An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Review of the Fixed Radio Links Licensing Regime

Response to Consultation and Decision

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1 Introduction

1.1 Background and Purpose

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

1.2 As noted in ComReg's Electronic Communications Strategy Statement 2021 to 2023[1], radio spectrum, as a medium over which data can be transmitted, is an essential input in the supply of wireless/radio-based ECN / ECS for a diverse range of uses and end-users. It is a valuable national resource that underpins nearly all communications services in the State. These communication services include mobile telephony, wireless broadband, radio and television broadcasting and radio communications used by commercial business and by air and maritime transport. The demand for radio spectrum continues to grow, driven by society's ever-increasing requirements in terms of access to data intensive services while on the move. In this context it is ComReg's goal[2] that the management of spectrum facilitates competition, enhances connectivity, and promotes efficient investment.

1.3 Many services rely on wireless connectivity as part of the backbone linking mobile base stations, providing feeds to broadcast transmitters and telemetry links that allow the monitoring of disperse infrastructure, for example water reservoir levels and remote power transformers. A key service for telecommunication infrastructure development is the fixed radio links which is a radio communication service between specified fixed geographic points. Some examples of fixed service applications are fixed links[3], transport networks (trunking, multi- hop, etc.), mobile backhaul networks,

[1] ComReg Document 21/70, "*Electronic Communications Strategy Statement 2021 to 2023*", published 30 June 2021, available at https://www.comreg.ie/

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

[3] A Fixed Link, also known as a microwave link, is a wireless connection for the transmission of information between two or more fixed locations using electromagnetic waves4. Fixed Links can provide an alternative

fixed wireless access ("FWA")[4] and temporary networks (electronic news gathering and disaster relief).

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

1.5 With that in mind, ComReg commenced a consultation process in 2020 to assess what, if any, changes are required to ensure that the Fixed Link regime is suitable to facilitate future uses of Fixed Links, in accordance with ComReg's statutory functions and objectives.

1.2 Fixed Link consultation process.

1.6 On 9 November 2020, ComReg issued a preliminary consultation on its review of the Fixed Links Bands licensing regime (ComReg Document 20/109[5]).

1.7 The preliminary consultation examined in particular:

- the existing and potential use cases (i.e., those with the potential to evolve and/or emerge over the foreseeable future) for the current Fixed Link Bands[6], and potential use cases for future frequency bands ("Candidate Bands") in Ireland;
- recent trends in demand for all use cases identified nationally and internationally, and forecast the likely demand for each use case over the foreseeable future in Ireland; and

or a complement to copper cables or fibre and are used for a variety of applications, including backhaul for mobile network base stations; distributing TV signals from studios to broadcast transmitter sites; providing direct voice or data connections to end users and connecting nodes within private or corporate communication networks.

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

[5] ComReg Document 20/109, "*Review of the Fixed Radio Links Licensing Regime"*, published 9 November 2020, available at https://www.comreg.ie/
Hereinafter referred to as "Document 20/109"

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

- the need for any of the Fixed Link Bands and/or Candidate Bands to be made available for, or reallocated from, some or all of the use cases identified.

1.8 ComReg also published an interim report (ComReg Document 20/109A[7]) prepared by ComReg's economic and technical experts, DotEcon Limited ("DotEcon") and Axon Consulting ("Axon")[8], on the current situation regarding the Fixed Links environment in Ireland and how this may develop in the future. Document 20/109A was informed by, amongst other things:

- Interviews, as conducted by DotEcon and ComReg, with several stakeholders including existing users and equipment manufacturers (the "Stakeholder Interviews");
- responses received to a voluntary request for information ("RFI") issued in March 2020 to current Fixed Link licensees; and
- responses received to an additional RFI sent by ComReg issued in March 2020 to members of the Independent Regulators Group[9].

1.9 In Document 20/109, ComReg provided an overview to Fixed Links and the associated licensing frameworks along with information on the demand and trends in Fixed Link licensing.

1.10 In December 2021, ComReg issued a further consultation on the review of the Fixed Links Bands licensing regime (ComReg Document 21/134[10]) and accompanying Consultants Report (ComReg Document 21/134A[11]) which set out proposals and preliminary views regarding:

- a new fee schedule for Fixed Links that facilitates the greatest number of use cases to promote greater use of the spectrum;
- a draft Regulatory Impact Assessment (RIA) of the revised Fixed Link licensing framework;

[7] ComReg Document 20/109A, "*Consultant's Report - Fixed Links Bands Review*", published 9 November 2020, available at https://www.comreg.ie/.
Hereinafter referred to as "Document 20/109A"

[8] Hereinafter referred to as "DotEcon"

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

[10] ComReg Document 21/134, "*Review of the Fixed Radio Links Licensing Regime*", published 17 December 2021, available at https://www.comreg.ie/
Hereinafter referred to as "Document 21/134"

[11] ComReg Document 21/134A, "*DotEcon Report Fixed Links Bands Review – conclusions and recommendations",* published 17 December 2021, available at https://www.comreg.ie/
Hereinafter referred to as "Document 21/134A"

- frequency bands suitable for the revised Fixed Link licensing framework; and
- technical requirements for the deployment Fixed Links in the bands identified.

1.11 In November 2022, ComReg published the Draft Decision including Draft Regulations (ComReg Document 22/93[12]), and accompanying Consultants Report (ComReg Document 22/93[13]), which set out:

(a) ComReg's consideration of respondents' views of ComReg Document 21/134; and

(b) Draft Decision and Draft Regulations for an appropriate licensing framework.

1.12 For Document 21/134 and Document 22/93, ComReg made available an Assessment Tool for existing Fixed Link licensees to enable Licensees assess the extent to which fees could change as a consequence of ComReg' proposed option.

1.3 Respondents to Consultation 22/93 and 22/93A

1.13 Two responses were received in respect of Documents 22/93 and 22/93A:

1. Inmarsat Global Limited ("Inmarsat"); and
2. Siklu Communications Limited ("Siklu").

1.14 ComReg would like to thank the interested parties for their submissions. ComReg has published the non-confidential versions of the submissions as ComReg Document 23/61s.

1.15 Having carefully considered the submissions, the points made therein and other relevant information, this document, among other things, sets out ComReg's views in relation to the matters raised by both respondents. ComReg also provides its Final Regulatory Impact Assessments and Decisions.

1.16 ComReg has also published a DotEcon report (ComReg Document 23/61A)[14] which assesses the responses to the Document 22/93.

1.4 Structure of this Document

1.17 This Document is structured as follows:

[12] ComReg Document 22/93 – "*Review of the Fixed Radio Links Licensing Regime - Response to Consultation and Draft Decision including Draft Regulations*" – published 9 November 2022. Hereinafter referred to as "Document 22/93

[13] ComReg Document 22/93a – "*DotEcon Report Fixed Links Bands Review - Assessment of responses to second consultation"* – published 9 November 2022. Hereinafter referred to as "Document 22/93A

[14] ComReg Document 23/61A – DotEcon Report: Fixed links review - Assessment of responses to the Draft Decision – published 4 July 2023. Hereinafter referred to as "Document 23/61A

Chapter 2: sets out the responses received to Document 22/93. This includes ComReg's assessment of the responses.

Chapter 3: sets out ComReg's Final Regulatory Impact Assessment.

Chapter 4: sets out ComReg's Decision regarding its proposals.

Annex 1: sets out relevant methodologies for setting fees for Fixed Links.

Annex 2: sets out the parameter values for ComReg's preferred option.

Annex 3: provides information on ComReg's Legal Framework and Statutory Objectives.

Annex 4: sets out the Regulations to facilitate the Proposed Framework for the Fixed Links Bands licensing regime.

Chapter 2

2 Response to submissions received to Document 22/93

2.1 Introduction

2.1 This chapter sets out ComReg's consideration of respondents' views and other issues under the following headings.

I. The future use of the 1.4 GHz Band;

II. The proposed fees for the 80 GHz;

III. Clarification on the pricing of TDD links

2.1.2 The future use of the 1.4 GHz band

Summary views of ComReg in Document 22/93

2.2 ComReg noted that it would consider whether to award some or all of the 1.4 GHz Band to facilitate the introduction of Wireless Broadband ("WBB") and/or Mobile/Fixed Communications Network ("MFCN") in the band in due course following the completion of MBSA2. ComReg further noted that:

- the 1.4 GHz Band is harmonised at an EC level for WB ECS;
- Article 2 of this EC Decision obliges EU Member States (MS) to designate and make available some or all of the 1.4 GHz Band for WBB ECS with recital 15 of EU 2018/661 (see below) providing guidance on how the measures in that EC Decision should be applied;
- a significant number of EU Member States (MS) and other European
- Countries have already awarded some or all of this band for WBB;
- a device ecosystem has developed for the 1.4 GHz Centre Band and is developing for the 1.4 GHz Extension Bands; and
- a number of WBB ECS networks are already deployed.

View of respondents to Document 22/93

2.3 Inmarsat observes that the frequency band adjacent to the 1.4 GHz band, 1518-1559 MHz, is used by Inmarsat MSS terminals to receive signals from geostationary satellites. As a result, Inmarsat is of the view that any use of the band 1492-1517

MHz (the “upper 1.4 GHz extension band”) by terrestrial mobile systems would require the implementation of compatibility measures to protect Inmarsat MSS operations in Ireland.

ComReg’s Assessment

2.4 ComReg notes that the technical conditions and arrangements, such as limits to unwanted emission power, are set out in EC Implementing Decision (EU)2018/661[15]. These conditions ensure that wireless broadband use in the 1427-1517 MHz frequency band provides appropriate protection of radio astronomy and passive earth exploration satellite services in the 1400-1427 MHz frequency band, and of mobile satellite services in the 1518-1559 MHz frequency band. ComReg further notes that MSS terminals operate with the 1518-1559 MHz band on a licence-exempt (non-interference and non-protected) basis, see section 2.10 of ComReg Document 20/47, as amended.

2.1.3 Proposed Fees for the 80 GHz band

Summary views of ComReg in Document 22/93

2.5 ComReg proposed to set fees for all licenced bands, including 80 GHz, by means of a pricing model that attempts to be reflective of the opportunity cost of Fixed Links. This model estimates the fee based on a number of characteristics of the Fixed Link, including its bandwidth, frequency band, and whether there is congestion in that frequency band and at that location.

View of respondents to Document 22/93

2.6 Siklu contends that the 80GHz band is the only fixed link band capable of supporting over the air fibre data rates of 10Gbps over a 2,000MHz channel. It further opines that the 80 GHz’s inherent immunity to interference and excellent frequency reuse due to the exceptional high degree of antenna (spatial) filtering means that the 80 GHz band can provide an inexpensive, reliable, and fast alternative to fibre.

2.7 Siklu considers that the revised fee structure for this band will price-out many who will not be able to afford, notably those without accesses to wired connectivity. Siklu is of the view that the proposed increase will result in Ireland having one of the highest licence fees for an 80GHz link compared to other developed countries and encourages ComReg to reverse the proposed fees increase in E-band spectrum fees.

[15] COMMISSION IMPLEMENTING DECISION (EU) 2018/661 of 26 April 2018 amending Implementing Decision (EU) 2015/750 on the harmonisation of the 1 452-1 492 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Union as regards its extension in the harmonised 1 427-1 452 MHz and 1 492-1 517 MHz frequency bands – https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0661&rid=1

Views of DotEcon

2.8 DotEcon[16] does not agree with Siklu that the new fees are likely to choke off demand for 80 GHz links or that the international comparisons made by Siklu are relevant to the proposals. In summary, DotEcon notes that:

- the new fees are designed to promote the efficient use of fixed links spectrum and the fact that prices are lower in certain other countries does not provide any argument as to why lowering fees in Ireland might be a better approach. Further, a benchmarking methodology has already been considered and rejected because it would not promote efficient use of the available spectrum.
- the price of different bands (e.g., 80 GHz) needs to be considered together due to the potential for at least some users to substitute between bands. Adjusting the fee level for 80 GHz (but not others) is not aligned with this approach
- the fees for 80 GHz have been set at a level that is much lower than suggested by the opportunity cost estimates (and that would result from using the same methodology as setting fees for other bands).
- the new annual fee for a 500 MHz link (the modal bandwidth used in the band) is €150, the same as under the current fee structure. For smaller channels the fees will be lower, and the majority of licensees in the 80 GHz band will see no increase in the amount they are paying for those links.
- the licence types considered in some of the other countries highlight by Siklu are not comparable to those offered by ComReg[17].

2.9 Overall, DotEcon does not see any convincing reason for ComReg to deviate from the proposed approach to setting fees for links in the 80 GHz band, which has been established on the back of a carefully considered assessment.

ComReg's Assessment

2.10 ComReg agrees with the views of DotEcon, ComReg has clearly set out the advantages of the proposed approach in its previous consultations which, in summary are:

I. it would require licensees to pay fees that increase with the Fixed Links bandwidth. encourage licensees to carefully evaluate any perceived need for

[16] ComReg Document 23/61A – DotEcon Report: Fixed links review - Assessment of responses to the Draft Decision – published 4 July 2023.

[17] For example, the fees quoted for the UK are for light licences that offer limited protection and require operators to self-coordinate with one-another, which clearly not the same as the fixed links licences offered by ComReg.

additional bandwidth;

II. it better reflects the value differences between lower and higher Fixed Link frequencies by establishing a frequency gradient within the range suggested by opportunity cost estimates for the highest band and the lowest band.

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

2.11 Siklu has not provided any reasons why ComReg's approach is incorrect. It should be noted that ComReg's review of fixed links concerns all relevant bands and not simply individual bands in isolation from one another. As highlighted in the RIA, the various bands form a chain of substitutes and there is no particular band that holds special relevance in the provision of a particular use case(s) because there are typically a range of bands available for any particular use case.

2.12 The increases referred to by Siklu arise primarily due to point (i) above noting that the existing framework did not reflect the impact of larger channels and fees did not increase proportionately with the spectrum used. In particular, fees above 40 MHz bandwidth were entirely unaffected by additional bandwidth meaning that there was no additional cost whatsoever for bandwidth above 40 MHz. However, this creates poor incentives for licensees to carefully evaluate any perceived need for additional bandwidth, noting that the need for bandwidth is already increasing. This highlights the need for measures to address the lack of charging for additional bandwidth considering the ever-increasing demand for bandwidth. Such increases arise because licensees were effectively charged zero for incremental spectrum above 40 MHz under the existing fee regime.

2.13 Interested Parties will appreciate that if the cost of holding additional spectrum rights of use is either too low or even non-existent, the incentives to use those rights of use efficiently are reduced, perhaps even resulting in inefficient spectrum hoarding. Indeed, some stakeholders raised concerns that the E-band (80 GHz) might become congested, particularly in urban areas and that the current cost per MHz of bandwidth could result in licensees holding very large bandwidths for very little annual cost.

2.14 ComReg's proposed approach achieves improvements to the current regime while keeping overall fee levels broadly neutral. Of course, these changes will vary across the licensees and fees are be composed of a range of increases and decreases depending on how licensees currently deploy existing rights of use. Siklu's pricing analysis uses a Fixed Link of 2 GHz as the unit for comparison, although that bandwidth accounts for only 0.5% of all Fixed Links[18] in the 80 GHz band. ComReg

[18] 11 of 2070 as of 30 June 2022.

notes that 85% of licensees in the 80 GHz Band use bandwidths of up to 500 MHz (i.e., 250 MHz and 500 MHz) and none of these licensees will experience an increase in fees. [19] Indeed, a third of these licensees will experience a decrease from €150 to €100, while the remainder of licensees who use the modal bandwidth will have the same fee as they currently pay (€150).

2.15 ComReg also notes that it considered the impact of a linear bandwidth increase in Document 22/93 but instead updated its view to include more general definition of effective bandwidth, such that each time we double the bandwidth of a link, per MHz charges decline (at least up to bandwidths in common use). For example, while the fee for a 2 GHz link is €480, this less is less than 4 times the price of a 500 MHz link. (i.e., the fee increases while reflective of bandwidth, are not linear).

2.16 Finally, ComReg notes that licence fees in other countries have limited relevance because ComReg's statutory objective is among other things to ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under section 13 of the 2002 Act. As noted in Section 3.2 of Document 20/109, Ireland has a natural higher reliance on Fixed Links for mobile and fixed backhaul. ComReg has therefore conducted a comprehensive review of the Fixed Links regime in order to ensure the longer-term efficient management and use of the spectrum for the benefit of all users. How fixed links are managed in other jurisdictions is not a matter for ComReg.

2.17 In any event, as noted by DotEcon, ComReg ruled out the use of a benchmarking as approach in Annex 2 of Document 21/134 for a number of reasons, including that fees are typically not reflective of opportunity costs (as they are not based on the outcome of a competitive process) and do not provide any particularly meaningful basis for setting fees in Ireland. Further, DotEcon had clear regard to fee methodologies[20] used in other countries in forming its recommendations giving an overview of European price references[21] and common practices[22].

2.1.4 Clarification on the pricing of TDD links

Views of DotEcon

2.18 DotEcon recommends that the pricing of TDD Fixed Links should be further clarified. Specifically, DotEcon recommends that ComReg clarifies that the effective bandwidth relates to the total spectrum required for a Fixed Link. Therefore, the fee for a TDD link is equivalent to the fee of a FDD link using a channel half the size. At present, it could be interpreted to mean that the fee for a TDD link would be the same as the fee for an FDD link using the same channel size (and double the total

[19] 1000 MHz and 500 MHz account for 289 and 1,222 of 2070 Fixed Links in 80GHz Band, as of 30 June 2022.
[20] See Annex A of ComReg Document 21/134A
[21] See Table 5 of ComReg Document 21/134A
[22] See Table 6 of ComReg Document 21/134A

bandwidth) e.g., a 500 MHz TDD link would cost the same as a 2x500 MHz FDD link.

ComReg's Assessment

2.19 ComReg agrees that the effective bandwidth relates to the total spectrum required for a fixed link and is happy to provide that clarification. For the avoidance of doubt, the fee for a TDD link would be half the fee for an FDD link using the same channel size e.g., a 500 MHz TDD link would be half the cost of a 2 x 500 MHz FDD link. ComReg will update the regulations to make that intention clearer.

2.1.5 Clarification on future application of formula

Views of DotEcon

2.20 DotEcon also clarifies, for avoidance of doubt, that the version of the effective bandwidth calculation used in its previous reports extends to situations in which bandwidths in use do not have a simply doubling relationship. For example, consider a 1750 MHz TDD link – this would be charged as if it was a 2 x 875 MHz FDD link. The effective bandwidth for an 875 MHz link cannot be obtained from 1000 MHz (as that is the largest bandwidth in common use) by successive halving. However, the formula can be easily generalised to deal with any bandwidth below the largest bandwidth in common use. DotEcon provides the full mathematical details in the Annex to its report.

