivial approach, the minimum price is set at the lowest level that could be expected to deter frivolous bidders participating in the proposed award process.

6.11 The low but non-trivial method is transparent, easy to understand, and implement in practice. Furthermore, and by virtue of its low level, it should guarantee that demand is not choked off inefficiently. If there is spectrum that is unsold, it should be due to deficient demand, not because demand has been choked off by an excessive minimum price.

6.12 ComReg, however, considers that there are a number of significant disadvantages that make this approach unsuitable for the proposed award process.

6.13 Firstly, it could facilitate the acquisition of spectrum at a significant discount to its true market value, which would not ensure the optimal use of that spectrum.

6.14 Secondly, a low but non-trivial price is set at a level that is substantially below market value but high enough to deter frivolous bidders. With prices starting at this level, bidders have a strong incentive to behave strategically to keep prices close to that low level and prevent them from escalating towards their actual market value. Furthermore, the recent concentration in the mobile market from four to three player's makes collusion that would prevent the market value of spectrum being realised in the auction easier to achieve than in past award processes like the MBSA (where two of the four successful bidders in that award process have since merged).

6.15 Under the administrative cost approach, the minimum price is set so as to recover at a minimum the administrative costs of running the award. In practice, and particularly in the present case, the administrative costs of running an award are likely to be small relative to the economic value of the spectrum. In this context, this approach may not be much different to the "low but non-trivial approach" and the advantages and disadvantages would appear to equally apply.

6.16 In addition, there is no guarantee that the minimum price will be high enough to deter frivolous bidders since the administrative costs are likely to be far below the market value of the spectrum proposed for inclusion in the award process.

6.17 Accordingly, ComReg is of the view that the minimum price should reflect a conservative estimate of the market value of spectrum. Minimum prices set according to administrative costs or according to a low but non-trivial approach are derived independent of the market value of the spectrum and therefore will not reflect the economic value to the user.

6.18 Furthermore, the use of either of the two approaches mentioned above in the proposed award process would likely result in minimum prices substantially below the true market value of the spectrum which would increase the incentives for bidders to behave strategically to reduce the price realised in the auction.

6.19 Winning bidders in such a scenario could:

i. acquire rights in respect of valuable spectrum, where cheaper capacity spectrum, which would satisfy such an operators requirements is readily available;

ii. use spectrally inefficient technologies that are available at low cost thereby denying the availability of spectrum to other parties, or new entrants, who may emerge in the future and have valid demand; and

iii. acquire spectrum without any actual requirement for it resulting in spectrum hoarding and the denial of spectrum to potentially efficient future users.

6.20 For the reasons set out above, both of these approaches are considered inappropriate for the proposed award process and are not considered further.

6.2.2 DotEcon approach to minimum prices

6.21 DotEcon firstly set out two options for spectrum valuation designed to be used in calculating the minimum price. These are that:

- the minimum price may be set to represent the value of the lot to the seller; and
- the minimum price may be set to an estimate of market value reflecting the option of a seller to find another buyer if bidders in the auction fail to offer a price that is sufficiently high.

6.22 DotEcon recommends that the first option is appropriate when the seller would prefer to retain the lot rather than selling it below this level. The second option ensures the lots will not be assigned at a low value in the event of a short run demand shortage, and most importantly provides a safeguard against assigning the lots to low value users in these scenarios.

6.23 DotEcon is of the view that minimum prices should be established in line with the second option, an estimate of market value, since this is best aligned with the objective of ensuring an efficient use of spectrum over the whole duration of the licence.

6.24 In this regard, DotEcon discusses two approaches to deriving a minimum price that are reflective of market value. These are Business Modelling and International Benchmarking.

6.2.3 Business Modelling

6.25 This is a forward-looking approach that involves the construction of a model to assess bidders' likely willingness to pay for the spectrum proposed for inclusion in the award process. It involves an assessment of the net benefit to a potential bidder by quantifying the incremental value of the bidder's business, as a result of being able to use the spectrum. The net benefit is calculated over the period associated with the licence, and a net present value calculated. By considering the business case of marginal bidders, an upper bound minimum price can be obtained.

6.26 Such an approach could, in theory, establish the value of spectrum to the user and would ensure that the full economic value of the spectrum is obtained. Accordingly, a winning bidder is likely to maximise full use of the acquired spectrum and use it efficiently.

6.27 DotEcon does not however recommend business modelling as an appropriate approach to establishing minimum prices for the proposed award process. It concludes that:

- it would be highly dependent on the underlying assumptions of the model including,
    - detailed assumptions on the alternative services that might participate in the process; and
    - the number of bidders of each type;
- it is subject to limitations in obtaining the necessary input data; and
- it would be difficult to obtain robust results under this approach.

6.28 ComReg agrees with this view and considers that business modelling would be highly sensitive to specific parameters and would be highly dependent on robust input data to which ComReg would not have access to the same quality as buyers.

6.29 More specifically, ComReg is of the view that business modelling suffers from a number of limitations which would make it unsuitable for the proposed award process. These include that:

1. there could be a substantial difference in the business case of interested bidders.

   This difference is acute in a technology neutral and service neutral licence award where different bidders may place different importance on the type and nature of services to be offered as well as in the type of technology to be used in delivering those services. This is particularly true of the proposed award process where there is likely to be a high degree of usage asymmetry between competing operators. There are a variety of services for which the spectrum proposed for inclusion in the award process might be used all of which have different commercial and revenue structures making it difficult to adequately reflect the true market value of the spectrum.
2. large information asymmetries exist between the seller and bidder.

Similar modelling approaches are typically used by bidders in preparing for spectrum auctions since they have access to full information regarding their particular valuations. A seller, however, cannot undertake such modelling to the same extent as a bidder as it would not have access to the same quality of information. The large information asymmetries that exist render the approach unreliable for determining minimum prices for the proposed award process.