ComReg's Assessment

2.21 ComReg agrees that it is helpful to provide this clarification and refers interested parties to the DotEcon report for full discussion. ComReg's notes that its assessment of the formula-based approach was based on this understanding, as noted by DotEcon, this clarification does not affect the recommendations or calculation of effective bandwidth (and resulting fees) for any of the bands/channels already covered in the Draft Regulations and the fees in the draft regulations remain the same aside form a small typographical error[23] (this is unrelated to this issue).

2.22 ComReg has also clarified in the Regulations that the phase in period also applies to congested bands. The previous draft Regulations could be interpreted as meaning that congestion fees for the new congested bands (i.e., 13 GHz and 15 GHz) would begin on day on which the Regulations were made.

[23] The correct fee for a 750MHz Fixed Link in the 80GHz band is €203, not €206 as in Document 22/93. This was a transcription error - this figure was based on an older value of m. We have updated accordingly.

Chapter 3

3 RIA

3.1 Introduction

3.1 In November 2020, ComReg published a consultation[24] and associated DotEcon Report[25] containing its preliminary views on potential adjustments to the existing Fixed Links licensing framework. In relation to fees, ComReg observed that spectrum fees would continue to form a part of ensuring the optimal use of the Fixed Link frequencies. Further, ComReg noted there are a variety of methodologies that can be used to calculate applicable fees for Fixed Link Bands, and it would set out its views in relation to same in the next phase of this review.

3.2 In December 2021, ComReg published a further consultation[26] (Document 21/134) that set out its views in relation to methodologies that can be used to calculate applicable fees for Fixed Link Bands and the fees resulting from the proposed fee model. This included a draft RIA which considered the impacts of the proposed fees on the relevant stakeholders and determined that its preferred option was to adopt the proposed new fee regime. In November 2022, ComReg published a further consultation and updated the draft RIA to take account of the views of respondents.

3.3 In that regard, this chapter sets out ComReg's final Regulatory Impact Assessment ("RIA") on the procedure for setting spectrum fees for the Fixed Links Bands and provides ComReg's preferred option having regard to the impact on stakeholders, competition, and consumers. It concludes with an assessment of the Preferred Option against ComReg's statutory remit, including relevant functions, objectives, duties and principles (as outlined in Annex 3).

3.4 ComReg conducted this RIA having regard to various information gathered throughout the consultation process, including the following:

- interviews, as conducted by DotEcon and ComReg, with several stakeholders including existing users and equipment manufacturers (the "Stakeholder Interviews");
- responses received to a voluntary request for information (RFI) issued in March 2020 to current fixed link licensees (the "Licensee RFI");

[24] ComReg Document 20/109, "Review of the Fixed Radio Links Licensing Regime", published 9 November 2020, available at https://www.comreg.ie/
[25] ComReg Document 20/109A, "*Consultant's Report - Fixed Links Bands Review*", published 9 November 2020, available at https://www.comreg.ie/
[26] ComReg Document 21/134, "*Review of the Fixed Radio Links Licensing Regime*", published 17 December 2021, available at https://www.comreg.ie/

- responses received to an additional RFI sent by ComReg issued in March 2020 to members of the Independent Regulators Group ("IRG") (the "IRG RFI").

- the views of respondents to Document 21/134[27], Document 20/109[28] and Document 22/93; and

- the DotEcon Reports - Document 20/109A, Document 21/134A, Document 22/93A);

3.2 RIA Framework

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

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

3.7 In conducting the RIA, ComReg has regard to the RIA Guidelines[29], while recognising that regulation by way of issuing decisions, for example imposing obligations or specifying requirements in addition to promulgating secondary legislation, may be different to regulation exclusively by way of enacting primary or secondary legislation.

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

3.2.2 Structure for the RIA

3.9 In assessing the available regulatory options, ComReg's approach to the RIA is

[27] ComReg Document 22/93B, "*Non-Confidential Submissions to Document 21/134 and 21/134A"*, published 17 December 2021, available at www.comreg.ie

[28] ComReg Document 21/134s, "*Non-Confidential Submissions to Document 20/109 and 20/109A"*, published 17 December 2021, available at www.comreg.ie

[29] ComReg Document 07/56a, "*Guidelines on ComReg's Approach to Regulatory Impact Assessment"*, published 10 August 2007, available at www.comreg.ie

based on the following five steps:

- **Step 1**: describe the policy issue and identify the objectives;
- **Step 2**: identify and describe the regulatory options;
- **Step 3**: determine the likely impacts on stakeholders;
- **Step 4**: determine the likely impacts on competition; and
- **Step 5**: assess the likely impacts and choose the best option.

3.10 In the following sections, ComReg identifies the specific policy issues to be addressed and relevant objectives. (i.e., Step 1 of the RIA process). Before moving on to Step 1 of the RIA, ComReg first makes some relevant observations below on the stakeholders involved and on ComReg's approach to Steps 3 and 4.

3.2.3 Identification of stakeholders and approach to Steps 3 and 4

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

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

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

II. Industry stakeholders.

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

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

3.14 Step 4 assesses the impact on competition of the various regulatory options available to ComReg. In that regard, ComReg notes that it has various statutory functions, objectives and duties which are relevant to the issue of competition.

3.15 Of themselves, the RIA Guidelines and the RIA Ministerial Policy Direction provide[30] little guidance on how much weight should be given to the positions and views of each stakeholder group (Step 3), or the impact on competition (Step 4). Accordingly, ComReg has been guided by its statutory objectives which it is obliged to seek to achieve when exercising its functions. ComReg's statutory objectives in managing the radio frequency spectrum, as outlined in Annex 3, include:

- to promote competition[31];
- contribute to the development of the internal market[32];
- promote the interests of users within the Community[33];
- 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[34];
- Regulation 4(5))(d) of S.I. No. 444 of 2022 which requires ComReg to promote efficient investment and innovation in new and enhanced infrastructure[35];
- Regulation 24 of S.I. No. 444 of 2022[36] permits ComReg to impose fees for rights of use, which reflect the need to ensure the optimal use of the radio frequency spectrum; and
- Regulation 27(4)[37] provides that, notwithstanding Regulation 27(3), 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,

[30] Ministerial Direction dated 21st February 2003
[31] Section 12 (1)(a)(i) of the 2002 Act.
[32] Section 12 (1)(a)(ii) of the 2002 Act.
[33] Section 12(1)(a)(iii) of the 2002 Act.
[34] Section 12(1)(b) of the 2002 Act.
[35] Regulation 4(5)(d) of S.I. No. 444 of 2022, the European Union (Electronic Communications Code) Regulations 2022.
[36] Regulation 24 of S.I. No. 444 of 2022.
[37] Regulation 27(4) of S.I. No. 444 of 2022.

- 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 27(7)[38].

3.16 In this document, ComReg has adopted the following structure in relation to Step 3 and Step 4 – the impact on industry stakeholders is considered first, followed by the impact on competition, followed by the impact on consumers. This order does not reflect any assessment of the relative importance of these issues but rather reflects a logical progression. A measure which safeguards and promotes competition should, in general, impact positively on consumers. In that regard, the assessment of the impact on consumers draws substantially upon the assessment carried out in respect of the impact on competition.

3.2.4 Step 1: Identify the policy issues & the objectives

Policy Issues

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

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

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

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

- Information Policy; and

[38] Regulation 27(7) of S.I. No. 444 of 2022.

- Spectrum Fees.

A. Information Policy

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

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

3.22 ComReg already provides useful information to licensees through the frequency band checker and its Fixed Links Annual Report. The Frequency Band Usage Checker helps users to understand the current state of availability/congestion, and thereby speeds up the application process by reducing the number of applications that cannot be accepted. ComReg will also update relevant information including the results of the proposed Grid Methodology for assessing spectrum availability), to improve the support to users with forming expectations on where congestion may emerge in the future.

B. Spectrum Fees

3.23 Regulation 24 of S.I. No. 444 of 2022[39] permits ComReg to impose fees for rights of use that reflect the need to ensure the optimal use of the radio frequency spectrum. In addition, ComReg is required to ensure that any such fees are objectively justified, transparent, non-discriminatory, and proportionate in relation to their intended purpose, and consider the objectives of ComReg as set out in Section 12 of the 2002

[39] See also Regulation 24 of S.I. No. 444 of 2022.

Act and the general objectives of the Directive and S.I. No. 444 of 2022[40].

3.24 In that regard, the effective management of radio spectrum requires more than a purely technical consideration of spectrum efficiency; functional and economic considerations must also be considered, including the extent to which the utilisation of spectrum meets a user's specific needs and the social and economic value that can be derived from it. This is particularly relevant in the current case where there is a variety of different users, providing different services using different technologies based on existing licence conditions (including spectrum fees).

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

3.26 ComReg's efficiency[41] objectives are typically supported using a market mechanism for assignment, such as a well-designed auction with prices set based on opportunity cost, which can help to[42]:

- establish the efficient assignment of spectrum amongst bidders, given bidders' willingness to pay (which can be expected to represent the economic value they are able to generate); and
- establish the opportunity costs of the assignment, setting suitable spectrum usage fees at a level that represents market value (and could be considered fair) and encourages the winning bidder(s) to utilise the spectrum more efficiently.

3.27 However, where rights of use across many bands are being made available for relatively short periods (e.g., annually renewable) an auction would clearly be impractical. In such cases, ComReg must use a different methodology for establishing the fees to be charged that are in line with its objectives[43].

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

[40] See also Regulation 4 of S.I. No. 444 of 2022.
[41] Section 12 (1) (b) of the 2002 Act.
[42] Use of a market mechanism also removes the burden on ComReg to make complex judgements (based on incomplete information) in relation to assigning the spectrum and the suitable level of fees, as it can better elicit relevant information about the value (and efficient assignment) of the spectrum that is likely not available to ComReg.
[43] Noting that the effectiveness of particular methodologies is constrained by the scope and quality of available data.

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

- Where excess demand exists or may exist in the future, an opportunity cost methodology (or proxy for same) may be appropriate in line with previous approaches; and
- An opportunity cost approach may not be suitable where spectrum is more freely available. In such cases, fees should incentivise potential users to assess its actual need for spectrum and select the most appropriate spectrum band from a range of alternatives.

3.30 ComReg notes that no respondent disagreed with such factors in response to Document 20/109, Document 21/134 and Document 22/93.

Objectives

3.31 ComReg aims to design and carry out its review of the Fixed Links licensing regime in accordance with its broader statutory objectives (as outlined in Annex 3) including the promotion of competition in the electronic communications sector.

3.32 A key objective is that spectrum fees must reflect the need to ensure the optimal use of the radio spectrum and must also be objectively justified, transparent, non-discriminatory, and proportionate.

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

- Encouraging efficient use and ensuring effective management of radio frequencies;
- Ensuring that users derive maximum benefit in terms of choice, price and quality;
- Ensuring that there is no distortion or restriction of competition in the electronic communications sector;
- Contributing to the development of the internal market; and
- Promoting the interest of EU citizens.

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

3.2.5 Step 2: Identify and describe the regulatory options

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

3.36 In relation to other options, ComReg observes that there is a variety of methodologies that could be used to calculate applicable fees for Fixed Link Bands. ComReg does not envisage one approach being suitable to account for all of the various bands and associated uses, given that there are potentially quite different considerations for each band. In that regard, and to identify potential options, ComReg assessed a variety of different methodologies in Annex 2 of Document 21/134.

3.37 In relation to the approach recommended by DotEcon (USPP as an AIP[44] proxy), this option sets fees that are reflective of opportunity cost which should encourage licensees to utilise the spectrum more efficiently, including incentivising the return of unused or underused spectrum. It seeks to achieve this in a practical and sensible way given the difficulties of estimating opportunity cost across a variety of different bands. As advised by DotEcon, this approach sets fees using a formula that seeks to proxy opportunity costs through a small number of parameters. The focus is largely on short run opportunity cost, where a surcharge applies for bands and areas where there is current congestion. However, the formula is designed to also reflect some of the structure of long-run opportunity cost, recognising that demand is increasing and that, even where there is no scarcity at present, there may be benefit in providing incentives for operators to organise themselves efficiently within the bands to avoid future congestion where possible.

3.38 Therefore, ComReg is of the view that the approach recommended by DotEcon (USPP as an AIP proxy) is a valid regulatory option. This approach is considered as Option 2 for the remainder of this RIA. Option 2 is summarised below but set out in more detail in Annex 2 and Section A.2 of Document 21/134A.[45]

3.39 ComReg also observes that it may be appropriate to consider administrative cost recovery as a regulatory option. As most Fixed Link Bands are uncongested, ComReg notes that a potential approach would be to assign rights of use on an administrative cost[46] basis for bands in areas that are not subject to congestion and

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

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

[46] ComReg notes that the €100 per link referred to in the DotEcon Report and this consultation is based on administrative costs incurred under the current regime and would in any event be higher if an administrative

apply an appropriate congestion charge for congested bands/areas[47].

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

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

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

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

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

3.41 Currently, congestion is relatively rare, primarily being an issue in the 13 GHz – 23 GHz bands in Dublin and between the city centre and a number of key sites to the south (e.g., Three Rock). Less than 1% of existing links fall into the congested bands in the congestion area as currently defined. However, congestion issues may well arise elsewhere in the future. As noted by DotEcon "*…this is not to say that congestion issues will not arise elsewhere in the future, in particular with ever increasing bandwidth requirements and the potential for fixed links to support fibre networks in rural areas*."[48]

3.42 Nevertheless, ComReg has previously suspended the acceptance of new Fixed Link Applications, in the 13 GHz and 15 GHz frequency bands in Dublin's city centre and the south of the city due to congestion. During the stakeholder interviews concerns were raised by some existing Fixed Links licensees ("Existing Licensees") in relation to this.

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

3.43 Where congestion arises, efficiency requires that spectrum rights of use are assigned to those users that value them the most. If spectrum is licensed at below opportunity

charge was charged to all uncongested links due to the likely significant increased compliance costs imposed on ComReg as a result.

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

[48] See page 81 of ComReg Document 20/109A.

cost, then there may be some other party that would have been prepared to pay more for the right of use but is being inefficiently denied access.

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

3.45 There is strong evidence that bandwidth requirements for Fixed Links are growing. Further, the availability of alternative technologies (e.g., fibre) will not arrest the general upward trend.[49] With that in mind, the following factors may have some relevance:

- Stakeholders have already noted that their demand for bandwidth is increasing, and raised the point that operators are restricted in the bandwidth they can access by means of the widest channel widths available in certain bands[50];
- Demand for links is increasing more generally, but especially for Fixed Links with higher bandwidths. This in turn could lead to congestion issues arising elsewhere. ComReg notes that:
    - demand for links is increasing in the uncongested zone;
    - bandwidth requirements are increasing, and there is potential for Fixed Links use cases to expand into previously unserved rural areas; and [51]
    - average link lengths are expected to decrease (e.g., as fibre presence expands, short microwave hops will be required to connect sites to a fibre node) so demand for higher frequencies (e.g., 80 GHz) will likely increase. [52]

[49] See page vi and Annex B.3 of ComReg Document 20/109A.

[50] The licensing data is consistent with this view, with operators using the second polarisation to double capacity over a given link, especially when wide channels are unavailable (e.g., we note that increased use of dual polarisation links started earliest in the 11 GHz band, where the largest channels are only 40 MHz)

[51] See page 90 of ComReg Document 20/109A

[52] See page 111 of ComReg Document 20/109A

- Increasing bandwidth requirements is required to meet the need for faster speeds [53];
- An increase in capacity requirements and use of dual polarisation where wider channels are not available [54];
- Increased demand for higher frequency bands where channel spacing is typically higher; and
- 5G backhaul will contribute significantly to increased demand in the coming years. [55]

3.46 Further, the potential for increased congestion is not proportionate across bands but often depends on network deployment across different use cases. For example:

- In bands up to 8 GHz, and although there does not appear to be any significant spectrum scarcity[56] currently, some stakeholders opined that they have sporadically found it difficult to find an available link in certain bands;
- There seems to be accord regarding a growing demand for links in the 18 GHz and 23 GHz bands. This is in part due to the roll-out of multi-band technology solutions that allow for pairing these bands with higher frequency spectrum (e.g., in the 80 GHz band) to achieve high-capacity links over mid-range distances. Given the current use of these bands there is a risk of further congestion going forward[57];
- Even in the uncongested/rural areas, demand is concentrated in certain areas or origin/destination paths due to the availability of suitable sites (e.g., those with favourable topography) and the concentration of population in certain areas, which creates the potential for pockets of congestion to emerge outside of urban areas[58].
- Several stakeholders raised concerns that the E-band (80 GHz) might to become congested, particularly in urban areas. Others contend that there is sufficient spectrum available in the band to allay any imminent congestion concerns, further noting that the W-band is a potential alternative in the future if the 80 GHz band was to become congested[59]; and

[53] See page 109 of ComReg Document 20/109A
[54] See page 109 of ComReg Document 20/109A
[55] See page 112 of ComReg Document 20/109A
[56] See page 109 of ComReg Document 20/109A
[57] See page 110 of ComReg Document 20/109A
[58] Supporting this view, a respondent in its submission to 21/134 highlighted instances of congestion in certain bands in rural areas.
[59] See page 11 of ComReg Document 20/109A

- Increased bandwidth usage is primarily driven by the MNOs and FWA operators. The trends for these user groups are qualitatively similar, and in both cases, there are rapid increases in bandwidth used, facilitated now by increased use of the 80 GHz band.

3.47 Therefore, ComReg is of the view that the established trend of increasing bandwidth requirements, given the prevailing business cases, increases the risk of potential scarcity in the future.

II. Migration from licence exempt

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

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

Table 1: Licence Exempt Bands

3.49 Respondents to ComReg's RFI[60] noted that FWA links were the most common use case in the Fixed Links licence exempt bands, though there were also some fixed network links, corporate users, and telemetry applications. Most licence exempt links operate outside of the five main cities[61] and in some cases outside regional towns. ComReg is aware that there are at least 20,000 FWA customers[62] availing of services provided via licence exempt spectrum in the 2.4 GHz and 5.8 GHz Bands and several thousand licence exempt fixed links.

3.50 Under this option, there is a risk that some or all operators that would ordinarily rely on use of licence exempt spectrum to satisfy existing and future requirements, would instead seek spectrum rights of use in the licensed bands, given the potential

[60] See Section 2.7 of ComReg Document 20/109A

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

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

attractiveness of access to protection from other users and services at low cost. In effect, licence exempt users would be provided with the benefits of licensed spectrum rights of use which could in turn create unintended incentives to migrate to the Fixed Link Bands.[63]

3.51 The precise impact of such a development is somewhat uncertain, in particular as the threat of a future congestion surcharge being applied if demand increases sharply should mitigate such a possibility. However, ComReg is of the view that reducing the difference between the costs of licensed and licence exempt spectrum to such an extent would unavoidably come with some risk of inefficient migration into the licensed bands, resulting in an unnecessary congestion.

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

"*operators' use of the licence exempt bands and their expressed opinion that licence fees limit use of the main fixed links bands suggests that the demand for other bands could increase significantly if licence fees were lower*."[64]

3.53 It is difficult to predict what frequencies licence exempt users would likely prefer in the event of migration given the disparate characteristics of individual users. RFI responses suggest that if operators who rely on licence exempt spectrum had to move out of the 5 GHz band, they would consider the 80 GHz band where link lengths permit, or into neighbouring bands where they could achieve higher throughput.[65] However, they could also move into bands with similar propagation – noting that less spectrum is generally available in these band compared with higher frequencies.

3.54 Therefore, ComReg is of the view that there would be an increased risk of inefficient and unpredictable migration from the licence exempt bands[66] that would primarily concern the provision of fixed wireless in rural areas.

III. Increased incentives for spectrum hoarding

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

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

or low expectation of efficient use. Spectrum hoarding can come in different forms[67]:

- Anti-competitive hoarding involves the accumulation of rights of use for strategic reasons to prevent potential competitors acquiring sufficient rights of use to compete downstream[68];
- Inefficient hoarding occurs where licensees obtain more spectrum than necessary because the cost of holding it is low; and
- Speculative hoarding is undertaken with the purpose of reselling for a higher value in the future (though this is primarily an issue for long-lived licences).

3.56 Under the proposed option, licensees would have a stronger incentive to hoard spectrum inefficiently or anti-competitively[69] than is currently the case due to the lower costs. The potential for ComReg to introduce a congestion charge might help to address this but there could still be scope for inefficient or anti-competitive hoarding up to the point at which congestion charging appears to be a real threat (e.g., in between ComReg's regular reviews).

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

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

ComReg assessment of administrative approach

3.59 Based on the information before it, ComReg is of the view that administrative cost recovery is not a valid regulatory option in the context of ComReg's statutory framework and is unlikely to be objectively justified and proportionate (compared to the current framework) as required by Regulation 14 of S.I. No. 444 of 2022[70]. Factors informing this view are as follows.

3.60 **First**, the proposed option would not accord with the objective of promoting

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

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

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

[70] Regulation 14 of S.I. No. 444 of 2022.

competition because, among other things:

- Such an approach would fail to support the efficient management and use of the radio spectrum as required under Section 12 of the Act because:
    - it would fail to take account of the different characteristics (e.g., propagation and capacity) of each of the Fixed Links Bands. For example, DotEcon does not recommend this type of administrative approach, "*as some differential should be maintained between higher and lower frequency bands to avoid lower frequencies being filled by users who could easily use higher frequencies, precluding lower bands to users who need their propagation advantages*".[71]
    - It would fail to account for potential scarcity in the future and that there could be an opportunity cost to a new licence even if there is no current scarcity in that band, as given long equipment lifetimes, the new fixed link may to be in place for many years and scarcity may emerge over that lifetime.
    - There are no incentives to choose bandwidth that is in line with actual requirements, and it would likely increase the incentives for inefficient hoarding of spectrum because the cost of holding additional spectrum would be low.
    - It would potentially lead to increased congestion and even the creation of new congestion areas across the state due to an increase in number of links and associated bandwidth resulting from risk of migration from the licence exempt bands and hoarding, as described above.
    - Licence exempt spectrum which is currently used in the delivery of services by operators (that are effective in managing interference) could become unnecessarily underused and the future use of these bands would need to be considered.
- There would be an increased risk of distortion or restriction of competition to the detriment of users because licensees would have stronger incentives for anti-competitive and inefficient hoarding[72] as the cost of holding those rights of use diminishes significantly under the proposals.

[71] See page 34 of ComReg Document 21/134A.

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

3.61 **Second**, creating the conditions for promoting efficient investment and innovation in new and enhanced infrastructures involves ComReg exercising its regulatory functions in an appropriate and predictable fashion, thus providing regulatory certainty. As noted by DotEcon, "*it is important that fees for Fixed Links are predictable, if ComReg is to encourage efficient investment. Otherwise, it could create a hold up problem, where investment is avoided because of highly uncertain and potentially large future fees (which operators cannot easily avoid by moving to other bands or alternative technologies such as fibre once equipment is installed)*."[73]

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

- ComReg may need to consider whether permitting licensees to renew rights of use annually in the context of increasing levels of congestion is appropriate[74], which may require a future reassignment and a transition process; and
- In the absence of fees being effective in reducing incentives for spectrum hoarding, and pursuant to Regulation 29 of S.I. No. 444 of 2022[75], ComReg may need to consider introducing rules in relation to spectrum hoarding and include specific rollout conditions for all Fixed Link licensees which likely would be reported to ComReg on an annual basis and prior to any decision to renew rights of use. Such rollout conditions could impose significant costs on licensees but may nonetheless be required in the absence of an effectively function fees framework.

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

3.64 **Third**, as set out under Option 1 below, there is no evidence that existing fees have choked off efficient demand. On the contrary, the Fixed Links regime has largely flourished, and users have benefitted from the general availability of spectrum rights of use that has supported the delivery of services across a range of use cases. The existing fee schedule provides ComReg with reliable information about the level at which fees would not choke off efficient demand and illustrates that fees do not need to be set excessively low (increasing hoarding possibilities) to avoid such risks.

3.65 **Fourth**, ComReg notes that such an approach would notably undermine ComReg's spectrum management function by reducing its ability to manage the risks created by an inefficient framework. For example, under administrative cost pricing ComReg

[73] See page 47 of ComReg Document 21/134A.
[74] Such issues create concerns around asymmetric access to the spectrum and spectrum hoarding.
[75] See too Recital 122 of the EECC.

would be prevented from implementing a frequency gradient, potentially resulting in hoarding and leading to scarcity in lower frequencies in new areas. An effectively functioning fees framework should ensure that licensees are incentivised to use assigned rights of use as efficiently as possible. This avoids excessive spectrum demand where alternatives are available, and which would cost licensees less than the foregone value that excluded users could realise from that spectrum.

3.66 Further, ComReg received no responses regarding the above matters in either of its previous consultations.

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

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

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

  Under Option 1 the existing fee schedule would continue to apply. In assessing this option, ComReg also considers small changes that could be made to the existing regime (e.g., CPI existing fees).[76]

- **Option 2 –** Make available all rights of use to the Fixed Link Bands using a USPP (as an AIP proxy) approach that sets fees for all bands using a formula. The approach would be introduced gradually over a three-year period[77] and include the following elements:

  - a base price per MHz;
  - a schedule of band specific values that determine the relative value difference between upper and lower frequencies;

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

[77] With 3-year phasing:
- Existing fees retained for year 1
- 1/3 weight to new prices and 2/3 to old prices in year 2;
- 2/3 weight to new prices and 1/3 to old prices in year 3; and
- new prices from year 4.

- an 'effective bandwidth'[78], for each band which exceeds link bandwidth where the bandwidth is less than the largest commonly used bandwidth within that band;
- a congestion charge; and
- an administrative cost floor below which prices cannot fall.

3.69 This latter option would be subject to a 3 – 5 year review. ComReg would be minded to hold the initial review 3 years following the full implementation of Option 2 (i.e., circa 2030 if a final Decision is made by ComReg in 2023).

3.70 A more detailed account of Option 2 and its associated variables is set out in Annex 2.

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

Identification of stakeholders

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

I. industry stakeholders as described above; and

II. competition and consumers.

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

3.73 For the purposes of the assessment below, stakeholders are categorised broadly into Existing Licensees and future and potential holders of Fixed Links.[79]

3.74 ComReg considers this to be the more useful than to examine each user case given that outcomes are more dependent on the attributes of the licensee and their requirements rather than the use case itself.

Impact on industry stakeholders

3.75 This section provides information on the impacts on industry stakeholders (as

[78] See Annex 2 and Chapter 3 for discussion on revised definition of effective bandwidth.

[79] This may include entrants based in the State, in other Member States or further afield that providing innovative new services such as the Potential Use Cases, international providers of services in existing use cases wishing to operate in the State or even existing users that wish to enter into the provision of services in other Existing Use Cases.

outlined above) arising from the regulatory options above.

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

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

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

3.78 Relatedly[80], and regarding Assignment Impacts, the preferred option should better incentivise the efficient assignment of spectrum rights of use such that an appropriate charging structure should create incentives for the installation of new links in the future).

3.79 ComReg assesses Financial Impacts and the Assignment Impacts on stakeholders in turn below.[81]

3.3 Financial Impacts

3.80 To assess the financial impact of Option 2 on Existing Licensees, ComReg has conducted a comparative analysis of the fees paid by those licensee compared to Option 1. The assessment that follows is necessarily static (i.e., it is based on existing Fixed Link deployment[82]) and is conducted to highlight possible impacts, noting that final fees paid by Existing Licensees would depend on choices made by those licensees in determining how to dimension their networks in the future.

3.81 This is a conservative approach to estimating the impact of Option 2 on Existing Licensees because it assumes that operators would continue to use existing rights of use in the same way which, while contrary to the aim of this review, nonetheless provides a useful comparator[83].

[80] ComReg notes that fee's impacts refer to a static analysis where licensees are assigned the same rights of use. However, it possible, even likely, that licensees will consider alternative bands or amounts of spectrum across different areas in response to ComReg's proposed changes.

[81] These assessments are not provided in any particular order and the issues they address can overlap.

[82] This assessment is based on licensing data as of 1 July 2022.

[83] For example, Existing Licensees may rationalise or change their use of Fixed Links under Option 2. This could arise due to licensees substituting between bands in response to changes in the relative prices, or from rationalising on other rateable factors such as bandwidth in response to higher price.

3.82 ComReg notes that equipment is generally only tuneable across a small range of frequencies and some rationalisation could occur over the short run – however any significant reorganisation would likely coincide with normal equipment replacement. That said, there is likely to be greater flexibility for certain operators. For example, the stakeholder interviews and RFI observed that the asset life of the equipment is not a key driver of when it is replaced (i.e., replacement of links is driven by end user demand). [84]

3.83 Under Option 2, the total fees paid by Existing Licensees would be broadly neutral, decreasing by approximately €1.35 million annually compared to Option 1[85].

3.84 While the impact on stakeholders overall is broadly positive, with the fees paid by licensees decreasing by 13.2% on average, licensees would experience a decrease in fees while others would experience an increase. The impact on an individual licensees aggregate fees for fixed links depends on how those licensees currently deploy existing rights of uses (i.e., bands, bandwidth, location). It is not possible to outline each of these impacts individually, given the prevailing confidentiality concerns. However, ComReg would note that any increase or decrease is modest (either in % or absolute terms).

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

3.86 With that in mind, the remainder of this section assesses the financial impact on fees in two parts:

I. The first part assesses how fees vary (increase or decrease) across both options. (“Fee Variations”); and

II. The second part provides an assessment of why fees vary across both options and the key factors driving same. (“Key Factors Driving Fee Variations”).

I. Fee Variations

3.87 As noted above, Option 2 is broadly neutral, because it reflects a re-weighting based on the individual characteristics of each Fixed Link. This necessarily implies different impacts to stakeholders given the heterogenous nature of Fixed Links and how

[84] See Annex B5 of ComReg Document 20/109A

[85] ComReg notes that the fees outlined in this consultation are lower than those in 21/134. This is the result of the revision of certain parameters of the Fixed Link fee model, which has incidentally decreased the total fees payable by operators under Option 2 relative to Option 1.

licensees have deployed their networks.

3.88 As noted by DotEcon, "*some licences will see increases, but others decrease in fees. For many classes of user, these changes will largely net out. Therefore, the proposed pricing formula is largely a restructuring of fees, rather than a general shift in level. In any case, we propose that changes are phased in over three years*". [86]

3.89 Under Option 2, 76% of Existing Licensees would pay lower fees[87] and any aggregate reduction in a licensee's Fixed Link fees would arise because of a reduction in uncongested fees[88].

3.90 Under Option 2 uncongested Fixed Links would become less expensive, with the median[89] fee decreasing from €1,125 under Option 1 to €784 under Option 2. Under Option 1 fees for uncongested links are capped at €1,500 per Fixed Link. However, fees per uncongested link tend to be higher compared to Option 2 because more fees are distributed closer to the cap. Under Option 1, there are many uncongested links, heavily weighted in the €1,100 to €1,200 range.

3.91 Under Option 2, fees are not capped, but instead are strictly increasing with the bandwidth used (for a given band and congested status). However, based on existing Fixed Links, there is a more even spread of fees across all price ranges (particularly those below €1,000). For example, under Option 2 there are approximately 6,400 Fixed Links with fees less than or equal to €1,000 per link and 4,200 Fixed Links with fees above €1,000 per link.

3.92 Figure 1 illustrates the distribution of fee variations under Option 2 compared to Option 1. Notably, the fees for approximately 7,400 uncongested links (70%) would reduce, with most reductions in the €0 - €600 range.

[86] See page xi of ComReg Document 21/134A

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

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

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

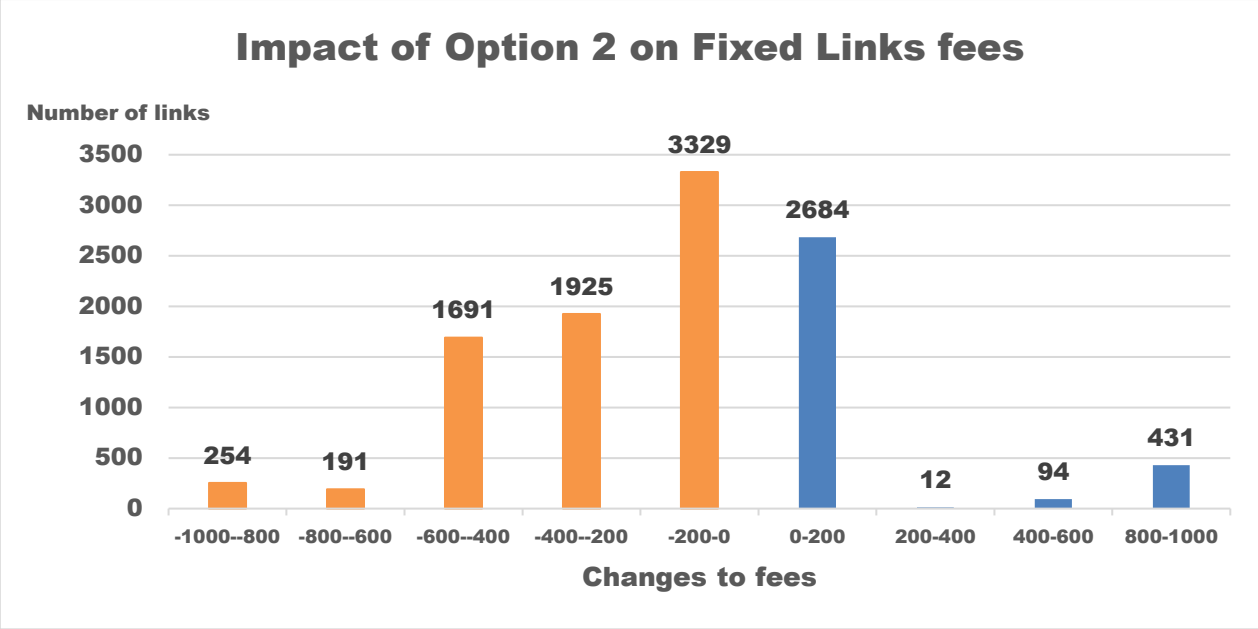

Figure 1: Uncongested fee increases and reductions under Option 2

3.93 On the other hand, around 3,200 uncongested links would experience an increase, around 83% of which are in the €0 - €200 range. As noted below ('Charging for increasing bandwidth') the reason for certain uncongested links increasing compared to Option 1 primarily relates to the bandwidth used for those links (i.e., under Option 1 fees increase slowly with bandwidth used and not at all after 40 MHz). See section 4.6 (Spectrum management and efficiency) below for a further discussion.

Band	No. of Licences	Average Change (%)
1.3/1.4	28	-90%
1.3/1.5	43	-90%
2.0/2.3	15	-59%
L6	81	-21%
U6	91	4%
L7	7	-51%
U7	179	-28%
L8	168	-25%
U8	3	-83%
11	1,139	-8%
13	963	-18%
15	1,179	-21%
18	2,035	20%
23	1,189	-13%
26	61	-53%
28	394	-40%
38	1,025	-75%
42	33	-25%
80	2,300	4%

Table 2: Average change in fees per band

3.94 Under Option 2, 16 of the 19 existing bands would experience a reduction in Fixed Link fees on average[90] as shown in Table 2.

3.95 Licensees whose overall fees would reduce under Option 2 (76% of licensees) would likely prefer that Option over Option 1. Such stakeholders would benefit from reduced fees if existing rights of use were retained. Further, such stakeholders may also decide to reconsider how its Fixed Links are deployed such that the required connectivity can be delivered more cost effectively by moving out of congested bands/ migrating to higher frequency bands etc.)

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

- Under Option 2, Fixed Links would no longer be capped at €1,500 resulting in some higher fees for Fixed Links that Existing Licensees may require in the future [91]; and
- To the extent such licensees required rights of use (or additional rights of use) in congested areas in the future, they would face higher fees for same.

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

II. Key Factors Driving Fee Variations

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

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

1. Bands Assigned

3.99 As set out in Table 2 above, the average fee for a Fixed Link would increase in three bands under Option 2 relative to Option 1:

- the upper 6 GHz - 4% increase;
- 18 GHz - 20% increase; and

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

[91] Under Option 2, fees for uncongested fixed links would have a greater variance, with a significant number of fixed links becoming more expensive (fatter tails to the right of the distribution).

- 80 GHz - 4% increase.

3.100 The most impacted Existing Licensees are those who would experience an increase in fees of greater than or equal to 10% (of existing fees) and/or an increase of greater than €10,000 under Option 2. The change in overall fees that would be paid among these licensees is driven largely by their current links which exceed 40 MHz bandwidth[92] particularly in the 18 GHz[93] and to a lesser degree 23 GHz bands where 110 / 112 MHz links are more common. In that regard, ComReg notes that the key driver of overall fee increases for Existing Licensees under Option 2 is that the incremental charge for additional bandwidth above 40 MHz is no longer set at zero.

3.101 As shown in Table 2, the magnitude of the change in average fees also varies significantly across bands, therefore the extent to which an existing licensees' fees increase or decrease depends in part on the bands in which it currently operates. Given that the various bands form a chain of substitutes there is much scope for Existing Licensees to switch many Fixed Links out of bands with higher fees into bands with lower fees.

2. Bandwidth assigned

3.102 ComReg estimates that under Option 2, that fees on bandwidth above 40 MHz (c. 6,000 Fixed Links) would account for approximately 33% of total fees.[94] This is roughly commensurate with its share of total bandwidth, noting that under Option 1 the additional bandwidth above 40 MHz does not account for any share of fees paid. This clearly raises the need for measures to address the lack of charging for additional bandwidth considering the ever-increasing demand for bandwidth.

3.103 Table 5 shows the fee under Option 1 and Option 2 for an uncongested Fixed Link in the most common bandwidth within each band. In short, fees reduce for the most commonly used bandwidths in most bands.