3. there is a large amount of uncertainty surrounding the results of the modelling process.

   If the model has insufficient data or makes incorrect technical or commercial assumptions about the buyers' intentions this could result in a minimum price that is too high or too low. The seller would only become aware of this during the award process, at the earliest, as lots were sold too quickly or not at all. This would result in both a distortion to competition and the economic value of the spectrum not being realised if the minimum price is too low or efficient willing bidders are excluded because the minimum price is too high.

4. transparency would be difficult

   Due to the confidential and commercially sensitive nature of much of the required information, it would be difficult to achieve transparency in implementing this approach.

6.30 Therefore, for the reasons set out above, ComReg is of the preliminary view that business modelling is inappropriate as an approach for determining minimum prices for the proposed award process.

6.2.4 Benchmarking

6.31 Benchmarking is a process of determining minimum prices by looking at the licence fee and minimum prices of comparable spectrum auctions to provide a benchmark for the value of spectrum in a future award process. Benchmarking estimates the value of lots using observed prices in concluded auctions, and adjusts to take account of differences between awards and transactions. Benchmarking was successfully used by ComReg in the recent MBSA and in its 26 GHz Award Process.

6.32 DotEcon views benchmarking as a means of estimating the value of lots using observed prices in concluded auctions or transactions of similar spectrum in comparable environments, and adjusting these to take account of differences between awards and transactions.

6.33 DotEcon therefore recommends a benchmarking approach since it is based on factual observations and would provide more objective value estimates than a more subjective business modelling exercise as estimates would not be dependent on modelling assumptions and likely market developments.

6.34 Taking into account DotEcon's recommendations, ComReg considers benchmarking as the best approach to establishing minimum prices for the proposed award process. Benchmarking has the advantage of revealing information about the actual willingness to pay for spectrum in other countries for similar bands. Other approaches are based on assumptions and forecasts about future behaviour which can be incorrect or change with proximity or onset of an award process.

6.35 Importantly, information asymmetries between the seller and potential buyers would not arise as ComReg would not require access to confidential or commercially sensitive information of market participants. It also offers the potential to minimise the potential for collusion.

6.2.5 Proposed approach for setting the Minimum Price

6.36 ComReg considers, taking account of DotEcon's recommendations, that minimum prices should be derived from an estimate of market value as this is best aligned with the objective of ensuring the efficient use of the spectrum over the whole duration of the licence. By so establishing a minimum price, lots would not be sold in the event of a lack of short term demand and rights of use should not be inefficiently assigned in low demand scenarios.

6.37 Furthermore, ComReg considers, taking account of DotEcon's recommendations, that a benchmarking approach is the most appropriate approach to establishing minimum prices for the proposed award process since it is based on factual observations and is less dependent on assumptions on likely market developments or uncertain future commercial decisions.

6.38 DotEcon has, however, noted that benchmarking the market value of spectrum from existing transactions poses a number of issues that need to be addressed before implementing a suitable benchmarking approach. These include that:

- there may only be limited spectrum transactions in the form of an auction or a bilateral agreement that may vary depending on transaction specific factors;

- the observed transaction values may not reflect the economic value of the spectrum to the user, if expectations are overvalued this could lead to the minimum price choking off demand; and

- the observed transaction values only provide information about the value of spectrum relevant to a specific time period rather than likely demand and value and demand over a wider time period.

6.39 It should be noted, however, that there are various techniques and metrics[122] available for deriving benchmarks depending on the nature of an award process and the extent of the sample of data available. Accordingly, ComReg is of the view that where these concerns arise, a benchmarking technique has sufficient flexibility to adjust to such factors.

6.40 In light of the concerns highlighted above and their relevance to the proposed award process, DotEcon recommends that ComReg applies the following benchmarking approach:

1. minimum prices should be set at a conservative estimate of market value;
2. a band specific benchmark for 2.6 GHz spectrum and the 700 MHz band should be determined; and
3. a common minimum price for the additional capacity spectrum should be set with reference to the 2.6 GHz band.

6.2.6 Conservative estimate of market value

6.41 The benchmarking approach used in the MBSA did not set out to predict the final winning licence price in that award process[123], but derived a conservative estimate of the market value of liberalised spectrum in order to allow ComReg to set an appropriate minimum price in the auction. Such a conservative methodology minimises the risk of setting a minimum price that chokes off efficient demand (i.e. demand of serious bidders) in the auction.

6.42 In respect of the level of the minimum price which should be set for the proposed award process, DotEcon recommends that:

[122] Different benchmarking metrics can be used to create various cuts of the data so that it is comparable to the Award Spectrum. These include population, population density, type of spectrum, competiveness of auction and technical conditions on licences.

[123] Indeed, it is clear from the auction results that the benchmarked reserve prices were greatly exceeded.

- it should be set closer to the estimated value of the spectrum if there is concern that a premature award of spectrum[124] may inefficiently displace valuable future uses or lead to excessive take up simply because the price of spectrum is offered at a relatively low price;
- it should be conservative when there is more uncertainty about the value of lots; and
- it should be conservative in order to minimise the risk of choking off demand if market value estimates are too high.

6.43 In light of the above, ComReg is of the preliminary view that the minimum price should be set by reference to a conservative estimate of the market value of spectrum.

6.44 For the avoidance of doubt and as noted previously, the benchmarking estimate is used solely to determine a conservative estimate of the minimum price. It does not set out to predict the final price of the spectrum. This will be determined solely by the competitive interaction of bidders in the proposed award process.

6.2.7 Benchmark for 2.6 GHz spectrum

6.45 In the MBSA, a variety of different averages and econometric forecasts were used to investigate the implied value of the award spectrum. A range of spectrum auction prices across various bands were used to produce a *lower bound estimate*. Minimum prices derived in the MBSA are relevant to sub-1 GHz spectrum such as the 700 MHz band but are not comparable to the value of the 2.6 GHz band and other capacity based spectrum generally. Therefore, DotEcon recommends that a band specific 2.6 GHz benchmark should be used to estimate the minimum price for spectrum in the Capacity Bands.

6.46 Sixteen European countries have auctioned 2.6 GHz spectrum and, as a result, the available sample, although smaller than that used to benchmark the value of sub-1GHz spectrum in the MBSA[125], is likely to be relevant in this award. Where appropriate, careful consideration of prices from multi band combinatorial auctions would need to be taken since it would not be possible

[124] ComReg considers that the proposed award process is timely, necessary and appropriate. The EC 2.6 GHz Decision sets out that services provided in the 2.6 GHz band should target end user access to broadband communications, as this will likely be the technology standard in the future. The band is also widely used for the provision of WBB across a number of Member States and it is unlikely that there will better or alternative uses over the duration of the licence.

[125] See DotEcon report on "Award of 800MHz, 900 MHz or 1800MHz - Fifth Benchmarking Report" (Document 12/23).

to break down package prices into band specific prices without detailed bid data.[126] DotEcon also observes that auction prices for the 2.6 GHz band have varied considerably since the first European award in Norway in 2008, and will consider this when coming to its final benchmark proposals for 2.6 GHz spectrum.

6.47 In light of the above, DotEcon recommends that estimating the value of the 2.6 GHz spectrum requires identifying those observations that are considered most relevant and placing a greater weight on such observations, in particular later observations which should better reflect the current market value of the band after the recent making available of the 800 MHz and 1800 MHz bands for LTE. In this way, the benchmark for the 2.6 GHz spectrum should result in an appropriate value estimate across relevant and suitably weighted spectrum auctions in the 2.6 MHz band. ComReg is of the preliminary view that this is an appropriate approach to benchmarking for the 2.6 GHz band.

6.2.8 Benchmark for remaining capacity spectrum

6.48 Relevant data points for the other capacity bands are more scarce than for the 2.6 GHz band and are not recent, therefore providing a poor reference point for the current value of these bands. For example:

- there has been just one auction of 1.4 GHz spectrum to date (UK L-Band Auction in 2008);
- only Norway has auctioned 2.3 GHz spectrum, in 2006. Elsewhere, Canada, Singapore, Hong Kong, India and Nigeria have also auctioned 2.3 GHz where prices vary widely and across different timelines; and
- there have been 15 European auctions in the 3.6 GHz band; however, most of these occurred a number of years ago with the most recent being in Portugal in 2010. Therefore, using these observations might not represent a contemporary view of the market value.

6.49 In general, DotEcon notes that the prices obtained in 2.6 GHz auctions exceed that of other capacity spectrum and that the greater deployment and availability of applications using spectrum in the 2.6 GHz band might drive its value above that of other capacity spectrum. Therefore, the 2.6 GHz band

[126] Nonetheless, the results from combinatorial auctions can be used as a cross-check of band specific value estimates. To date, this exercise suggests that the package prices obtained in combinatorial auctions are broadly consistent with the estimates for the lots in the package obtained from band-specific benchmarks.

seems likely to represent the highest valued capacity spectrum in the proposed award process.

6.50 Given the shortage of data for other capacity bands, it may be necessary to set a minimum price for the other capacity spectrum bands by reference to the 2.6 GHz band. In this regard, DotEcon recommends that it would be appropriate to establish the likely relative values for imperfect substitutes and ensure that minimum prices are set at levels consistent with this.

6.51 In light of the above, for other capacity bands, ComReg is of the preliminary view that a minimum price for the other capacity bands should be set based on the estimated value of 2.6 GHz spectrum by investigating the relative valuations of 2.6 GHz spectrum and spectrum in those bands. DotEcon notes that it may be appropriate to set a lower common minimum price for these bands given that these bands have similar characteristics and have been designated for similar uses. However, ComReg notes that the additional capacity bands might require more than one minimum price in order to reflect some of their respective differences.

6.52 Overall, in ComReg's view, it is desirable to set minimum prices for different capacity bands by reference to the 2.6 GHz band. This also ensures that minimum prices for the various capacity bands are all based on a conservative estimate of market value (for the 2.6 GHz band). This approach also takes into account the multiband nature of the proposed award process and the interaction of relative demand for each frequency band.

6.2.9 Conclusion on Benchmarking for this Award Process

6.53 ComReg agrees with the above approach to setting minimum prices as it ensures that the concerns highlighted by DotEcon are minimised in the following ways:

(a) by ensuring that only data points relevant to this Award Process are used;

(b) using a conservative estimate of market value minimises the risk of artificially choking off demand; and

(c) by giving a higher weighting to more recent observations, the minimum prices estimate best represents the most recent value of spectrum.

6.3 Minimum Price Structure

6.54 The fee for spectrum rights of use awarded in the MBSA consists of a minimum upfront SAF which is payable as part of the award process and

SUFs which are paid prior to the initial grant of the licence and then periodically over the licence duration.

6.55 The rationale for this minimum price structure in the MBSA was to create sufficient incentives for licensees to make efficient use of spectrum and to hand back part or all of any spectrum holdings for which they no longer have any use.[127]

6.56 DotEcon notes that the recent introduction of spectrum trading could potentially reduce the importance of SUFs in encouraging the efficient use of spectrum.

6.57 Notwithstanding this, DotEcon is of the view that SUFs continue to play an important role in encouraging the efficient use of spectrum and the spectrum trading regime should be viewed as a complementary tool in ensuring this efficient use rather than a replacement for it. Spectrum transfers will only likely take place when there is a sufficiently large value difference between the buyer and the seller. Where the value differential is too small it may be more beneficial to retain the unused spectrum in order to deny a competitor efficient use of same. In this context, the SUF may provide a stronger incentive to trade or return spectrum than the expectation of revenue that could be generated from a spectrum transfer.