Fees for select uncongested Fixed Links, by band

Bands	Bandwidth	Option 1	Option 2
1.3/1.4	**0.5**	€1,200	€100
1.3/1.5	**1**	€1,100	€100
2.0/2.3	**14**	€1,200	€495
L6	**29.65**	€1,200	€947
U6	**40**	€1,200	€1257
L7	**14**	€1,100	€434

[92] Under the existing fee schedule an otherwise identical Fixed Link of 40 MHz or 120 MHz would have the same fee - the additional 80 MHz was in effect free. Under the proposed fee model this Fixed Link would now be more expensive, with the fee rising linear to the bandwidth.

[93] ComReg notes that the increase in fees in the 18 GHz Band is driven by changes in how additional bandwidth is charged.

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

U7	**28**	€1,000	€861
L8	**29.65**	€1,000	€901
U8	**7**	€1,100	€210
11	**40**	€1,200	€1,105
13	**56**	€1,500	€1,461
15	**112**	€1,500	€2,280
18	**110**	€1,125	€1,943
23	**112**	€1,125	€1,650
26	**28**	€900	€421
28	**112**	€1,125	€1,177
38	**112**	€825	€412
42	**112**	€150	€112
80	**1000**	€150	€250

Table 3: Average change in fees for largest, commonly used bandwidths

3.104 Fees increases for highest commonly used bandwidths under Option 2 are concentrated in the middle frequency bands where licensees regularly require additional bandwidth above 40 MHz, after which point no marginal cost applied under existing fee schedule. Under Option 2, above 40 MHz fees would increase in line with the bandwidth used.

3. Congestion charges

3.105 The number of links (and associated licensees) which would require a congestion charge is relatively small (c. 322 Fixed Links held by 26 licensees) and this congestion premium would account for just 6% of total fees[95], noting that under the existing fee regime congestion charge accounts for <1% of total fees

3.106 Under Option 2, congested Fixed Links would become more expensive, with the median fee increasing from €1,080 to €1,967. There is also a greater spread of fees above €1,700. The left-hand side of figure 2 provides some rationale for the ineffectiveness of the existing congestion charges, with those charges under Option 1 weighted too heavily in the €900 - €1,100 range.

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

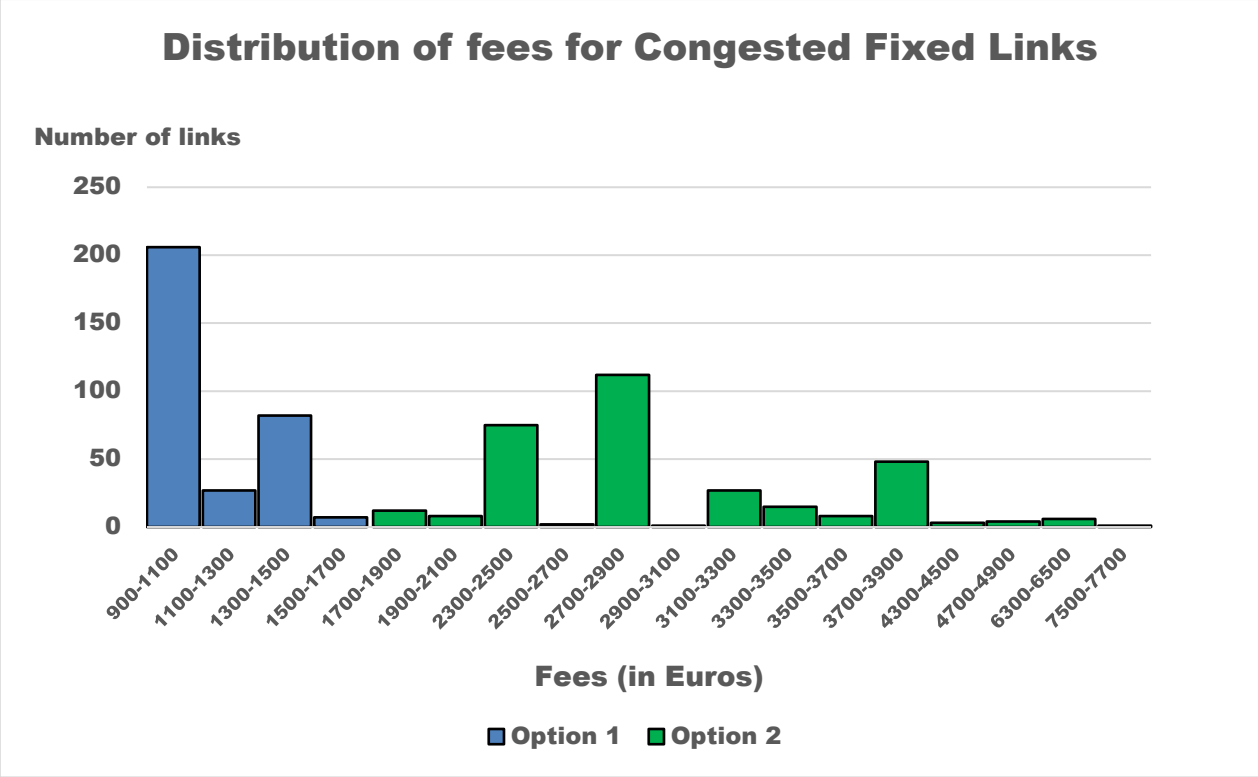

Figure 2: Distribution of fees for Congested Fixed Links

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

Conclusion on stakeholder Impact

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

3.109 The extent to which Existing Licensees may prefer either Option 1 or Option 2 depends on several factors including the level of fees and the extent to which such licensees would prefer additional flexibility.

- 69% of licensees would pay lower fees and would **likely prefer Option 2** because of these reductions. Further, such licensees may be able to reduce their fees further by re-dimensioning their network by migrating into bands and bandwidth where fees are lower; and
- 31% of licensees would pay higher fees and would thus **likely prefer Option 1.** However, because increases are relatively modest and such licensees **may prefer Option 2** because it may be possible to reduce fees over time by migrating into bands where fees are lower. In particular:
    - Fees for uncongested links primarily increase where bandwidth

requirements are above common bandwidths of 28 MHz or higher.

- The combination of bandwidth above 40 MHz in the bands between 17 GHz and 37 GHz is where fees under Option 2 are highest compared to Option 1.
- This increase is driven primarily by links in the 18 GHz band, that exceed 40 MHz in bandwidth.

3.110 New licensees are **likely to prefer Option 2** because fees decrease for most links and new licensees can dimension their networks from the outset in line with the incentives provided by that option. New licensees will benefit from the fact that the primary focus of Option 2 is on the incentive potential an appropriate charging structure creates for the installation of new links.[96] Such licensees will be able to choose the most cost-effective combination of bands and bandwidth that best meet its link length and bandwidth requirements.

3.111 Under Option 1, new licensees would be faced with greater uncertainty about whether that framework would persist in the long run and may delay investment decisions and ultimately entry. This is mostly because it lacks the flexibility given by Option 2 for ComReg to vary parameters in response to changes in demand and technology developments for Fixed Links without making wholesale changes to the framework.

3.4 Assignment Impacts

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

(a) Efficiency and congestion;

(b) Simplicity; and

(c) Stable and predictable fees.

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

I. Efficiency and Congestion

3.114 As outlined in 'Charging for increasing bandwidth' below, ComReg is of the view that

[96] See page 31 of ComReg Document 21/134

increased bandwidth requirements increase the risk of potential scarcity in the future. This creates Assignment Impacts for stakeholders to the extent that future users may be unable to access sufficient spectrum because fees failed to promote more efficient use. This could arise through ComReg not having an appropriate charging structure that creates incentives for licensees to consider their requirements at the point of installation of new links.

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

3.116 Further, because Option 2 is more likely to prevent congestion issues arising, it is significantly more likely that spectrum will be available when a new licensee requires it. Alternatively, under Option 1 a new licensee may have to choose a sub-optimal combination of bands and bandwidth because of congestions in certain bands and areas that would not exist under a more efficient option.

II. Simplicity

3.117 DotEcon advises that simplicity for users is important to ensure that users and potential users do not face undue burdens in the assignment process.[97] In particular, new users should not be discouraged from applying for rights of use. The preferred option should reduce the extent to which a potential licensee is assigned rights of use which were made based either on poor information or a lack of understanding of the assignment process.

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

3.119 Under Option 2, there is some risk that a new licensing framework could create Assignment Impacts that would not arise under Option 1. ComReg considers this unlikely because the practical implementation of the formula is very straight-forward, and licensees are generally very well versed given the nature of Fixed Links. Licensees simply must know their requirements or range of requirements for a specific link and the associated fee would be calculated automatically on that basis.

3.120 Therefore, while Option 1 is likely to be simpler for licensees in the short run, any additional complexity created by a new approach under Option 2 is likely to be

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

marginal and transient. Consequently, there are unlikely to be any Assignment Impacts arising from simplicity/practicality under either Option.

III. Stable and predictable fees

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

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

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

3.5 Impact on competition

3.124 As outlined above, (see Policy Issues and Objectives) there are different elements to competition that are relevant in determining the impact of any of the preferred options. There is a natural overlap between the aims of the fee methodology and an assessment of ComReg's compliance with some of its statutory obligations, particularly that of promoting competition, in accordance with Section 12 of the 2002 Act of by. These include:

(a) Encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources[98] ("Efficiency and Spectrum Management - Section 4.6");

(b) Ensuring that there is no restriction or distortion of competition in the electronic communications sector[99] ("Distortions to competition" – Section 4.7);

(c) Promoting efficient investment and innovation in new and enhanced infrastructures[100] ("Efficient Investment and Innovation" – Section 4.8); and

[98] Section 12(2)(a) of the 2002 Act.
[99] Section 12(2)(a) of the 2002 Act.
[100] Regulation 4(5)(d) of S.I. No. 444 of 2022.

(d) Safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition[101] ("Infrastructure based competition" – Section 4.9). [102]

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

3.6 Spectrum management and efficiency

3.126 ComReg's spectrum management role requires that operators with spectrum assignments in the relevant bands are incentivised to efficiently use those spectrum assignments. ComReg agrees with DotEcon that the primary focus is on the incentive potential an appropriate charging structure creates for the use of links. [103]

3.127 With that in mind, ComReg assesses the efficiency of each Option under the following headings:

I. Fees should best reflect the fact that a unit of spectrum (MHz) in the lower frequency bands has a higher value than in the higher frequency bands because of increased propagation and more limited supply. ("Frequency gradient").

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

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

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

3.128 Before, assessing each efficiency consideration below, readers are reminded that under Option 1:

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

[101] Regulation 4(5) of S.I. No. 444 of 2022.
[102] Impact on consumers assessed separately below.
[103] ComReg Document 20/109A, "*Consultant's Report - Fixed Links Bands Review*", published 9 November 2020, available at https://www.comreg.ie/

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

1. Frequency Gradient

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

> "*Operators, in response to the RFIs and through the stakeholder interviews, emphasised that link length policy is the most important factor in the selection of a band, and beyond that they simply select an appropriate size channel".* [104]

3.130 While licensees typically have a range of bands that can be used to deliver a specific use case[105], it is likely that bands with longer links, that fall within that range, will be chosen once appropriate channel spacing is available. Accordingly, absent sufficient incentives, licensees are, unsurprisingly, more likely to pick lower frequency bands when higher frequency bands would have been sufficient to accommodate their needs, even though there is less bandwidth typically available in those bands. This, in turn, makes them more prone to congestion.

3.131 DotEcon notes that there is a good case for maintaining a differential between lower and upper bands as this avoids the problem that lower frequency bands become occupied with users who could have used alternative higher bands as they did not actually require the superior propagation offered by lower bands. [106]

Option 1

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

3.133 To determine whether the existing frequency gradient sufficiently reflects the value difference between the upper and lower frequency bands, DotEcon estimated the difference in opportunity cost between upper and lower frequencies (if there was

[104] See page 54 of ComReg Document 20/109A

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

[106] See page 30 of ComReg Document 21/134A.

scarcity).[107] The ratio between the highest opportunity cost and lowest opportunity cost for links of a given size, and given level of congestion, is informative of the relative prices at which operators may prefer one band over another.

3.134 DotEcon's modelling[108] shows that value differences between the upper and lower frequencies are significantly greater than the 10:1 ratio that is used under Option 1. DotEcon advises that the current charging scheme does not seem to provide a strong enough incentive to avoid the lower bands if they were acutely congested. The cost modelling suggests that the ratio of opportunity cost in congested areas between lower and upper bands is in the order of **1:15 to 1:54** depending on the bandwidth used and the location of the links considered. [109]

3.135 Therefore, ComReg is of the view that while a frequency gradient is present under Option 1, this 1:10 level is unlikely to reflect the likely value differences between the bands. Consequently, it is not able to provide a strong enough incentive to discourage the use of the lower bands when higher frequency bands are also fit for purpose. This deficiency could therefore lead to inefficiencies in the assignment of spectrum rights of use in the future.

Option 2

3.136 DotEcon considers that it is beneficial to try to reflect at least some of the likely structure of long run opportunity costs within fees. Option 2 achieves this by establishing some reasonable differential in per MHz fees across different bands reflecting the intrinsically more limited supply of low frequency spectrum and to provide an incentive for users with flexibility to leave lower bands available for those who require them.[110]

3.137 Under Option 2, the ratio between the highest opportunity cost and lowest opportunity cost for a given link and level of congestion is used to determine the relative ratio between bands. This is likely to be informative of the relative prices at which flexible operators may prefer one band over another. As noted, this is likely to be in the range of **1:15 to 1:54,** depending on factors such as the bandwidth used, and the location of the links considered. Within this range, ComReg considers that a ratio of 1:30 would seem appropriate (See Annex 2).

3.138 Furthermore, and as set out in Table 4 below, ComReg notes that Option 2 provides a 1:30 ratio between the highest and lowest frequency bands, providing a more accurate reflection of the relative value differences between all twenty Fixed Links

[107] DotEcon also advise that even without acute congestion, there is a still good case for maintaining a differential between lower and upper bands. This avoids the problem that lower frequency bands become occupied with users who could have easily moved to alternative higher bands when initially installing links, not needing the superior propagation of lower bands.
[108] See Annex 2
[109] See Table 9, 10 and 11 of ComReg Document 21/134A.
[110] See page 28 of ComReg Document 21/134A.

Bands (i.e., each band is assigned its own ratio). This contrasts with Option 1 which retains the 1:10 ratio only for the highest and lowest categories of bands rather than between each of the bands under Option 2. There is little incentive for an operator (who is able to do so) to choose the higher frequency band within a category of bands (e.g., 17 – 37 GHz) since the price is the same regardless of the band used.

3.139 Of course, the higher ratio under Option 2 does not mean that fees are three times higher compared to Option 1 (i.e., 1:10 v 1:30) as this refers only to the ratio between the lower and upper frequencies. For a given band, the minimum price per MHz for that band[111] is simply the base price multiplied by the band ratio. Note that the 1:30 ration applies to the per MHz price for modal bandwidth links, and therefore, following the revision to the definition of effective bandwidth, the band ratio for the 42 GHz band is now less than one. The base price for the two lowest frequency bands (1.3 GHz and 1.4 GHz) is determined by treating them as the same frequency band (See Annex 2).

Frequency Bands (GHz)	Option 2	Option 1
1.3	30.00	10
1.4	30.00	
2	29.49	
L6	26.62	
U6	26.19	
L7	25.83	
U7	25.62	
L8	25.31	
U8	25.03	
11	23.02	
13	21.74	
15	16.97	
18	14.72	7.5
23	12.27	
26	12.54	
28	8.76	
38	3.07	5.5
42	0.83	1.00
80	0.21	1.00

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

Conclusion of frequency gradient

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

3.140 ComReg is of the view that Option 2 is likely to better reflect the relative differences in value between each of the bands and provide better incentives for operators to choose appropriate bands, that is lower frequency bands would be chosen only when the particular characteristics of that band are required (e.g., the additional propagation and/or available equipment in lower bands).[112]

2. Charging for increasing bandwidth

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

3.142 Indeed, ComReg notes the views of Vodafone in relation to the 80 GHz Band that opines:

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

3.143 Any preferred option should discourage spectrum hoarding by reducing its incentives. This is a particular concern arising from Option 1 and is discussed below.

Option 1

3.144 Under Option 1, fees for each bandwidth category above the lowest bandwidth category increase slowly in steps[113] up to 40 MHz, and not at all after that. DotEcon notes that because fees increase slower than proportionately with bandwidth used and not at all above 40 MHz bandwidth, the current charging structure fails to reflect emerging demand for higher bandwidths. [114] ComReg notes the following issues with the assignment of additional bandwidth under Option 1.

3.145 **First**, where bandwidth is available there are poor incentives for licensees to choose bandwidth categories that best reflect their actual requirements. The increase in

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

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

[114] See page 31 of ComReg Document 21/134A

prices as a licensee moves to a higher bandwidth category is very modest (and zero after 40 MHz) and unlikely to deter licensees from acquiring additional bandwidth when a lower amount would suffice. If scarcity becomes more of an issue in the future, the prevailing fees framework needs to favour more efficient operators that are able to deliver services with lower amounts of spectrum.

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

- increased bandwidth requirements generally means that there is going to be an increased requirement for higher bandwidth lengths (e.g., the majority of links are already above 40 MHz and invulnerable to the current fees structure); and
- take up of more advanced equipment in the future will provide operators with increased flexibility to increase bandwidth (i.e., provide a higher bandwidth ceiling than existing legacy equipment. [115][116]

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

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

[115] See Ceragon Products available at https://www.ceragon.com/

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

Table 5: Links in each bandwidth category under Option 1

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

Option 2

3.149 Option 2 moves away from the bandwidth category approach and instead charges fees that increase with channel size. However, additional spectrum is less expensive up to the highest commonly used channel, after which the fees increase linearly with bandwidth used. That is, there is a declining marginal cost of spectrum for larger channel sizes and lower per MHz price for larger channels.

3.150 DotEcon notes that where there is significant congestion, efficient pricing requires licensees to pay in proportion to bandwidth used because the assignment of additional spectrum precludes some other potential users (with the opportunity cost defined by the highest value amongst these potential alternative users). If there are many excluded alternative users (reflecting a high level of scarcity), the effect of diminishing returns will be weak, as there will be some other next highest value excluded user with closely similar value as the highest value excluded user. [117]

3.151 Separately, even where there is no current issue of acute scarcity, (e.g., uncongested links) DotEcon advises that charging by bandwidth would seem to be appropriate, to ensure operators do not acquire licences for larger channels than they need and minimise the risk of avoidable congestion arising in the future. This is likely to be particularly relevant for cases where congestion is not currently an issue, but demand is increasing and inefficiently assigned spectrum might become an issue.