6.58 As also noted by ComReg in its most recent spectrum strategy statement[128], there may be little incentive for rights holders of spectrum in harmonised bands to trade with competitor firms and initial experience to date in other jurisdictions bears this out. Even if a firm has valuable spectrum that it is currently not using intensively it may well choose to retain this spectrum in order to be able to react to growth in demand that it had not previously predicted. In addition, selling such spectrum to a rival is an irreversible decision which may carry a greater risk to the firm than holding onto the unused spectrum.

6.59 ComReg is therefore of the preliminary view, taking into account the views expressed by DotEcon and in its most recent strategy statement, that a fee structure composed of both a minimum upfront SAF and ongoing SUFs should be applied for the following reasons:

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127 The important role played by annual SUFs in ensuring the efficient use of spectrum is also emphasised in ComReg's most recent spectrum strategy statement (See Section 7 of ComReg Document 11/89).

128 See Section 4.2 of ComReg Document 11/89.

- paying SUFs on an ongoing basis during the licence period would encourage licence holders to consider the opportunity cost of holding rights of use throughout the period of the licence.
- a real financial outflow (i.e. the SUF) will provide a stronger incentive than an opportunity cost alone (i.e. the revenue forgone from not trading) to use spectrum efficiently;
- SUFs should remain helpful in the event that the secondary trading spectrum market does not function properly;
- SUFs encourage efficient use of the full assignment as opposed to seeking partial transfers from the spectrum trading regime; and
- SUFs encourage those operators who have no desire to retain spectrum but do not wish to trade spectrum, to return it to ComReg.

6.60 In the MBSA, SUFs were indexed to inflation based on the Consumer Price Index ("CPI"). For the purpose of the proposed award process, it is proposed that SUFs are index-linked to CPI as published by the Central Statistics Office of Ireland or its successor in order to adequately reflect the value of spectrum over time.

6.61 ComReg is, therefore, of the preliminary view that minimum prices should consist of a two-part payment structure composed of an upfront SAF and an ongoing stream of indexed SUFs.

6.3.1 Minimum Price Split

6.62 In addition to the discussion above regarding a minimum price structure (both an upfront SAF and an ongoing stream of SUFs), it is necessary to consider an appropriate split between these fee payments.

6.63 In the MBSA, the minimum price was apportioned on a 50/50 basis between the minimum upfront SAF and ongoing SUF. In practice a greater proportion of the total cost of the licence was in the form of an upfront fee as the combined lots sold were above the combined minimum price for those lots.

6.64 DotEcon recommends against setting SUFs too high as this reduces the cost of acquiring too many lots. In a high SUF scenario, bidders who acquire a large number of lots face low upfront costs and retain the possibility of returning spectrum at a later date thus avoiding any outstanding SUFs. In this scenario, a bidder has incentives to acquire a large amount of spectrum and adjust in relation to market demand at a low cost depriving more efficient users of the timely use of spectrum. The bidder would be able to return this spectrum at a later date if the benefits from retaining such spectrum fell below

the costs of the annual SUFs particularly at the point where it consolidated its market position.

6.65 In this respect, ComReg considers that the SUFs should be sufficiently high so as to:

(a) incentivise licensees to hand back part or all of their spectrum holdings in the event that they no longer have use for the spectrum;

(b) 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

(c) ensure that participation in the auction will be limited to serious, credible bidders.

6.66 ComReg has also considered the possibility of having a different split of minimum prices across different bands. Using a different split, however, risks distorting relative demand for substitutable spectrum, in particular from bidders who may be sensitive to alternative payment conditions. DotEcon, therefore recommends the same split for substitutable bands especially where they are close substitutes. While the Capacity Bands are not equally substitutable between each other, these bands have similar characteristics and are designated for similar uses. Accordingly a different split across the Capacity Bands appears unwarranted.

6.67 The incentives to acquire spectrum for hoarding purposes do not appear to be greater in the proposed award process than in the MBSA. Indeed, given the amount of spectrum available and the range of operators and potential uses of the spectrum proposed for inclusion in the award process the incentives for hoarding may even be less. ComReg is therefore of the preliminary view that the minimum price for the proposed award process should be apportioned on a 50/50 basis for the Capacity Bands consistent with the approach taken in the MBSA.

6.68 ComReg, additionally, considers the potential inclusion of the 700 MHz band in the proposed award process. DotEcon is of the view that such a situation might warrant a different split compared with the Capacity Bands where higher SUFs could help encourage long term efficient use. Alternatively, it may be more appropriate to set SUFs comparable to those for the 800 and 900 MHz spectrum (i.e. SUFs and SAFs apportioned on a 50/50 basis). Given the high degree of substitution between this band and the 800 and 900 MHz bands awarded in the MBSA and the proximity of that award process, ComReg proposes to apply a similar split for the 700 MHz band if it becomes available for inclusion in the proposed award process.

Chapter 7

7 Indicative Licence Conditions

7.1 In accordance with Regulation 10(1) of the Authorisation Regulations, ComReg may only attach those conditions listed in Part B of the Schedule to the Authorisation Regulations to rights of use for radio frequencies.

7.2 In this chapter, ComReg sets out its proposals regarding appropriate conditions that should be attached to any spectrum rights of use that may be granted under the proposed award process.

7.3 Noting the similarities between the rights of use being made available under the proposed award process and those made available under the MBSA[129] and the temporal proximity of the two processes, ComReg is guided, in principle, by the approach taken to identifying appropriate licence conditions under the MBSA process and the rationale for that approach. However, ComReg acknowledges that the type of parties likely to be interested in participating in the proposed award process is not necessarily identical to that in the MBSA and has borne this in mind when considering appropriate licence conditions below.

7.4 This chapter discusses the following proposed licence conditions:

- notification of the termination of a technology;
- roll-out and coverage; and
- quality of service.

7.1 The notification of the termination of a technology

7.5 While Regulation 18 of the General Authorisation [130] ("GA") (Document 03/81R4) sets out a number of consumer protection rules, that apply to Authorised Persons in the event of a cessation of service[131], ComReg notes

[129] Similar at least in terms of propagation characteristics and actual or expected application by operators at EU and international level.

[130] http://www.comreg.ie/_fileupload/publications/ComReg0381R4.pdf

[131] Amongst other things, Regulation 18 obliges an Authorised Person to:

- notify ComReg of an actual or anticipated cessation of service affecting a substantial number of consumers (Condition 18.2);

that the cessation of services caused by the termination of the use of one technology in favour of another is currently not within the scope of the consumer protection provisions of Condition 18 of the General Authorisation. The MBSA process awarded rights of use which required notification to ComReg where an operator proposes to terminate the provision of services using one technology in favour of the continued provision of the services using another technology. It is proposed to attach a similar condition to rights of use assigned under the proposed award process. This licence condition aims to minimise the effects on consumers from disruption in services.

7.6 Therefore, ComReg proposes to attach a condition to rights of use assigned under the proposed award process requiring a licensee to give six months' notice of its intention to terminate the provision of services using one technology in favour of another.

7.2 Roll-out and Coverage

7.2.1 Licence conditions in the MBSA process

7.7 When considering whether it would be appropriate to set a coverage and roll-out obligation during the MBSA process, ComReg noted that:[132]

- it is entitled to attach coverage requirements to spectrum rights of use, (see Condition 1 in Part B of the Schedule to the Authorisation Regulations) subject to compliance with Regulation 10 of the Authorisation Regulations;

- even in competitive markets there is no guarantee that market forces will deliver and maintain an acceptable level of coverage across the State, particularly as operators consolidate and seek efficiencies in their respective radio access networks. This can lead to operators choosing to 'cherry-pick', focusing on the most profitable market segment(s) only; and

- provide ComReg with information which it deems necessary, where ComReg forms the view that there is a reasonable probability of a cessation of service (Condition 18.4); and
- at all times use reasonable endeavours to ensure the effect of any cessation of service is minimised (Condition 18.5).

[132] See Section 5.5.1 of ComReg Document 12/25 "*Multi-band Spectrum Release - Release of the 800 MHz, 900 MHz and 1800 MHz Radio Spectrum Bands"*

- accordingly, regulatory intervention may be required in the form of a licence condition specifying a certain minimum level of coverage. This would minimise the above risks and ensure the efficient use of spectrum.

7.8 As such, in the MBSA process[133], ComReg formed the view that a 70% population coverage obligation was appropriate having regard to its statutory objectives, for the following reasons:

- actual coverage levels were expected to exceed this 70% population obligation by a considerable margin given the competitive nature of the market and the limited risk of coverage levels receding from existing levels;

- a 70% population coverage level is sufficient to provide coverage in all the townlands in Ireland with 50 inhabited houses or more. At the same time, MNOs will have both the opportunity (through substantially reduced costs) and the incentive (through strong competition on coverage) to provide a service which exceeds the minimum population coverage level;

- the existing GSM and 3G mobile networks already have coverage levels exceeding 70%, meaning that these operators could leverage existing network infrastructure to offer coverage levels in excess of 70% of the population;

- a 70% population coverage licence condition is without prejudice to the possibility of legitimate operator co-operation (such as network sharing) arising in the future. This has the potential to be a more efficient means of serving sparsely populated areas. So long as there remains effective competition between networks, such co-operation allows operators to minimise their costs and avoid any inefficient infrastructure duplication; and

- a 70% population coverage level seems unlikely to deter new entrants or incumbents from entering into the auction and competing for spectrum (noting that the timeline for roll-out was more relaxed for new entrants, see below).

7.9 Furthermore, ComReg relied on independent expert advice from its economic and technical advisors in arriving at the above licence condition.

[133] For further information, please see Section 5.5 of ComReg Document 12/25.

7.10 In order to facilitate market entry, ComReg allowed for asymmetric roll-out periods in which to meet this coverage obligation:

- for an existing MNO, the 70% population coverage obligation was to be met within 3 years; and
- for a new entrant MNO, the 70% population coverage obligation was to be met within 7 years, with an obligation to meet an interim coverage obligation of 35% population coverage within 3 years.

7.11 The coverage obligation could be met using any rights of use acquired in the MBSA process, and, for existing MNOs, up to half of the coverage obligation (i.e. 35%) could be met using other pre-existing rights of use (i.e. in the 2100 MHz band).

7.12 National roaming could not count towards coverage obligations.

7.2.2 Coverage and roll-out principles for this proposed award process

7.13 ComReg considers that, in general, the reasoning and justification highlighted in the MBSA process for applying coverage and roll-out obligations still hold and are equally valid in respect of this award process. In particular, there is no guarantee that market forces alone will ensure the efficient use of radio spectrum and ComReg, therefore, proposes that minimum coverage requirements should be attached to spectrum rights of use.

7.14 However, ComReg is fully cognisant that the frequency bands proposed for inclusion in this award process are predominantly capacity bands, at least from the point of view of MNOs. For example, with the exception of the 700 MHz and 1.4 GHz bands, the bands proposed for inclusion in this award process exhibit propagation characteristics which are more appropriate for applications aimed at supporting capacity over relatively short ranges rather than for wide-area coverage. Where spectrum is to be used for capacity purposes only (e.g. in high traffic hotspots like town centres), a coverage requirement may, on balance, be less effective for ensuring the efficient use of spectrum than where the spectrum is used, at least partially, for wide area coverage purposes.