3.152 ComReg agrees with DotEcon and is of the view that this approach is more efficient in the assignment of bandwidth than Option 1 because:

I. it is more reflective of current circumstances where demand for increased bandwidth is emerging, particularly in the higher frequency bands. For

[117] See page 31-32 of ComReg Document 21/134A

example, all bands from 11 GHz and above (except 26 GHz[118]) have significant usage of channels of 40 MHz or more;

II. fees increase with bandwidth used;

- thereby ensuring that for congested links additional rights of use are more likely to be assigned to those who value that spectrum the most; and
- for uncongested links it minimises the risk of inefficient assignment and the risk of avoidable congestion arising in the future.

III. there are no situations where fees are entirely unaffected for increasing bandwidth requirements and licensees will have to carefully consider any need for additional bandwidth;

IV. this approach strikes a balance between discouraging hoarding (e.g., fees proportionate to bandwidth above commonly used bandwidths) while encouraging use among commonly used bandwidths (e.g., declining marginal price for commonly used channels);

V. the starting point for determining the appropriate fee is based on actual usage (rather than the fee for the lowest bandwidth category under Option 1); and

VI. lower bandwidth links can still be efficiently provided for (e.g., 1 MHz is the most common bandwidth for the 1.3/1.5 GHz band.) [119]

3.153 Notice that this is not an argument for fees being higher but rather that fees should be assigned based on the largest most commonly used bandwidth within the band (which by definition most licensees would fall under) and increase in proportion for bandwidths higher than that.

Conclusion on charging for increasing bandwidth

3.154 Based on the assessment above, ComReg is of the view that Option 2 is likely to better reflect emerging demand for higher bandwidths and encourage licensees to choose bandwidth levels that best reflect their requirements.

3. Fragmentation risk

3.155 There is always a risk that a band(s) can become fragmented to some extent given that users tend to have different bandwidth requirements (larger or smaller)

[118] The widest channels available in the 26 GHz band are 28 MHz

[119] Indeed, fees for what would fall under the lowest bandwidth category under Option 1 (e.g., 1 MHz link) would be significantly lower under Option 2.

depending on their use case. Fragmentation arises because of the assignment of smaller channels where larger channels are required or will be required in the future (i.e., gaps between smaller channels preclude allocation of large channels).

3.156 Fragmentation would not be an issue if users all want the same bandwidth and spectrum is offered in that channel size. In such circumstances, gaps would be useable by all parties. However, there is a risk of a band(s) becoming fragmented, if a licensees smaller bandwidth requirement (e.g., 28 MHz) is spaced in such a way that users who require a larger bandwidth (e.g., 56 MHz) might not be facilitated even if there is enough spectrum available overall. As noted by DotEcon:

> "*This could occur if the channel widths demanded by operators increase and, while there is sufficient unused spectrum available to accommodate a new larger channel, the organisation in of the existing links in the band preclude the new higher capacity link from being installed".*[120]

3.157 This creates a risk of inefficiency if currently unused spectrum is fragmented and cannot be utilised to its full potential by larger bandwidth users who have a requirement for same.[121] This has not been a substantial issue to date, but the general trend towards larger bandwidths increases the risk of fragmentation becoming more prevalent in the future in areas where a significant number of smaller channels remain in use.

3.158 DotEcon observe that fragmentation becomes more of an issue in the larger channel widths. With 28 MHz channels there is some impact of fragmentation in some areas, but no issue in the majority of the country. The number of "problem areas" increases in the options for assigning 56 MHz channels; the presence of 112 MHz channels appears to have a fragmentation impact in a large proportion of the country.

3.159 While a certain amount of fragmentation is inevitable given the differing bandwidth requirements of users and consequently the matters cannot be fully resolved by either Option, the assessment below evaluates the extent to which either option would mitigate future fragmentation, particularly with the larger uncongested bands in mind.

Option 1

3.160 Under Option 1, the fee structure means that licensees are generally incentivised to choose larger channel sizes over small ones. (i.e., smaller channel sizes are significantly more expensive than larger ones on a per MHz basis). This would

[120] See page 145 of ComReg Document 20/109A

[121] There is an internal efficiency trade-off between encouraging efficiency and while this is in some ways supportive of efficient spectrum use (operators with limited bandwidth requirements do not need to acquire larger channels that are then partially unused), it does create potential fragmentation issues where the unallocated frequencies are not in sufficiently large contiguous blocks to allow access to greater bandwidths (even if there is enough free spectrum overall to do so)

appear to suggest that the assignment of smaller channels (which are the source of fragmentation) are less likely to arise under Option 1.

3.161 However, the definition of a smaller channel is not an absolute. Rather, it varies according to band and is ultimately relative to the size of the so-called larger channels in that band. Under Option 1, there is no reference point with which to determine whether a particular bandwidth is large or small. In practice, smaller channels are simply those channels that are smaller than the common bandwidth within a band.

3.162 The use of bandwidth categories under Option 1 results in one fee covering a range of different channel sizes. This range is notably significant above 40 MHz, increasing the possibilities for more licensees to have bandwidth smaller than the common bandwidth (i.e., while there will be a common bandwidth there is a greater risk of more licensees having bandwidth below that.) Alternatively, under Option 2, a fee would apply solely to the common bandwidth and smaller channels would be charged a premium on same.

Option 2

3.163 Under Option 2, while users of a smaller channel would pay less than users of a larger channel, fees increase proportionately for bandwidths below the largest commonly used channel size, because the effect of a user licensing a smaller channel may be to preclude a marginal user of larger bandwidth (e.g., if the price for 56 MHz typical bandwidth was €1,000 the price for a 28 MHz channel would be €625). As noted by DotEcon:

- the pricing structure proposed would also help by creating incentives for users to use larger channels rather than multiple small channels with the same total bandwidth, increasing the potential for spectrum in use to be kept contiguous and better organised in the formal channel plan. [122]
- would give an incentive for smaller channel users to come together and share a wider channel, which is desirable as it avoids these smaller users scattering across the band, leaving unusable gaps. [123]

Conclusion on fragmentation

3.164 Based on the assessment above, ComReg is of the view that while the risk is low across both options[124], Option 2 provides better protection against excessive fragmentation of bands which would unnecessarily preclude the issuing of wider

[122] See page 15-16 of ComReg Document 21/134A

[123] See page 32 of ComReg Document 21/134A

[124] Further, long-term technology changes will assist in reducing any fragmentation that exist. DotEcon advise that the use of XPIC configurations and carrier aggregation equipment to combine non-adjacent channels would alleviate the problem, particularly in the longer term as equipment is naturally swapped out. However, the timeframe for these changes is unclear and the fee structure can assist in the interim.

channels in the future.

4. Congestion charges

3.165 In relation to Congestion Charges, where there is congestion (i.e., as already occurring in the 13 – 23 GHz bands) rights of use should be assigned to the users who value it most.

3.166 The impact of congestion charges on efficiency under both options is assessed under the following headings which form separate parts of the congestion charge:

- The level of the congestion charge; and
- High usage charges.

Option 1

Level of congestion charge

3.167 Under Option 1, a congestion charge of 20% of the corresponding uncongested fee applies in areas determined to be congested. For example, in the 1.3 GHz – 15 GHz band category, the fee for 0.25 to 3.5 MHz bandwidth category is €1,000 compared to €1,200 in congested areas (i.e., the congestion charge is quite modest, adding only 20% of the corresponding uncongested fee).

3.168 DotEcon notes that setting fees based on opportunity cost[125] supports an efficient assignment of spectrum as the 'excluded users'[126] under the efficient allocation would have incentives to use other (cheaper) Fixed Link Bands or alternative technologies such as fibre, leaving the spectrum available for the higher value users.[127]Such an approach is consistent with ComReg's view that efficient spectrum assignment[128] generally requires rights of use to be assigned to those users who value it the most and can make the best economic use of it.

3.169 In that regard, DotEcon approximates that the short-run opportunity cost for the congested 13 GHz, 15 GHz and 18 GHz bands for a 56 MHz bandwidth is over €10k per annum. This is estimated based on users that may need to migrate up to higher bands and may need additional intermediate stations. DotEcon notes that a key concern is that if lower frequency bands (with better propagation) become congested, this could force some users up to higher frequency bands, requiring additional

[125] The opportunity cost is the value that is forgone by assigning spectrum to the user rather than making that spectrum available to other users. (i.e., the opportunity cost is set by the valuation of the excluded user).
[126] Where a band becomes congested (i.e., with Existing Licensees) there are a group of excluded licensees and fees charged to existing users should be reflective of opportunity cost (set by the valuation of the marginal excluded user) in order to encourage efficient use.
[127] See page 27 of ComReg Document 21/134A
[128] Subject to measures that reduce the risk of restrictions or distortions to competition.

intermediate stations (or possibly a shift to fibre in some cases). [129]

3.170 With that in mind, DotEcon notes that the current congestion surcharge of 20% is very likely too low. It is clear that the current congestion prices are significantly below the modelled short-run opportunity costs because the maximum congested fee under Option 1 is €1,800 compared to a modelled opportunity cost of €10,000.

3.171 However, DotEcon also notes that "*the surcharges do not necessarily need to be at such a high level to promote efficient use of the spectrum, as at least some users are likely to be able to shift bands more easily and so would do so in response to more modest fee differentials between bands, but these certainly still need to be large enough to at least compensate for possible equipment cost differences and somewhat less robust connections at higher frequencies.*" [130]

3.172 Notwithstanding, ComReg agrees with DotEcon that existing congestion fees under Option 1 are likely too low and therefore unable to encourage more efficient use of the radio spectrum. In particular:

- Under Option 1 congestion charges are significantly below the actual short-run opportunity costs associated with acute congestion and more relevantly not large enough to at least compensate for possible equipment cost differences and / or less favoured propagation at higher frequencies;
- Any impact that may exist reduces significantly as licensees move to higher frequencies which could become congested in the future. For example, in the 42 – 80 GHz band category the impact of the congestion charge is an inconsequential €20 - €50 depending on the bandwidth category; and
- The congestion charge has no impact above 40 MHz (i.e., in the same way fees above 40 MHz bandwidth are entirely unaffected by additional bandwidth) such that any bandwidth above 40 MHz is only €50 - €500 more expensive, depending on the bandwidth category.

3.173 Therefore, while the 20% congestion charge provides notional incentives to avoid the band in the congested areas, the impact (if any) is likely to be quite small.

High usage charges

3.174 Under Option 1 (and at present), ComReg applies a congestion charge for links in the 18 GHz and 23 GHz bands where at least one end of the link is within the congested area. A high usage charge applies when a licensee has five or more links over the same path.

[129] The methodology for estimating opportunity cost and the result of the model is described in greater detail in **Error! Reference source not found.**of ComReg Document 21/134A.
[130] See page 29 of ComReg Document 21/134A

3.175 The high usage charges worked well in encouraging users to avoid having many links in the same path. For example, there was a relatively high number of high usage links when this approach was first introduced (e.g., 102 in 2010). However, licensees appear to have migrated usage over time to avoid these charges and there have been no high usage charges applied since April 2019 (having fallen to 10 or less links per year for each of the previous 4 years).

3.176 However, with increased bandwidth usage in the future, it is possible that high usage charges may become less effective in preventing localised congestion. As noted by DotEcon, a high usage approach needs to avoid creating perverse incentives by making the total fees that a licensee would pay significantly different dependent on whether it licenses a given bandwidth as a single channel or as multiple channels across different links.[131] This problem is present under Option 1 because fees do not increase beyond a 40 MHz bandwidth and being assigned additional bandwidth can be achieved across one link (avoiding the need for multiple links when the high usage charge might apply).

3.177 It also leads to situations where licensees with the same spectrum endowment in a band over a given path could be treated differently depending on the Fixed Links they are assigned (i.e., a licensee that is assigned multiple links could be subject to a high usage charge but an alternative licensee with fewer individual links, but the same overall bandwidth would avoid the high usage charge).

3.178 Therefore, Option 2 is likely to better reflect the emerging demand for higher bandwidths and better encourage licensees to choose bandwidth levels that best reflect their requirements.

Option 2

Level of congestion charge

3.179 As noted above, DotEcon estimates that the short-run opportunity cost for the congested 13 GHz, 15 GHz and 18 GHz bands for a 56 MHz channel is over €10k per annum.[132] To implement congestion charging to best reflect opportunity costs of that scale would require setting the congestion charge value at 6 rather than 1.2 under Option 1. Under Option 2, ComReg intends to take a conservative approach and set the congestion charge at 3. ComReg will consider further under any future reviews.

3.180 Congestion fees need to be large enough to incentivise potential licensees to at least consider whether it would be more efficient and cost effective to be assigned

[131] See page 35 of ComReg Document 21/134A.

[132] The approach to setting opportunity cost is described in Annex B of the DotEcon Report (ComReg Document 21/134A).

alternative rights of use in other bands. Further, DotEcon[133] observes that congestion charges set at a sufficiently high-level puts users of uncongested links on notice that they may face surcharges in the future if congestion arises.

3.181 Under Option 2, it is possible that a congestion charge of 3 (See Annex 2) may be set too low, however, it is likely to be more effective at encouraging efficient use than Option 1 and ComReg can change the charge in the future in response to any developments in how licensees use Fixed Links in the future.

High usage charges

3.182 Under Option 2, fees are increasing with the bandwidth used[134] reducing any difference between using more channels or larger channels if this leads to the same overall bandwidth in use. With that in mind, a high usage path surcharge only applies if more than half of the total spectrum across the group of bands is used. (i.e., the surcharge would apply to half the total spectrum across a range of bands regardless of number of channels used)[135].

3.183 This is likely to be more effective in preventing localised hoarding than Option 1 (which was primarily aimed encouraging use of fibre[136]) although both effects are possible in each case.

Conclusion on congestion and high-usage charges

3.184 Based on the assessment above, ComReg is of the view that Option 2 better reflects the short-run opportunity cost of spectrum rights of use in congested bands and better ensures that rights of use to those bands are held by those who value the spectrum the most.

3.7 Distortions to competition

3.185 Potential distortions or restrictions to competition in the assignment of Fixed Links rights of use could arise in two main ways.

I. Anti-competitive hoarding.

II. Fee's choking off efficient access.

3.186 The remainder of this section assesses each option under I and II in order determine

[133] See page 56 of ComReg Document 21/134A

[134] This is subject to surcharges for small channels – represented as "m" in the formula under Option 2.

[135] Note that the surcharge of 20% would still apply. As this level of surcharge appears to have worked well to date (with High-usage Fixed Links decreasing to single digit figures), ComReg is therefore not minded to increase this surcharge.

[136] ComReg Document 09/89R2 "*Guidelines to Applicants for Radio Links Licences",* published 06 July 2017, available at www.comreg.ie

whether the Options would potentially create restrictions or distortions to competition.

I. Anti-competitive hoarding

3.187 As described in paragraph 3.55 above, anti-competitive hoarding involves the accumulation of rights of use for strategic reasons to prevent potential competitors acquiring sufficient rights of use to compete downstream. [137]

3.188 Below, ComReg assesses anti-competitive hoarding[138] under Option 1 and Option 2.

Option 1

3.189 Option 1 has delivered a variety of important use cases, including narrowband telemetry and control, broadcast distribution, backhaul from mobile cell sites, fixed wireless access, and links within core networks.[139]These have been delivered since at least 2009 and ComReg is unaware of any anti-competitive hoarding having occurred in that time. This is to be expected given that there is high availability of links, with <1% of links considered congested and all of those located in specific geographic locations in Dublin.[140] Further, no high usage charges have been levied since April 2019, supporting the view that there is unlikely to have been any issue of localised hoarding.

3.190 Relatedly, there is unlikely to have been any issues around asymmetric access to spectrum[141] arising from any incumbency advantages Existing Licensees may have. While these links are typically renewed annually by licensees (having been originally assigned on a first-come first served basis), congestion is highly restricted and the assignment of links in such areas is unlikely to have constrained or distorted competition given the availability of alternative frequencies to other licensees.

3.191 However, ComReg notes that such a situation may not always be the case and there is the potential that restrictions or distortions to competition may arise in the future. We note that bandwidth requirements for Fixed Links are increasing, and the

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

[138] Inefficient hoarding is assessed under 'Spectrum Management and Efficiency' above.

[139] See Section 2.1 of ComReg Document 20/109A, for further discussion on these use cases.

[140] Congestion mainly arises in a number of key high sites with good visibility to the city centre (e.g., Three Rock).

[141] Anti-competitive hoarding can arise from asymmetric access to spectrum and particularly by incumbents or Existing Licensees. Such issues could arise in the provision of fixed links. For example, if a frequency band(s) important in the delivery of a particular downstream service(s) became congested and sufficiently substitutable frequencies were not available. Asymmetric access can arise because Existing Licensees may have incumbency advantages from being able to renew such frequencies and could be protected from new entry.

increasing availability of more advanced equipment will allow licensees to utilise greater bandwidth links. This would exacerbate the existing pricing inefficiency (i.e., fees do not increase in proportion to bandwidth used) and could lead to asymmetric access concerns.

3.192 The extent to which such scenarios would restrict or distort competition depends on the levels of congestion, the importance of the frequencies and the availability of alternatives. For any given use case, there is typically a range of frequency bands that can be used. As noted by DotEcon, a consequence of there being a chain of substitutes is that even if one band is scarce, it may be possible – at least in the long-run once equipment is renewed – for users to employ different bands such that spectrum can be freed up. [142] There is no frequency band that holds special relevance in the provision of a particular use case(s) because there are typically a range of bands available for any particular use case. [143]

3.193 However, depending on level of congestion there could potentially be incentives for anti-competitive hoarding for some use cases (e.g., Advanced FWA) over others (e.g., mobile backhaul)[144] particularly in the longer run as demand for bandwidth grows and potential use cases emerge. FWA is already an established service in Ireland and is one of the primary use cases for Fixed Links, both for connecting end users and for backhaul into the core network.

3.194 Further, as noted by DotEcon[145], advanced FWA[146] has already emerged, allowing operators to offer fixed wireless broadband services at much higher speeds. These typically use dense networks of links at higher frequencies and are aimed at competing directly with fixed networks in urban areas. This provides valuable competition to existing fixed and mobile broadband services and the use of spectrum for this purpose should clearly not be precluded because of any incentives for incumbents to hoard spectrum rights of use.

3.195 While FWA services are typically spread across several bands (depending on their specific speed and length requirements), advanced FWA has the narrowest range of frequencies of all the use cases identified by DotEcon which are likely to be suitable

[142] See Section 4.2.1 of ComReg Document 20/109A

[143] As noted by DotEcon "*Whilst there will be a "sweet-spot" in terms of optimising the trade-off between capacity and propagation for any given use case, in practice there is typically a wide range of feasible frequencies and particular use cases are not limited to single bands*." See p52, Document 20/109a.

[144] Hoarding in relation to backhaul is unlikely as other higher frequency bands may become available (e.g., W-Band and D-Band) along with other technologies that are available to MNOs, such as integrated access backhaul (IAB) that would not require such high frequencies. See p9, Document 20/109A.

[145] See page 48 of ComReg Document 20/109A

[146] Advanced FWA can use new technologies (such as dynamic beamforming) that can support much higher capacities using mmWave bands, creating the potential to use Point-to-Multipoint and/or mesh systems to provide high-speed broadband in urban areas. See Document 20/109A (Section 4.1). See also Section 3.2.2 and Vodafone's and Siklu's view on relevance of advanced FWA.