7.15 Notwithstanding this, there is a practice at both domestic and international level of imposing coverage and roll-out obligations on higher frequency bands having similar propagation characteristics to the bands in the proposed award process which are above 1 GHz. For example, a coverage obligation was attached to all rights of use awarded under the MBSA including those in the

1800 MHz band. In addition, licence conditions pertaining to coverage have been attached to 3G licences in the 2100 MHz band. In terms of international practice, since 2010 at least seven European countries[134] have elected to attach coverage obligations to licences in the 2.6 GHz band, albeit obligations which are, in general, less onerous than those attached to licences awarded for lower frequency bands such as the 800 MHz and 900 MHz bands.

7.16 In light of the differing propagation characteristics of the bands considered for inclusion in the proposed award process, the design of a coverage obligation should be appropriate to the bands in question. Accordingly, the bands proposed for inclusion in this process could, for the purposes of imposing a coverage requirement, be differentiated in terms of propagation characteristics and, in turn, likely application:

- the 1.4 GHz[135], 2.3 GHz, 2.6 GHz and 3.6 GHz bands (i.e. those bands above 1 GHz[136]), to which a less onerous coverage obligation might apply; and

- the 700 MHz band, to which a more onerous coverage obligation (relative to the above obligation) might apply given its relatively more favourable propagation characteristics than the above bands.

7.17 For the purposes of the proposed award process, ComReg is of the view that a minimum coverage obligation for the Capacity Bands should also apply to ensure the efficient use of the radio spectrum. This coverage obligation could take the form of a population coverage requirement or other appropriate measure. In cases, however, where such radio spectrum is being used for both 'coverage' and 'capacity' purposes, then a more onerous coverage obligation might apply.

7.18 ComReg also proposes to attach coverage obligations to rights of use in the 700 MHz band. In Europe, sub-1 GHz rights of use suitable for mobile

[134] Germany, Netherlands, Austria, Italy, Romania, Czech Republic and Slovak Republic - for further information see Annex A of DotEcon report.

[135] However, as the band is harmonised for SDL at the European level, ComReg must consider whether to treat the 1.4 GHz band in a manner similar to other capacity bands proposed for inclusion in the award process or alternatively to make available with or without an alternative coverage obligation.

[136] These bands are more likely to be viewed by MNOs as capacity bands. While fixed wireless operators are unlikely to view these bands as 'capacity' bands, they would still likely be viewed differently to traditional coverage bands, because of their differing propagation characteristics and, in turn, lower relative market value.

services generally have coverage obligations attached. However, given the specific policy environments and service deployment contexts of individual countries, the level of coverage obligations differs considerably across countries (and also across rights of use made available in a single award process), depending on the specific policies and objectives each country wishes to achieve.[137]

7.19 At this point, ComReg is not proposing any specific level of coverage obligations which may attach to any 700 MHz rights of use or indeed setting out specific objectives it wishes to achieve through the setting of coverage obligations, beyond that of ensuring the efficient use of spectrum.

7.20 Nevertheless, having elsewhere noted the discrepancy in the availability of advanced electronic communications services in different areas of the State[138], ComReg invites the views of all interested parties to comment on what level of coverage obligation would be justified and proportionate (and in line with ComReg's statutory remit as described in Annex 2) to attach to future rights of use in some or all of the spectrum bands proposed for inclusion in the award process, to assist in addressing this discrepancy.

Roll-out conditions

7.21 In relation to speed of roll-out, again ComReg is of the preliminary view that it is appropriate to attach equivalent roll-out conditions to the 700 MHz band as applied to the bands awarded in the MBSA process. In particular, ComReg proposes that:

[137] Recent award processes of sub-1 GHz spectrum suitable for WBB services have predominantly included coverage obligations. These obligations range from 50% population coverage (e.g. Switzerland) to population coverage obligations above 95% (e.g. Austria, Belgium, Czech Republic, Finland, UK).

A number of the recent award processes included complex rules on how the obligations could be achieved (e.g. jointly between operators, allowing coverage from other technologies to count toward coverage obligations) and/or specific rules on network roll-out (e.g. rural areas first, obligations for specified municipalities) and so comparison between obligations in various countries is not straightforward.

Additionally, it should be noted that high coverage obligations in many countries were set with the aim of achieving specific policy objectives such as national broadband plans and Digital Agenda 2020 targets (e.g. Austria, Sweden, Germany, Portugal, Denmark).

[138] See section 5.4 of ComReg Document 14/75

- for an operator with an existing national wireless network[139], that the population coverage obligation is to be met within 3 years; and

- for all other licensees (i.e. a licensee without a 'national wireless network'), that the population coverage is to be met within 7 years, with an interim obligation of half the population coverage to be met within 3 years.

7.22 For the remaining bands, ComReg is minded to attach rollout conditions which may be dependent on whether a licensee has an existing network or not. Nevertheless, ComReg is minded to impose rollout conditions for such bands that meet the required coverage obligation within 3 to 7 years.

7.3 Quality of Service ("QoS")

7.23 In relation to the imposition of quality of service standards, ComReg notes the position that it adopted in the MBSA process:[140]

> "*it is not appropriate to specify what services can be deployed in the bands for award. However, where ComReg sets a QoS obligation for a particular service and the licensee (or a third party on the licensee's network) then chooses to provide that service, the QoS obligation would apply to that service*."

7.24 As various services, including FWA, could be provided using spectrum that may be included in the proposed award process, ComReg notes that it may be appropriate and necessary to apply service and technology specific QoS standards that are, in its view, appropriate to protect the interests of consumers and are proportionate and non-discriminatory.

7.3.1 Network Availability

7.25 ComReg notes that Part B of the Schedule to the Authorisation Regulations specifically mentions 'quality requirements' as one of the conditions which can be attached to spectrum rights of use and that even in competitive markets there are situations where, due to information asymmetries, the setting of minimum QoS standards may be necessary in order to protect end users.

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[139] An existing wireless network refers to an operator with a national footprint. This category might, for example, include an MNO with a 'national network' or one which had entered into a network sharing agreement with another operator to the same effect. This could also include a fixed wireless operator.

[140] Document 12/25, at paragraph 12.243.

ComReg therefore proposes to attach similar QoS licence conditions to rights of use awarded under the proposed award process as were attached to licences awarded under the MBSA process.

7.26 The attachment of a licence condition concerning QoS standards was discussed at length in the MBSA process and, in particular, in section 5.6.2 of ComReg Document 12/25.[141]

7.27 In summary, ComReg believed that setting a licence condition relating to network performance protects consumers against unreasonable levels of disruption to their mobile service and safeguards the interests of consumers against operators who might otherwise have unacceptably high levels of network unavailability. ComReg noted that:

- attaching maximum levels of network unavailability to licences for liberalised spectrum ensured a minimum QoS standard that was in line with current expectations as these standards had been in place for over 15 years and appeared to have served consumers well over this period; and

- to date, ComReg had not received any information to suggest that the proposed maximum overall duration of network unavailability, which was equivalent to those standards which were attached to GSM licenses, was inappropriate or placed a disproportionate burden on licensees.

7.28 ComReg is of the preliminary view that a similar rationale applies in the context of the proposed award process and that QoS licence conditions should apply to all wireless service providers in these bands as it is appropriate to protect consumers of all wireless services and not just those of mobile services. In relation to network availability, ComReg therefore proposes to set the following conditions:

- each licensee is to keep a log of network availability, available for inspection by ComReg;

- each licensee is to ensure that network unavailability is less than 35 minutes per six month period; and

- the calculation of network unavailability will be subject to weighting factors that take account of traffic load variations.

[141] http://www.comreg.ie/_fileupload/publications/ComReg1225.pdf

7.29 In line with the approach taken in the MBSA, as outlined in Section 5.6.3 of Document 12/25, ComReg proposes 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 MVNO arrangements) are to be captured under this QoS obligation. ComReg also proposes that, as in the MBSA, its assessment of this obligation will be made against the aggregate total.

7.3.2 Voice call Standards

7.30 ComReg considers that there is a possibility that at least some of the rights of use that may be awarded in the proposed award process will be used to provide voice call services. As such, ComReg is of the view that proposing minimum standards, where a voice call service is provided, is also in line with its statutory objectives in that:

- the interests of consumers would be safeguarded against operators who might not otherwise maintain acceptable quality levels for voice calls;
- attaching similar QoS standards for voice calls to those applied in the MBSA would ensure that the minimum QoS standard for mobile voice calls is in line with current expectations; and
- the standards have been in place for over 17 years and appear to have served consumers well over this period.

Similar to the approach taken in the MBSA, ComReg proposes that all relevant non-VoIP 'voice call' services provided to a licensee's customers and provided to third party customers by a licensee, are to be captured under this QoS obligation. ComReg further proposes that managed VOIP call services will also be captured under this QoS obligation as such services are considered to be substitutable with traditional voice call services[142] and are increasingly used by consumers. ComReg also proposes that any assessment of this obligation will be made against the aggregate total.

[142] 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.

Chapter 8

8 Submitting Comments and Next Steps

8.1 Submitting Comments

8.1 All input and comments are welcome. However, it would make the task of analysing responses easier if comments were referenced to the relevant section / paragraph number in each chapter and annex in this document.

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

8.3 The four week period for comment will run until 17:00 on Tuesday 28 October 2014, during which time ComReg welcomes written comments on any of the issues raised in this paper.

8.4 Responses must be submitted in written form (post or email) to the following recipient, clearly marked —Submissions to ComReg 14/101:

Ms. Sinéad Devey

Commission for Communications Regulation

Irish Life Centre

Abbey Street

Freepost

Dublin 1

Ireland

Email: marketframeworkconsult@comreg.ie

8.5 We 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.

8.6 ComReg appreciates that respondents may wish to provide confidential information if their comments are to be meaningful. In order to promote openness and transparency, ComReg will publish all respondents' submissions to this 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 information[143]. In that regard, respondents are requested to provide both a confidential and non-confidential version of their submission to the consultation, providing supporting reasoning as to why they consider material to be confidential. Alternatively, respondents are requested to place confidential material in a separate annex to their response, again providing supporting reasoning in that annex as to why such material is confidential.

8.2 Next Steps

8.7 When it has concluded its review of all of the submissions received and other relevant material, ComReg's intention would be to publish a response to consultation together with a further consultation.

[143] Document 05/24 - Response to Consultation - Guidelines on the treatment of confidential information - March 2005.

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
1800 MHz band	The frequency range 1710 – 1785 MHz paired with 1805 – 1880 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
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.
EC 2.6 GHz Decision	Refers to EC Decision 2008/477/EC. See Section A1.3 below for further details
EC 3.6 GHz Decision	Refers to EC Decision 2014/276/EU. See Section A1.3 below for further details
ECC 1.4 GHz	Refers to ECC Decision (13)03. See Section A1.3 below for

Decision	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 telegraphy apparatus used for the retransmission of programme services on a point to multipoint basis at frequencies of 1 gigahertz or above;
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 allocated.
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 3rd Generation Partnership Project
ComReg	Commission for Communications Regulation
CEPT	Conférence européenne des Administration des postes et des télécommunications. In English, European Conference of Postal and Telecommunications Administrations
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[144]
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 2 500-2 690 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 terrestrial systems capable of providing pan-

[144] Includes the Communications Regulation (Amendment) Act 2007 and the Communications Regulation (Premium Rate Services and Electronic Communications Infrastructure) Act 2010.