(i.e., a short chain of substitutes).[147] These are the bands that offer the large bandwidths required to run high-capacity links but can still operate over distances that are long enough to be economical and not suffer from propagation issues. (e.g., 37 – 39.5 GHz[148]). In that regard, because it is the use case that would likely compete with existing FWA, fixed and/or mobile operators and because it operates across the narrowest range of frequencies, such operators may be tempted to hoard spectrum inefficiently in these bands in the future.

3.196 Overall, ComReg is of the view that the fee schedule under Option 1 is unlikely to result in anti-competitive hoarding, particularly in the short run. However, and while the risk is generally low, anti-competitive hoarding scenarios cannot be ruled out in the longer run as more advanced use cases become available.

Option 2

3.197 Under Option 2, the cost of holding additional bandwidth increases in proportion to the bandwidth used and consequently, any anticompetitive hoarding strategies would be significantly more costly. More generally, Option 2 is less likely to result in unnecessary congestion and inefficient use which create the conditions for asymmetric access and hoarding.

3.198 Further, congestion charges set at a sufficiently high-level puts users of uncongested links on notice that they may face higher fees in the future if congestion arises. This has a disciplining effect because hoarding is premised on rights of use becoming congested, precluding competitors or new entrants from using those rights of use. However, if such a situation arose congestion charges would apply, significantly increasing the costs of holding hoarded spectrum compared to Option 1.

3.199 Finally, as noted above, the high usage charges provided an additional protection against localised hoarding by imposing an additional charge if a user occupied more than half of the available spectrum in the band.

3.200 Therefore, the risk of anticompetitive hoarding under Option 2 is highly unlikely.

Conclusion on anti-competitive hoarding

3.201 ComReg is of the view that while the risks of anticompetitive hoarding are low under Option 1, Option 2 is more future-proofed as it provides additional protections that would better encourage the development of new and competing use cases.

II. Fees choking demand

3.202 Distortions or restrictions to competition could arise due to the level of fees choking

[147] See Figure 1 of ComReg Document 20/109A

[148] For example, a US ISP Starry is currently using a combination of light-licensed shared spectrum in the 37 – 39 GHz band and its recently acquired exclusively licensed spectrum in the 24 GHz band. See page 48 of ComReg Document 20/109A

off efficient demand for spectrum rights of use. (i.e., spectrum would have been used to provide services, if the fees were set lower). Fees have a role in encouraging efficient use and preventing unnecessary congestion in various spectrum bands, however, such fees should not be set at a level that would choke off any particular use. Prices that are set too high could lead to scarce spectrum being unused, or under-used (e.g., with an operator choosing not to deploy sites at the expense of diminished coverage or service quality).

Option 1

3.203 ComReg is not aware of any particular use case that has been restricted or choked off due to the existing level of the fees. Indeed, the detailed stakeholder engagement conducted in 2020 did not uncover any use cases that were restricted through the existing fee levels or structure.

3.204 Further, in response to Document 20/109, only Virgin raised any issue regarding the level of current fees:

> "*the annual fees especially on the frequencies 38 GHz and below on higher bandwidths can impact or impede the use of these frequencies. This issue becomes more apparent when operators are dealing with cross border links and are therefore in a position to compare to the equivalent Ofcom pricing model*."

3.205 It is not clear from this response what aspect of existing charging is impeding the use of these frequencies in the view of Virgin. Further, the eight fixed wireless operators[149] have not raised any particular issues instead noting that:

> "*A new hopefully Improved fee schedule for Fixed Links that facilitates the greatest number of use cases, in order to ultimately promote greater use of the spectrum that are identified in this consultation and the responses".*

3.206 Separately, in response to Document 20/109, eir noted that in its experience the current fee structure seems to work well.

3.207 Finally, ComReg agrees with DotEcon's view that "*The current pricing regime has worked reasonably well to date and does not appear to have set fees at an excessive level that is inefficiently choking off demand*". [150]

3.208 Therefore, ComReg is of the view that fees are unlikely to choke off demand under Option 1.

Option 2

[149] Airwave, BBNet, Digitalforge, Whizzy, Kerry Broadband, Lightnet, Orion, Regional Telecom and Wireless Connect

[150] See page 38 of ComReg Document 21/134A

3.209 As set out on the impact on stakeholders earlier there would inevitably be some adjustment in fees paid by individual licensees. Licensees who experience a fee decrease (estimated at 51%) are unlikely to be choked off from delivering efficient demand since existing services are already being delivered at a higher level under Option 1.

3.210 Further, Option 2 has the additional benefit of supporting the development of rural ECS services and networks, noting that the decline in fees is greater in uncongested Fixed Links, which occur primarily in non-urban areas (e.g., outside of Dublin and the main cities). Fixed Links in such areas support the provision of ECS to rural consumers and businesses as rural ECS network are particularly reliant upon Fixed Links given the topographical and economic challenges in using alternatives in rural areas (e.g., fibre).

3.211 ComReg notes however that fees for several Fixed Links will increase, most notably in the case of:

- Fixed Links in the congested areas (Dublin city centre and south); and
- Fixed Links with high bandwidths (>100 MHz) in 15 GHz, 18 GHz, 23 GHz and 80 GHz.

3.212 In relation to licensees whose fees may be higher, it is possible that those higher fees might affect demand. However, while this risk is arguably greater under Option 2, ComReg notes that any fee increases would be relatively modest in either % increase or in terms of absolute increases.[151] Further, any of the greater increases would be borne by the larger licensees who hold the greatest number of links in any event.

3.213 Fee increases are a result of the incentives under Option 2 that are necessary to promote the efficient use of spectrum, specifically the *Bandwidth charge* and the *Congestion charge* which would increase the weighting on larger bandwidths and congested links respectively. ComReg has already explained in detail why such incentives are necessary if it is to achieve an efficient assignment of Fixed Links (see “Assignment Impacts”).

3.214 Further, ComReg notes that in instances where an operator faces an increase in fees, it could take actions to limit its exposure to that price increase over time. For example, an operator could, where distance and capacity permit:

- switch its Fixed Links to a less expensive band (e.g., a higher band);

[151] For example, some smaller licensees have a large % increase which corresponds to a small absolute increase and vice versa (i.e., an increase of from €500 to €1,000 is a 100% increase but just €500 in absolute terms).

- in Dublin, switch its Fixed Links to an uncongested band (e.g., a higher or lower in band; and
- economise on its bandwidth or rationalise its Fixed Links.

3.215 ComReg notes that use cases with the least potential for switching, and therefore at a greater risk of having demand choked off, are those which rely on the peripheral bands where propagation is specifically required such as 1.4 GHz (e.g., radio broadcasters). ComReg notes however that the average fee in individual Fixed Link in these bands decreased, and therefore the viability of the use cases with the narrowest range of potential bands are not negatively impacted. ComReg notes that fees for links in the 1.3/1.4 GHz bands would decrease from €1,000 to €100 per link.

3.216 Therefore, ComReg is of the view that the fee level under Option 2 is unlikely to choke off efficient demand.

Conclusion on fees choking off demand

3.217 The fee levels under Option 1 and Option 2 are unlikely to choke off efficient demand in the future.

3.8 Efficient investment and innovation

Option 1

3.218 Creating the conditions for promoting efficient investment and innovation in new and enhanced infrastructure investment involves ComReg exercising its regulatory functions in an appropriate and predictable fashion, thus providing regulatory certainty. As noted by DotEcon, "*it is important that fees for fixed links are predictable, if ComReg is to encourage efficient investment. Otherwise, it could create a hold up problem, where investment is avoided because of highly uncertain and potentially large future fees (which operators cannot easily avoid by moving to other bands or alternative technologies such as fibre once equipment is installed).*" [152]

3.219 Any option should provide certainty that the regulatory framework, which often underpins investment decisions, will not change unnecessarily and require operators to make subsequent and additional investments and/or changes to their network. Promoting competition and encouraging efficient investment, in ComReg's view, means allowing for a cost-effective deployment of Fixed Links and preventing inefficient duplication of investment caused by predictable changes to the regulatory regime.

3.220 As noted by DotEcon "*Fixed links licences are annual, but the equipment used for fixed links has a long asset life, often over ten years. Therefore, it is important that fees for fixed links are predictable, if ComReg is to encourage efficient investment.*

[152] See page 36 of ComReg Document 21/134A

Otherwise, it could create a hold up problem, where investment is avoided because of highly uncertain and potentially large future fees (which operators cannot easily avoid by moving to other bands or alternative technologies such as fibre once equipment is installed).” [153]

3.221 With that in mind, it is important that any option considers the likely long run development of the market to avoid future changes to the regulatory framework that could have been foreseen or give rise to additional cost.

3.222 Under Option 1, it is likely that investment in networks used to deliver services up to now could be considered efficient given the benefits to consumers and competition. However, it is unlikely that this Option can persist in the long run for the reasons set out above. In particular, the increased requirement for additional bandwidth is not compatible with an Option that provides no incentives for efficient use beyond 40 MHz, that is it is unlikely to be fit for purpose.

3.223 Therefore, ComReg would be unable to provide regulatory certainty that Option 1 would persist in the long run.

Option 2

3.224 Option 2 has been designed to accommodate all existing and potential use cases that are likely to require Fixed Links. Investments in new use cases (e.g., advanced FWA) are more likely to arise under Option 2 which promotes innovation in new and enhanced infrastructure.

3.225 Option 2 seems sufficiently future-proofed given that it also takes account of changes in demand conditions (e.g., increased requirement for bandwidth) that are likely to arise in the medium to long-term so that changes in demand conditions in the future should not require significant regulatory intervention. As noted by DotEcon:

> “*Use of a formula-based approach also helps to ensure the pricing regime is future-proof and robust to changes in demand (i.e., for bandwidth, and across different bands) and developments in congestion (which may increase or decrease in different bands and/or locations).”* [154]

3.226 Furthermore, in Document 22/93, ComReg introduced a second measure of bandwidth (e.g., the largest bandwidth in common use). This is the largest bandwidth that is expected to be used by a significant proportion of new links in the band in the near future. This additional measure takes a forward-looking view when considering how to charge by bandwidth. By including a reference to the largest bandwidth in common use, the formula is better future proofed as it is not relying solely on modal bandwidth, which concerns bandwidth at a point in time. This addresses respondent

[153] See page 36 of ComReg Document 21/134A
[154] See page 32-33 of ComReg Document 21/134A

concerns about the need to consider larger bandwidths in the formula but also likely reduces the need for ComReg to make changes to its approach in the short run, increasing regulatory certainty.

3.227 Option 2 also provides flexibly to adjust the formula in a straightforward fashion to the extent that issues arise (e.g., if one of the variables is set too low) without requiring large scale structural changes (i.e., an entirely new framework). As noted by DotEcon:

> "*ComReg should be free to adjust the fees in response to changes in fixed links demand, but it should be clear on its reasons for doing so, any major changes it does make should be phased in and operators should be given sufficient notice of any changes ComReg is considering*." [155]

> "*setting the fees using a formula provides a limited and transparent set of ways in which ComReg can changes the fees – this should help users form reasonably accurate expectations on the fees they will pay over the lifetime of a link they are about to install*." [156]

3.228 It is also proposed that Option 2 would be introduced over a three-year period thereby providing users with sufficient time to consider how to dimension their network and to plan future investments accordingly.

3.229 Finally, Option 2 is less likely to create unnecessary congestion zones that would compromise efficient investments made on the basis of sufficient spectrum rights of use being available in certain locations.

3.230 Therefore, ComReg is of the view than Option 2 better promotes efficient investment incentives.

3.9 Infrastructure based competition

3.231 Infrastructure based competition is competition among operators that physically own networks. This could be a fixed operator competing with a mobile operator or two operators which have similar networks competing against each other. As a general point, the Fixed Links regime provided under either Option would enhance the possibilities for infrastructure-based competition because it would allow operators to deploy services using Fixed Links when alternative infrastructures are available (e.g., fixed/fibre).

3.232 Fixed Links continue to enhance infrastructure across the state.

[155] See page 36 of ComReg Document 21/134A
[156] See page 36 of ComReg Document 21/134A

- Fixed Links are provided in urban areas (five cities) to interconnect dense networks of small cells which typically only requires short links, but at high bandwidth[157]. Fixed Links are typically used in many cases where operators may be unable to secure permission to install fibre to each of these sites and/or it would likely be prohibitively expensive. Fixed Links are also used in urban areas for customers requiring higher bandwidth connections, typically provided as dedicated Point-to-Point links.

- Fixed Links are used in rural areas or hard to reach locations. A key role for such links is for FWA to provide bandwidth connectivity to isolated customers and businesses in areas where fibre deployment is not economically viable. In less densely populated rural areas, there can be a lack of infrastructure-based competition due to the cost of fixed rollout.

3.233 As noted above, the risk of congestion arises in both rural and urban areas. The promotion of infrastructure-based competition in these areas relies on spectrum rights of use in the Fixed Links bands being available to the greatest extent possible at the various locations. This competition is endangered by unnecessary congestion in certain locations where some bands may not have the available capacity to meet the link length and bandwidth requirements. [158]

3.234 ComReg notes that Option 2 provides incentives for operators to dimension their network over time and choose the most cost-effective combination of bands and bandwidth when delivering services. ComReg considers therefore Option 2 has the potential to improve infrastructure-based competition by encouraging operators to fully consider how their Fixed Links are deployed and thereby how they could deliver connectivity more efficiently than rivals.

3.235 Given the benefits to efficiency as described above, the prospects for the extension of infrastructure-based competition may be greater under Option 2.

Conclusion on impact on competition

3.236 Based on the assessment above, ComReg is of the view that Option 2 best promotes competition.

[157] Where there are a large number of cells within a small area (for example attached to street furniture or contained in shop hoardings), it may be either cost prohibitive or simply infeasible to run fibre to each site. Therefore, there is likely to be significant and growing demand for short wireless links to connect small cells.

[158] For example, there is a risk that the demand for certain use cases (e.g., advanced FWA technologies) would not be served or might be underserved by Option 1 because of the greater risk of congestion arising from this Option. Similarly, wireless backhaul could be employed as an alternative to fixed or fibre connections (e.g., backhaul, broadcast distribution, links within core networks) and where appropriate links are not available, the cost of fibre deployment would be high increasing the overall cost of providing connectivity.

3.10 Impact on consumers

3.237 ComReg observes that the notion of what may benefit consumers can be viewed in terms of ensuring that spectrum rights are used to (a) provide the services that are most highly valued by consumers (e.g. services which consumers would purchase, either directly or indirectly, and lead to the greatest consumer benefits (e.g. overall sales)) and (b) in a manner which would be valued by end-consumers (e.g. high quality/service levels at the lowest cost), over the lifetime of the rights of use.

3.238 Further, it can be generally assumed that what is good for competition, and what promotes investment in infrastructure, is, good for consumers. This is because increased competition between operators brings benefits to their customers in terms of price, choice and quality of services. In that regard, options that are good for competition are likely to be good for consumers. For example, consumers are likely to prefer those options which maintain or improve services and while at the same time not deterring entry or efficient investment. With that in mind, ComReg reminds the reader that Option 2 is preferred in terms of the likely impact on competition.

3.239 ComReg is also satisfied that Option 2 would not choke off[159] efficient demand for the delivery of services.[160]

3.240 In relation to congested links, Option 2 should ensure that Fixed Links rights of use are assigned to those bidders who most value those rights of use and who are therefore best placed to maximise consumer welfare (by using their assigned spectrum efficiently)[161]. This is a result of setting fees for congested rights of use by reference to both an estimate of the short-run opportunity cost of spectrum (e.g., congestion) and of the licence itself (e.g., bandwidth).

3.241 Existing Licensees would have the opportunity to retain their existing rights of use or migrate, making those rights of use available for new licensees (potentially new entry) who are willing to pay a price reflective of the short-run opportunity cost. ComReg additionally notes such criteria (i.e., assigning rights of use to those users that value scarce spectrum the most) should also result in the greatest benefits to downstream competition and consumers.

3.242 Alternatively, under Option 1, some Existing Licensees could hold rights of use in congested areas at a price significantly below its short-run opportunity cost which could preclude access to other users who would be willing to pay more. Excluded

[159] Demand for a Fixed Link or Use Case is inefficiently choked off where a fee results in a Fixed Link (or Use Case) being uneconomic, where a lower price could both be economically viable for users and cover the necessary opportunity cost of the spectrum. The economic viability of a given use case will depend on both the spectrum licence fee and the value of the Fixed Links for that use case (e.g., the ability to generate profits).

[160] See paragraph 4.62 above.

[161] If downstream competition is effective, the objective of achieving greatest social benefit can be achieved by assigning rights of use to whoever values the rights the most.

users with limited flexibility may not have good alternatives leading to certain areas and consumers being underserved or not at all.

3.243 In relation to uncongested links, consumers are also likely to benefit more from Option 2, because there would be an overall reduction in Fixed Link fees in uncongested areas. As previously noted, for licensees that use the most common bandwidth, uncongested fees per link will be lower under Option 2 which should benefit end-consumers. Further, and as noted above, increased infrastructure-based competition arising from the overall incentives provided under Option 2 should benefit consumers by improving operator competitiveness and the services they provide, which includes mobile, fixed and FWA networks.

3.244 In relation to existing and potential use cases, ComReg notes consumers are likely to prefer Option 2 because it (unlike Option 1) is forward looking and has been designed to accommodate all existing and potential use cases that are likely to require Fixed Links. This provides for a range of outcomes and differentiated services which increases the choice for consumers while also allowing for mobile operators to complement their existing spectrum holdings or fixed connections, while improving existing and future services to consumers.

3.245 ComReg notes that the use cases that are delivered over Fixed Links can be categorised into (i) those that are provided directly to consumers and businesses in downstream markets and (ii) those that are used as inputs to provide downstream.

Downstream services

3.246 In relation to (i), ComReg notes that FWA and advanced FWA are the only two use cases that are provided directly to consumers and business in downstream markets. In that regard, ComReg is of the view that consumers would prefer Option 2 for the following reasons:

- Overall growth in bandwidth is driven in part by demand from FWA operators[162], and the more efficient use of spectrum by all licensees ensures that more spectrum is available for the delivery of end services (from consumers who increasingly require more bandwidth);
- FWA is the primary use case in rural areas and Option 2 better supports the development of rural ECS networks, noting that the decline in fees is greater in uncongested Fixed Links, which occur primarily in non-urban areas
- Investments in new use cases (e.g., advanced FWA) are more likely to arise under Option 2 because it promotes innovation and efficient investment; and

[162] See page 126 of ComReg Document 20/109A.

- Option 2 is less likely to restrict the development of advanced FWA by reducing the likelihood of congestion[163] and the incentives for spectrum hoarding in bands suited for the delivery of this service.

3.247 Alternatively, under Option 1, certain areas may be underserved or not at all in the future due to emerging congestion.