	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 3 400-3 800 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
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
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.
Meteor	Meteor Mobile Communications
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
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)
SUF	Spectrum Usage Fee
T-DAB	Terrestrial Digital Audio Broadcasting
TDD	Time Division Duplex
TD-LTE	Time Division – Long Term Evolution
UE	User Equipment
UMTS	Universal Mobile Telecommunications System.
UMTS-TDD	Universal Mobile Telecommunications System – Time Division Duplex
UTRA	Universal Terrestrial Radio Access
Vodafone	Vodafone Ireland Limited
WDMDS	Wideband Digital Mobile Data Services
WiMAX	Worldwide Interoperability for Microwave Access

Annex 2: Legal Framework and Statutory Objectives

A 2.1 The Communications Regulation Acts 2002-2011[145] (the "2002 Act"), the Common Regulatory Framework (including the Framework and Authorisation Directives [146] as transposed into Irish law by the corresponding Framework and Authorisation Regulations[147]), and the Wireless Telegraphy Acts1926 to 2009 [148] 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 relation to postal services, premium rate services or market analysis). For

[145] 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.

[146] 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")

[147] 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.

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

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.

A1.1 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 competition[149];
- contribute to the development of the internal market[150];
- promote the interests of users within the Community[151];
- ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under Section 13 of the 2002 Act[152]; and
- unless otherwise provided for in Regulation 17 of the Framework Regulations, take the utmost account of the desirability of technological neutrality in complying with the requirements of the Specific Regulations [153] in particular those designed to ensure effective competition [154].

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

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

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

[152] 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.

[153] 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).

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

A1.1.1 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.

A1.1.2 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.

A1.1.3 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.

A1.1.4 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.

A1.1.5 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.

A1.1.6 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;[155]

- have regard to international developments with regard to electronic communications networks and electronic communications services, associated facilities, postal services, the radio frequency spectrum and numbering[156]; 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.[157]

A1.1.7 Policy Directions[158]

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

[155] Section 12(3) of the 2002 Act.

[156] Section 12(5) of the 2002 Act.

[157] Section 12(6) of the 2002 Act .

[158] 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.

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.

A 2.19 ComReg is conscious that the three year objective described in this policy direction has now expired making this direction less relevant currently.

Policy Direction No.4 on Industry Sustainability

A 2.20 ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.

Policy Direction No.5 on Regulation only where Necessary

A 2.21 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 2.22 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 2.23 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 2.24 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 2.25 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.

A1.2 Other Relevant Obligations under the Framework and Authorisation Regulations

A1.2.1 Framework Regulations

A 2.26 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 2.27 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 2.28 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 2.29 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 2.30 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 2.31 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 2.32 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 2.33 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 2.34 Regulation 17(9) provides that Regulations 17(2) to (7) only apply to spectrum allocated to be used for electronic communications services, general authorisations issued and individual rights of use for radio frequencies granted after the 1 July 2011. Spectrum allocations, general authorisations and individual rights of use which already existed on the 1 July 2011 Framework Regulations are subject to Regulation 18.

A 2.35 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 2.36 Regulation 17(11) requires ComReg to, in the fulfilment of its obligations under that Regulation, respect relevant international agreements, including the ITU Radio Regulations and any public policy considerations brought to its attention by the Minister.

A1.2.2 Authorisation Regulations

Decision to limit rights of use for radio frequencies

A 2.37 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 2.38 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 2.39 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 2.40 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 2.41 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 2.42 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 2.43 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 2.44 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 2.45 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 2.46 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 2.47 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 2.48 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 2.49 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 2.50 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).

A1.3 Other Relevant Provisions

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

A 2.51 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 2.52 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 2.53 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 2.54 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 2.55 Section 6(2) provides that Regulations made by ComReg under Regulation 6 may authorise and provide for the granting of a licence under Section 5 subject to special terms, conditions, and restrictions to persons who satisfy it that they require the licences solely for the purpose of conducting experiments in wireless telegraphy.

Broadcasting Act 2009 (the "2009 Act")

A 2.56 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 2.57 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 2.58 On 15 February 2012, the European Parliament adopted the five-year Radio Spectrum Policy Programme 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 2.59 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: EC/CEPT Decisions and technical documents relating to award spectrum

A 3.1 This Annex sets out, in the following table, all pertinent documentation, at an EC and CEPT level, relating to the bands proposed for inclusion in the award process:

Spectrum Band	Document Title	Description and link
2.6 GHz band	EC Decision 2008/477/EC ('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 2300-2400mhz ('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: http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep172.pdf

Spectrum Band	Document Title	Description and link
	ECC Report 205	Sets out an approach to licenced shared access ('LSA') particularly in relation to the 2.3 GHz band: http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP205.PDF
1.4 GHz band	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: http://www.cept.org/Documents/fm-51/17426/FM51(14)Info-40_EC-Mandate-to-CEPT-on-the-band-1452-1492-MHz
	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: http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1303.PDF
	ECC Report 202	Derives the out of band emission limits for Mobile/Fixed Communication Networks (MFCN) Supplemental Downlink (SDL) operating in the band: http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP202.PDF
	ECC Report 188	Presents an analysis of the most suitable use for the band in Europe: http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP188.PDF
3.6 GHz band	EC Decision 2014/276/EU ('the EC 3.6 GHz Decision')	Amends EC Decision 2008/411/EC on the harmonisation of the 3 400-3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services. 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/ECCDec1106.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

Spectrum Band	Document Title	Description and link
		03.PDF
700 MHz	EC Mandate to CEPT	EC Mandate to CEPT to develop harmonised technical conditions including frequency arrangements for the band: http://ec.europa.eu/information_society/newsroom/image/11_march%202013_5787.pdf
	EC Draft CEPT Report 53	Draft Report A from CEPT to the European Commission in response to the EC Mandate. This document when finalised will include channelling arrangements and technical conditions: http://www.cept.org/ecc/tools-and-services/ecc-public-consultation