Inputs to downstream services

3.248 In relation to the remaining use cases (e.g., backhaul etc), it is useful to briefly set out why the efficient assignment of Fixed Links across a range of bands which are not directly used for downstream services is an important issue for consumers, as it will affect the choice, price, and quality of the electronic communications service that ultimately are made available to consumers.

3.249 Providers of wireless mobile services use a combination of inputs to provide those services. This includes radio frequency spectrum which is used to transmit signals between base stations and end users' devices and to operate key network infrastructure such as base stations and transmission towers. The backhaul element of a mobile network is essential to the provision of wireless mobile services as it routes voice and data traffic from base stations to the core network. Providers of wireless mobile services must have access to sufficient backhaul, in terms of sufficient capacity and speed, to avoid communications bottlenecks and a reduced quality of service for their consumers.

3.250 The need for improved backhaul infrastructure - in terms of higher capacity and faster speeds – has increased and will probably continue to increase in parallel with the roll-out of more advanced services (e.g., advanced FWA etc) and ever-increasing consumer demand for data intensive mobile services such as mobile video streaming. ComReg observes that a 'feedback loop' exists in that increased consumer demand leads to better services, which further increases consumer demand, which leads to even better services, which further increases consumer demand, and so on. All of this puts pressure on backhaul infrastructure. Even if operators were to use more fibre backhaul in the future, alongside wireless backhaul, microwave links would still be essential for backhaul to the core network, especially in rural areas. Therefore, the way new Fixed Links are assigned for backhaul could have significant impacts on consumers and on downstream communications markets.

3.251 In that regard, Option 2 would likely be preferred by consumers because, as noted previously, it best ensures that spectrum rights of use are available for the delivery of these services. In particular, the incentives provided by Option 2 are less likely to result in congestion in the future such that rights of use are more likely to be available

[163] Through the incentive mechanisms identified in Impact on Competition above (i.e., frequency gradient, bandwidth charges and congestion charges etc).

in provision of same. This improves an operator's ability to use Fixed Links and deliver services where and when they need it. Option 2 would incentivise operators not to occupy and retain Fixed Links unnecessarily (e.g., Fixed Links in Dublin) and more generally to economise on their use of Fixed Links spectrum (e.g., bandwidth charge).

3.11 Preferred option

3.252 This RIA considers a number of regulatory measures available to ComReg within the context of the analytical framework set out in ComReg's RIA Guidelines (i.e., impact on industry stakeholders, impact on competition and impact on consumers). This section complements that analysis and provides an assessment of the extent to which any regulatory measure would, if implemented, be likely to achieve one or more of ComReg's statutory objectives in the exercise of its related statutory function or functions.

3.253 Considering the above, ComReg is of the view that Option 2, is the preferred option in terms of the impact on stakeholders, competition and consumers.

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

3.12 Assessment of the Preferred option against ComReg's other relevant statutory objective

3.255 This RIA identifies and considers the options potentially available to ComReg, within the context of the RIA analytical framework as set out in ComReg's RIA Guidelines (impact on industry stakeholders, the impact on competition and the impact on consumers). This RIA also analyses the extent to which those various options would facilitate ComReg to meet its statutory remit in managing the radio spectrum. This includes analysing the extent to which the various options would promote competition and ensure that there is no distortion or restriction of competition in the electronic communications sector, whilst also encouraging efficient investment in infrastructure, promoting innovation, and ensuring the efficient use and effective management of the Fixed Links Bands.

3.256 In this section, ComReg assesses the Overall Preferred Option in the context of other statutory provisions relevant to the management of Ireland's radio frequency spectrum (which are summarised in Annex 1 of this document). It is not proposed to exhaustively reproduce those statutory provisions here. However, set out below is a summary of all statutory provisions which ComReg considers to be particularly relevant to the management and use of the radio frequency spectrum with an assessment (to the extent not already dealt with as part of the RIAs) of whether, and to what extent, the Overall Preferred Option accords with those provisions. In

carrying out this assessment, ComReg has highlighted below some of the relative merits / drawbacks which would arise if it was to select some of the alternative options assessed under the RIA above.

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

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

3.12.2 General Provisions on Competition

3.258 There is a natural overlap between the aims of the RIA and an assessment of ComReg's compliance with some of its statutory obligations and, in particular, one of its statutory objectives under section 12 of the 2002 Act of promoting competition by, among other things:

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

3.259 In so far as the promotion of competition is concerned, Regulation 4(3)(b)[164] of S.I. No. 444 of 2022 further requires ComReg to pursue the following general objective: to promote competition in the provision of electronic communications networks and associated facilities, including efficient infrastructure-based competition, and in the provision of electronic communications services and associated services.

3.260 Certain other provisions also relate to ComReg promoting and protecting competition in the electronic communications sector including:

- Regulation 4(3)(d)[165] of S.I. No. 444 of 2022 which requires ComReg to promote the interests of the consumers and businesses in the State, inter alia by enabling maximum benefits in terms of choice, price and quality on the basis of effective competition.
- Regulation 4(5)(d) of S.I. No. 444 of 2022, which requires ComReg, in pursuit of the policy objectives referred to in Regulation 4(3), to apply impartial, objective, transparent, non-discriminatory and proportionate regulatory principles by inter alia promoting efficient investment and innovation in new and enhanced infrastructures;
- Regulation34[166] of S.I. No. 444 of 2022 which requires ComReg to promote effective competition and avoid distortions of competition in the internal market when deciding to grant, amend or renew rights of use for radio spectrum for electronic communications networks and services in accordance with these Regulations. ; and
- General Policy Direction No. 1 on Competition (26 March 2004) which requires ComReg to focus on the promotion of competition as a key objective, including removing barriers to market entry and supporting new entry (both by new players and entry to new sectors by existing players).

3.261 Based on the assessment provided in the RIA above, ComReg's view is that the Preferred Option in the RIA would best safeguard and promote competition to the benefit of consumers.

3.12.3 Contributing to the development of the Internal Market

3.262 In achieving the objective of contributing to the development of the Internal Market, another of ComReg's statutory objectives under section 12 of the 2002 Act, ComReg considers that the following factors are of particular relevance in the context of setting fees for Fixed Links:

[164] Regulation 4(3)(b) of S.I. No. 444 of 2022
[165] See Regulation 4(3)(d) of S.I. No. 444 of 2022.
[166] See Regulation 34 of S.I. No. 444 of 2022.

- the extent to which the Overall Preferred Option would encourage the establishment and development of trans-European networks and the interoperability of pan-European services, by facilitating, or not distorting or restricting, entry to the Irish market by electronic communication services providers based or operating in other Member States; and
- to ensure the development of consistent regulatory practice and the consistent application of EU law, the extent to which ComReg has had due regard to the views of the European Commission, BEREC and other Member States in relevant matters, in selecting an option and considering any regulatory action required by ComReg in respect of such an option.

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

3.263 ComReg notes the overlap between this objective and the objective of promoting competition in the provision of ECN/ECS. Encouraging the establishment and development of trans-European networks requires that operators from other Member States seeking to develop such networks are given a fair and reasonable opportunity to obtain spectrum rights of use required for such networks and, particularly, access to critical spectrum rights of use. Accordingly, options which would restrict or distort competition or otherwise unfairly discriminate against potential entrants (such as through pricing models which do not incentivise efficient use or encourage low value incumbent not to vacate) would not, in ComReg's view, satisfy the requirements of this objective.

3.264 In this regard, ComReg refers to the RIA and its finding that the Overall Preferred Option is likely to be preferred by future and potential Fixed Link licensees, which may be new entrants. This is because the Overall Preferred Option would best encourage the efficient use of Fixed Links and reduce the incentives for Existing Licensees to engage in spectrum hoarding strategies. Further, this option reduces the likelihood of asymmetric access scenarios arising which may benefit Existing Licensees simply by virtue of their incumbency. Such an approach would also be in line with service- and technology-neutrality requirements by not preferring existing services and technologies by virtue of incumbency.

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

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

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

- ComReg considered international trends in the use of Fixed Links in paragraph 75 of Document 20/109 and informed its consideration in developing its preferred Option;
- ComReg issued a Request for Information and received 22 responses from members of the Independent Regulators Group ("IRG")[167] provided a response to the IRG RFI which ComReg issues in order to gather, among other things, the most up to date information on trends in the use of Fixed Links;
- ComReg and DotEcon held stakeholder meetings with international equipment manufacturers and vendors to inform its Preferred Option; and
- DotEcon had clear regard to fee methodologies[168] used in other countries in forming its recommendations giving an overview of European price references[169] and common practices[170].

3.12.4 Promote the interest of users within the community

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

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

3.12.5 Efficient use and effective management of spectrum

3.269 Under section 10(1) of the 2002 Act, it is one of ComReg's functions to manage the radio frequency spectrum in accordance with a Policy Direction under section 13 of the 2002 Act. Policy Direction No. 11 of 21 February 2003 requires ComReg to ensure that, in managing spectrum, it takes account of the interests of all users of the radio frequency spectrum (including both commercial and non-commercial users) (see discussion on this policy direction below). Importantly, in pursuing its objective

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

[168] See Annex A of ComReg Document 21/134A

[169] See Table 5 of ComReg Document 21/134A

[170] See Table 6 of ComReg Document 21/134A

to promote competition under section 12(2)(a), ComReg must also take all reasonable measures to encourage efficient use and ensure effective management of radio frequencies. Section 12(3) of the 2002 Act also requires that in carrying out its functions, ComReg shall seek to ensure that measures taken by it are proportionate having regard to the objectives set out in section 12.

3.270 Regulation 27(1)(a)[171] of S.I. No. 444 of 2022 also provides that ComReg must ensure the effective management of radio spectrum for electronic communications networks and services having regard to section 12of the 2002 Act, Regulation 4 of S.I. No. 444 of 2022, and Article 4 of the Directive.

3.271 In relation to Policy Direction No. 11, the RIA set out above considers the interests of all users of the radio frequency spectrum (and assesses the extent to which such interests are consistent with ComReg's own statutory obligations), both commercial and non-commercial. ComReg is of the view that the Overall Preferred Option is one that would safeguard and promote those interests.

3.272 In addition, the preferred Option best facilitates efficient new entry and encourages an efficient use of spectrum by those successful in acquiring spectrum. This is because the formula-based approach under Option 2 would achieve the following:

- In relation to uncongested links, it best provides that licensees are incentivised to use assigned rights of use as efficiently as possible (i.e., the least amount of spectrum necessary to deliver a service at certain levels) and not rely on additional rights of use when a service could be delivered using less; and
- In relation to congested links, it best ensures that spectrum rights would be awarded to those users who value them the most and because of the incentives provided under this option, those users are also the most likely to use the spectrum efficiently.

3.273 In particular, ComReg refers to Section 3.6 'Spectrum management and efficiency above'.

3.274 ComReg is of the view that the Overall Preferred Option complies with the obligations contained in the above statutory provisions. ComReg is also of the view that Option 1 would fail to satisfy the above provisions to the same extent, if at all considering the increased requirement for bandwidth in the future.

3.12.6 Regulatory Principles

3.275 Under Regulation 4(5)[172] of S.I. No. 444 of 2022, ComReg must, in pursuit of its

[171] Regulation 27(1)(a) of S.I. No. 444 of 2022.
[172] Regulation 4(5) of S.I. No. 444 of 2022.

objectives under Regulation 4(3) of S.I. No. 444[173], apply impartial, objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things:

- promoting regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods; and
- promoting efficient investment and innovation in new and enhanced infrastructures.

Regulatory Predictability

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

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

- promoting regulatory predictability in relation to availability of spectrum rights to other users of spectrum by applying an open, transparent, and non-discriminatory approach to accessing spectrum for Fixed Links; and
- promoting regulatory predictability in relation to ensuring that the process used to determine fees is predictable and not subject to significant change such that it would compromise efficient investments.

3.278 In relation to the first objective, ComReg's approach for congested links is consistent to its general treatment of a scarce resource such that rights of use should be assigned to those who value it the most. Further, in relation uncongested links, ComReg assigns rights of use in a way that encourages efficient use in line with its competition objectives.

3.279 In relation to the second objective, ComReg refers to its assessment under efficient investment below and its view that the conditions for promoting efficient investment and innovation in new and enhanced infrastructures investment involves ComReg taking its regulatory functions in an appropriate and predictable fashion as provided under Option 2.

3.280 Considering the above, ComReg is of the view that the Overall Preferred Option complies with the regulatory principle of promoting regulatory predictability.

[173] Regulation 4(3) of S.I. No. 444 of 2022.

3.12.7 Efficient Investment and Innovation in New and Enhanced Infrastructures

3.281 ComReg considers that the Overall Preferred Option is consistent with the aims of this regulatory principle for the reasons set out in Section 4.8. Further, ComReg notes that it:

- provides for a range of outcomes and differentiated services noting that this option has been designed with existing and potential use cases in mind and consulted in detail on same in Document 20/109 and associated documents. This potentially increases the choice for consumers while also allowing for mobile operators to complement their existing spectrum holdings or fixed connections, while improving existing and future services to consumers;
- supports entry and/or participation by new use cases or new entrants by removing any incumbency advantages Existing Licensees may have from holding certain rights of use;
- is the one likely to best promote competition in the assignment of Fixed Links; and
- produces an efficient outcome by assigning congested links to uses who would attach the highest value to it and, because of these financial incentives, thereby generate the greatest benefits to society from the use of the spectrum.

3.12.8 Relevant Policy Directions and Policy Statements

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

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

3.284 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

3.285 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."*

3.286 The purpose of this Policy Direction was to ensure that the regulatory framework for electronic communications plays its part in contributing to the achievement of the then Government's objectives regarding the rollout of broadband networks.

3.287 ComReg is cognisant of the fact that the three-year objective described in this policy direction has now long expired. In any case, ComReg is of the view that the Preferred Option is aligned with the objectives of the current Programme for Government. For example, it would promote the introduction of advanced FWA services and fixed wireless more generally in relevant bands and it complements other schemes such as the National Broadband Plan aimed at improving broadband infrastructure and services for businesses and citizens across the State.

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

3.288 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".*

3.289 The purpose of this policy direction is to ensure that any regulatory decisions take due account of the potential impact on the sustainability of industry players, in light of the business cycle at the time such decisions are taken.

3.290 ComReg observes that this policy direction concerns the sustainability of the industry as a whole rather than the position of individual players. In that regard, ComReg notes that total fees are broadly stable under Option 2 and may reduce depending on how licensees decide to deploy their networks in the future.

3.291 Notwithstanding, in its RIA above, ComReg has considered the impact of its Preferred Option in the context of all industry stakeholders, including different types of industry stakeholders, and refers the financial impact on these stakeholders in the Impact on Stakeholders section above. This shows that while Option 2 may result in

some modest increases for certain stakeholders, this is highly unlikely to threaten industry sustainability. ComReg also refers to its considerations in the context of the principle of proportionality above.

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

3.292 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".*

3.293 The purpose of this policy direction is to ensure that ComReg achieves an appropriate balance between the interests of various users of the radio frequency spectrum the respective interests of commercial and non-commercial user.

3.294 In carrying out the RIA, ComReg has considered the Preferred Option in light of the interests of various categories of industry stakeholders and consumers.

3.295 ComReg is of the view, therefore, that it has complied with this requirement in carrying out the RIA and that the Preferred Option is the one that best serves the interests of all users of the radio frequency spectrum and strikes an appropriate balance where those interests may conflict.

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

3.296 ComReg notes that it is required to comply with the guiding principles of objectivity, transparency, non-discrimination and proportionality in carrying out its functions under the 2002 Act and under the European Electronic Communications Code (which has repealed the Common Regulatory Framework), as transposed in the State. 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.

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

- Regulation 27(1)(b)[174] of S.I. No. 444 of 2022 requires that ComReg ensure that the allocation of, the issuing of general authorisations in respect of, and the granting of individual rights of use for radio spectrum for electronic communications networks and services are based on objective, transparent, pro-competitive, non-discriminatory, and proportionate criteria; and

[174] See also Regulation 36(7) of S.I. No. 444 of 2022.

- the regulatory principle set out in Regulation 4(5)(a)[175] of S.I. No. 444 of 2022 requires ComReg in pursuing its objectives to apply impartial, objective, transparent, non-discriminatory, and proportionate regulatory principles by, inter alia, ensuring that, in similar circumstances, there is no discrimination in the treatment of providers of electronic communications networks and services.

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

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

- is objectively justified given the detailed assessment provided in this RIA, including that it would be unlikely to distort or restrict competition and it better encourages the efficient use of the radio spectrum;
- would not give rise to discrimination in the treatment of undertakings because:
    - any change in fees arising from Option 2 arise because the situation of some licensees is materially different from the other.
- means that whether fees increase or decrease does not depend on the stakeholder but rather on the bandwidth and bands operators locate their rights of use;
- is transparent because, among other things:
    - the detailed methodology is set out in Annex B and the DotEcon Report;
    - ComReg provides an assessment of the impact on stakeholders (including financial impact) in the RIA above; and
    - ComReg will provide each licensee with an Assessment Tool to estimate impacts at a licensee level.
- is proportionate because, among other things:
    - the preferred option would accord with ComReg's statutory objectives and regulatory principles as described above;
    - there does not appear to be less onerous means by which these

[175] Regulation 4(5) of S.I. No. 444 of 2022.

objectives and principles could be achieved; and

- the preferred option is being implemented over a 3-year period which allows licensees more time to plan and make the necessary changes to their use of Fixed Links and relevant networks, allowing greater flexibility in adjusting to the changes. ComReg considers that this will allow the operators to make better planned and more informed decisions and resulting improve efficiency of assignment.

Conclusion

3.300 In light of the above, ComReg is satisfied that the Preferred Option complies with those statutory functions, objectives and duties relevant to its management of the radio frequency spectrum.

Chapter 4

4 Decision

4.1 This chapter sets out ComReg's Decision Document based on the views expressed by ComReg in the preceding chapters and their supporting annexes.

4.2 The Communications Regulation and Digital Hub Agency (Amendment) Act 2023, nor S.I. No. 444 of 222, the European Union (Electronic Communications Code) Regulations 2022, have been commenced by the Minister for Communications at the time of publication of this Response to Consultation, and so ComReg refers to the Code legislation as appropriate.

Decision

PART I - DEFINITIONS AND INTERPRETATION

1. In this Decision (Decision number D04/23), save where the context otherwise admits or requires:

"Communications Regulation Act 2002" means the Communications Regulation Act, 2002, (No. 20 of 2002), as amended;

"ComReg" means the Commission for Communications Regulation, established under section 6 of the Communications Regulation Act 2002;

"**Congestion Area**" means the geographic area wherein a congestion charge applies to a Point-to-Point Fixed Radio Link or Point to Multi-Point Fixed Radio Link operating on a Congested Frequency Band;

"**Congestion Band**" or "**Congested Frequency Band**" means the frequency band, or bands, which have been identified as being congested within a specific geographic area;

"Electronic Communications Network" and **"Electronic Communications Service"** have the meanings assigned to them in S.I. No. 444 of 2022;

"**Fixed Links"** or **"Fixed Radio Links"** are Point-to-Point and/or Point-to-Multipoint wireless systems that connect two or more fixed geographic locations for Wireless Telegraphy;

"Minister" means the Minister of Communications, Climate Action and Environment*;*

"**Licence**" means a licence granted in accordance with section 5 of the Act of 1926 in accordance with and subject to the matters prescribed in these Regulations to

keep, have possession of, install, maintain, work and use Apparatus in a specified place in the State granted to the licensee

"**Duration of Licence**" means the duration of time from the commencement date that the Licensee is licensed to use a Fixed Link licence set out Schedule 1 to the Radio Links Regulation;

"**Licence Fee**" means the fee associated for Fixed Links are set out in Schedule 2 to the Radio Links Regulations;

"**Renewal of Licence**" means a licence may be renewed from time to time by the Commission set out in the Radio Links Regulations;

"Point-to-Multipoint" means a radio communication service by links between a single station located at a specified fixed point and a number of stations located at specified fixed points;

"Point-to-Point" means a radio communication service by a link between two stations located at specified fixed point**;**

"S.I. No. 444 of 2022" means S.I. No. 444 of 2022, the European Union (Electronic Communications Code) Regulations 2022;

"**Temporary Licence**" means a licence that is only valid for a limited time and is non-renewable;

"Undertaking" has the same meaning set out in S.I. No. 444 of 2022; and

"Wireless Telegraphy Act 1926" means the Wireless Telegraphy Act, 1926 (No. 45 of 1926), as amended.

PART II - LEGAL BASIS

2. This Decision Instrument is made by ComReg:

having had regard to its powers, functions, objectives and duties, including, without limitation, those specifically listed below;

a. the Communications Regulation Act 2002, and, in particular, sections 10, 12 and 13 thereof;

b. S.I. No. 444 of 2022, and, in particular, Regulations 4, 5, 9, 14, 15, 16, 17, 27, 28, 29, 30, 31, 32, 34, and 36 thereof;

c. Sections 5 and 6 of the Wireless Telegraphy Act, 1926; and

d. the applicable Policy Directions made by the Minister under section 13 of the Communications Regulation Act 2002;

e. the contents of, and the materials and reasoning referred to in, as well as the materials provided by respondents in connection with, the below-listed ComReg documents (insofar as they are relevant to the present Decision):

f. ComReg Documents 20/109, 21/134 and 22/93;

g. ComReg Document 23/61 [This Document]; and

h. the consultants' reports commissioned, and the advice obtained by ComReg, in relation to the subject-matter of the documents and materials listed above (insofar as they are relevant to the present decision) and, in particular, ComReg documents 20/109A, 21/134A, 22/93A, and 23/61A;

i. and, noting that it has given all interested parties the opportunity to express their views and make their submissions in accordance with applicable consultation and transparency mechanisms.

PART III -DECISIONS

3. ComReg hereby makes the following decisions:

I. subject to obtaining the consent of the Minister to the making by it of the Fixed Radio Link Licence Regulations, to make those regulations under section 6 of the Wireless Telegraphy Act 1926, prescribing relevant matters in relation to Fixed Links, including prescribing the form of the Licences concerned, their duration, fees, and the conditions and restrictions subject to which they are granted;

II. to grant Fixed Links Licences, under section 5 of the Wireless Telegraphy Act 1926 to relevant applicants subject to the conditions and restrictions (including conditions as to suspension and withdrawal), prescribed in the Fixed Links Regulations as currently set out in Annex 4 of Document 22/93 [this document];

Frequency Bands and bandwidths for Fixed Links

III. make available the frequency bands and bandwidths as set out in Table 10 of Annex 5;

Technical Requirements for deploying Fixed Links

IV. set minimum technical requirements for the use of each frequency band as set out in Table 11 of Annex 5;

<u>High/Low Database</u>

V. to remove the search radius requirement for the 80 GHz band;

VI. to retain the high/low search radius for all other frequency bands as set out in Table 12 of Annex 5);

Multi-Band Aggregation (MBA)

VII. to apply the availability requirement for the relevant lower frequency band for Fixed Links employing MBA;

Congestion Area

VIII. to make the 13 GHz and 15 GHz bands available for licensing in the Congestion Area;

IX. to designate the 13 GHz, 15 GHz, 18 GHz and 23 GHz band as Congestion Bands (see Table 13 of Annex 5);

X. to designate the Grid 3122 and 3123 as the Congestion Area (see Table 13 of Annex 5);

Duration and Renewal of Licence

XI. that a Licence shall, unless it has been suspended or withdrawn, remain in force from the date of grant for a period of one year unless renewed;

XII. that a Temporary Licence shall, unless it has been suspended or withdrawn, remain in force from the date of grant until the expiry date as specified in the licence, which shall not be greater than an eleven (11) month period, and shall not be renewed;

Licence Fees

XIII. that the Licence Fee shall be calculated in accordance with the Fixed Radio Link Licence Regulations;

XIV. the Licence Fee for any period of less than one year shall be calculated on a pro rata daily basis for such period;

XV. that if a Licence is suspended or withdrawn, the Licensee may be entitled to a refund of the relevant Licence Fee of the fee paid by the Licensee;

XVI. that if a Licence is suspended or withdrawn due to a finding by ComReg of non-compliance with any relevant licence conditions, the Licensee shall not be entitled to be repaid any part of the Licence Fee paid by the Licensee, but shall still be liable to pay any sums, including interest, that are outstanding; and

XVII. that if the amount of radio frequency spectrum specified in a Fixed Link Licence is reduced, the Licensee may be entitled to a refund of the relevant Licence Fee already paid in the relevant year on a pro rata monthly basis having regard to the nature of the amendment.

PART IV – EFFECTIVE DATE

This Decision Instrument shall come into force on the day of its making.

PART VI – MAINTENANCE OF OBLIGATIONS

If any section or clause contained in this Decision Instrument is found to be invalid or prohibited by the Constitution, by any other law or judged by a court to be unlawful, void or unenforceable, that section or clause shall, to the extent required, be severed from this Decision Instrument and rendered ineffective as far as possible without modifying the remaining section(s) or clause(s) of this Decision Instrument and shall not in any way affect the validity or enforcement of this Decision Instrument.

PART VI - STATUTORY POWERS NOT AFFECTED

Nothing in this document shall operate to limit ComReg in the exercise of its discretions or powers, or the performance of its functions or duties, or the attainment of objectives under any laws applicable to ComReg from time to time.

GARRETT BLANEY
COMMISSIONER
THE COMMISSION FOR COMMUNICATIONS REGULATION
THE 4 OF JULY 2023

Chapter 5

5 Next Steps

5.1 ComReg envisages that the next step in this process will be the making and publication of the licensing regulations under Wireless Telegraphy Acts following the obtaining of the required consent of the Minister.

Annex 1: Relevant methodologies for setting fees for Fixed Links

A 1.1 This Annex identifies the methodologies that could be used to estimate fees for Fixed Links in the absence of a market mechanism. These methodologies may form one or more regulatory options in the RIA.

- Description of potential methodologies for setting fees for Fixed Links; and
- Assessment of potential methodologies and suitability for consideration in the RIA.

Methodologies for setting fees for Fixed Links

A 1.2 In Annex 1 of Document 21/134A, DotEcon provides an assessment of the various methodologies available to ComReg for setting fees for fixed links administratively (i.e., outside of a market mechanism). DotEcon assessed four general methodologies[176]:

(i) Universal system performance pricing ("USPP");

(ii) Administrative Incentive Pricing ("AIP");

(iii) Benchmarking; and

(iv) Administrative cost recovery.

A 1.3 ComReg provides a brief description of each methodology before assessing the appropriateness of each Option for inclusion in the RIA.

I. USPP

A 1.4 The USPP approach implements a price for spectrum based on a set of relevant usage factors that are selected in advance, such as bandwidth, the number of channels or links used, degree of congestion, geographical location etc. Therefore, the term 'USPP' refers to a broad approach to spectrum pricing, with a specific implementation involving choice of a pricing formula and factors to act as inputs into that formula. Those choices will reflect both the policymaker's objectives and the need for a workable pricing formula based on objectively verifiable data forming inputs to that formula.

[176] DotEcon also briefly assessed other methodologies for setting spectrum fees that are not broadly used internationally, as they are not easily adapted to different circumstances. These are all inferior to the methodologies above and were not assessed further

A 1.5 A typical application of USPP would identify various factors related to the interference, or 'pollution area', imposed on others by a given licence, and to set spectrum fees by applying rating factors. In effect, this penalises a licensee in relation to the spectrum that it denies other users. Such rating factors encourage efficient use through incentivising operators to establish links in a more spectral efficient manner and penalises spectrum hoarding. This should be thought of as accounting for the opportunity cost of the specific licence (i.e., the foregone spectrum uses as a result of the individual characteristics of a licence.

Example

USPP fee = (Bandwidth factor x Use factor x Frequency factor).

II. Administrative Incentive Pricing or "AIP"

A 1.6 AIP attempts to set prices equal to opportunity cost, such that only the highest value users have an incentive to take up licences in the band and an efficient outcome is achieved. A fee is based on an estimate of the opportunity cost of the spectrum, typically the value per MHz. This should be thought of as accounting for the opportunity cost of the spectrum (i.e., the foregone use of this spectrum.) The fee is set administratively to incentivise efficient use, rather than being determined by a process such as an auction, which would reveal opportunity cost through a competitive process.

Example

Fee = Reference Fee × Bandwidth factor × Frequency band factor × Path length factor × Availability factor

A 1.7 An AIP fee formula usually contains multiple criteria such as bandwidth, number of channels or links used, degree of congestion, geographical location etc that seek to account for the specific characteristic of the licence being awarded. Therefore, in practice, there may be some overlap between USPP, in that it implements a formula-based pricing rule based on various factors. However, with AIP, it is necessary to consider not just how a licence is used by the licensee, but also factors related to the value that excluded users might have for that spectrum (for example, the availability factor in formula in the box above might indicate congestion for a particular licence type).

III. USPP as an AIP proxy

A 1.8 DotEcon advises that, if the factors with a USPP formula are the key determinants of opportunity cost and with an appropriate formula, then USPP could (in principle) be used as a proxy for opportunity cost. However, the term USPP is typically used to describe formula-based pricing rules more widely, whether or not they are intended to act as a proxy for opportunity cost.

A 1.9 Due to the difficulties in estimating opportunity cost (in particular, the lack of information that the administrator is likely to have about the value of excluded potential users for spectrum), AIP may in practice be implemented through a simplified formula that only includes the most significant drivers of opportunity cost. Therefore, any practical AIP scheme will involve a degree of averaging of opportunity costs across different users, rather than each user paying an opportunity cost individualised to its own specific circumstances.

A 1.10 Therefore, a formula-based implementation of AIP could be very similar in structure to USPP. For this reason, we use the term “USPP as an AIP proxy” below to describe a situation in which a formula-based pricing approach is used, but the factors within the formula and its parameters are chosen to proxy opportunity cost (at least in terms of its broad features).

IV. Administrative cost-recovery

A 1.11 Cost based fees can take the form of simple charges that are set at a level sufficient to recover the costs of spectrum management. This is one of the simplest methodologies available and may be appropriate when there is no threat of spectrum scarcity.

A 1.12 A typical formula for such an approach would be to calculate fees based on the estimated cost of the licensing regime divided by the number of licences.

Example

Spectrum Fee = Spectrum Management Costs / Amount of total Spectrum Assigned to the User

V. Benchmarking

A 1.13 Benchmarking estimates the value of spectrum based on the prices paid by licensees in other countries for access to equivalent spectrum.

A 1.14 Regulators may also carry out benchmarking by drawing inferences from market prices for substitutable bands, in the same or similar jurisdictions. Where fees are set by benchmarks derived from (competitive) auction results, this implicitly uses opportunity cost pricing. Regulators could also benchmark the fees set administratively in other jurisdictions.

A 1.15 ComReg's award of the 2 GHz band to Mobile Satellite Services ("MSS") in 2017 (the "SSA") [177], used benchmarking to set fees administratively.

Assessment of methodologies for setting fees for Fixed Links

A 1.16 DotEcon assessed these methodologies against four criteria which are broadly aligned with ComReg's statutory objectives;

(i) promoting competition and **efficient** use of the radio spectrum, including ensuring that the most valuable users should be prioritised where spectrum is scarce.

(ii) **simplicity for users**, to ensure that users and potential users do not face undue burdens. In particular, new users are not discouraged from applying (which reinforces a dynamic efficiency objective).

(iii) charges should be **predictable**, so that users do not face future price shocks.

(iv) **practicality** of implementation for ComReg. It is of little value if a methodology provides theoretically optimal fees but requires inputs which are impossible to measure or otherwise unavailable to ComReg.

A 1.17 A summary of DotEcon assessment across each of the four criteria is provide in Table 6.

	AIP	USPP as an AIP proxy	Benchmarking	Administrative cost
Efficiency	Potentially good but may be difficult to measure opportunity costs with accuracy due to lack of information.	Potentially good if opportunity costs are reasonably approximated by the pricing formula.	Likely very poor in this case, due to highly varied basis of setting fixed link charges used by other NRAs and different scarcity environment in other countries.	Very poor, as unlikely to reflect opportunity cost and encourage more efficient use.

[177] Mobile Satellite Services with Complementary Ground Component Authorisation Regime, 17/19.

	AIP	USPP as an AIP proxy	Benchmarking	Administrative cost
Simplicity	May be complex if many drivers of opportunity cost included.	Reasonable and significantly simpler than full AIP, as only key drivers of opportunity cost.	Simple	Simple
Predictability	Moderate – opportunity cost estimates may be unstable over time.	Good, provided that the price formula anticipates future requirements.	Moderate-low.	Moderate-high.
Practicality	Challenging due to difficulty of measuring opportunity cost, so in practice likely to fall back to some proxy approach anyway.	Reasonable.	Reasonable, though question of which benchmarks to use where there is significant variation across NRAs.	Good.

Table 6: Summary of DotEcon assessment across each of the four criteria

A 1.18 DotEcon suggests that a proxy for opportunity cost prices based on a formula that sets fees for all bands (i.e., what we describe above as USPP as an AIP proxy) could be an appropriate way to set fees for Fixed Links. This is more likely to support efficient use of the spectrum than simpler methods but remains more predictable and practical than using modelled opportunity cost estimates directly as fees.

A 1.19 ComReg agrees with the assessment provided by DotEcon and sets out its view in relation to each of the methodologies below.

A 1.20 **In relation to benchmarking,** comparable market values could be used to estimate fees for the Fixed Link Bands and reduce the burden of directly calculating the opportunity costs of spectrum. However, such an approach requires benchmarks that are sufficiently reflective of opportunity costs in the Fixed Link Bands. With that in mind, ComReg notes that:

- spectrum rights of use for fixed links are rarely awarded by auction and only a small number of auction benchmarks are therefore available [178];
- such auctions are made on a very infrequent basis (10 -15 years); and

such auctions cover only a small number of the 20 Fixed Links Bands.

A 1.21 Similarly, benchmarking against fees set administratively in other jurisdictions is also inappropriate. These fees are typically not reflective of opportunity costs (as they are not based on the outcome of a competitive process) and do not provide any particularly meaningful basis for setting fees in Ireland.

A 1.22 Further, any fees framework needs to account for the various use cases identified in this Decision. Fees in other jurisdictions were set historically (decades ago in some instances) and therefore could not account for the use cases that were consulted on in Document 20/109, Document 21/134 and discussed further in this Decision.

A 1.23 For these reasons, ComReg could not rely on benchmarking to set fees for each of the Fixed Links Bands[179]. Therefore, there is no benefit in including benchmarking for consideration in the RIA.

A 1.24 **In relation to AIP**, ComReg notes that such an approach is theoretically appealing because it directly sets prices based on estimates of the opportunity cost, which should promote efficient use. However, and as noted by DotEcon, it is difficult to implement in practice. In particular, even under some simplifying assumptions (i.e. that marginal excluded users are existing fixed links licensees, and looking only at a scenario where there is acute scarcity of spectrum) the determination of the opportunity cost of the spectrum requires ComReg to calculate the discounted cash-flow of potential users with and without access to the spectrum under assessment. ComReg notes several difficulties with such an approach.

[178] For example, ComReg's 2017 26 GHz award and Norway 2020 Multiband award (0 GHz, 13 GHz, 18 GHz, 23 GHz, 28 GHz, 32 GHz and 38 GHz).
[179] ComReg notes that DotEcon/Axon has considered the small number of potential comparable in for the small number of instances available (e.g., ComReg's 26 GHz award).

- First, there could be a substantial difference in the use case of licensees and associated cashflow estimates. (i.e., there is likely to be a high degree of usage asymmetry between licensees). There are a variety of services for which Fixed Link Bands might be used, all of which have different commercial and revenue structures. This makes it very difficult to adequately reflect the opportunity cost arising from its use. Readers will be aware that this phenomenon is particularly acute in Fixed Links where there are a wide variety of different users and up to seven different use cases, as identified in Document 20/109;

- Second, there is a large amount of uncertainty surrounding the results of the modelling process. If the model has insufficient data or makes incorrect technical or commercial assumptions about licensees, this could result in errors that misrepresents the value of spectrum across all of the fixed link bands. It is unrealistic to suggest that ComReg can accurately determine opportunity cost for each band/region combination without relying on assumptions, but the robustness of those assumptions seem unlikely to be adequate; and

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

A 1.25 For these reasons[180] ComReg could not rely on AIP to estimate fees for each of the Fixed Links Bands[181]. Therefore, there is no benefit in considering whether AIP is a valid regulatory option in the RIA.

A 1.26 **In relation to administrative cost**, ComReg agrees with DotEcon that such an approach is straightforward and simple to implement. However, ComReg also agrees that it does not reflect opportunity cost in any way and would provide poor incentives for efficient use more generally. Notwithstanding, where there is no risk of spectrum scarcity over a sufficiently long period, there may be a sufficient basis for it to be used to set fees for spectrum rights of use.

A 1.27 Therefore, ComReg is of the view that there is merit considering whether an administrative cost recovery option is a valid regulatory option in the RIA. [182]

[180] There is also a risk that fees would be set too low where the opportunity cost is low or zero. Such scenarios are problematic where potential scarcity is an issue because such fees do not provide licensees with incentives to use spectrum efficiently and promote greater availability of spectrum in the future.
[181] ComReg notes that DotEcon/Axon has considered the small number of potential comparable in for the small number of instances available (e.g., ComReg's 26 GHz award).
[182] This assessment is provided in Step 2 of the RIA framework. 'Identify and describe the regulatory options'

A 1.28 The **USPP (as an AIP proxy)** proposed by DotEcon[183] recognises that any attempt to estimate opportunity cost accurately for 20 Fixed Link Bands is subject to significant data and assumption limitations. This approach identifies important drivers of opportunity cost (e.g., channel size, frequency band) and includes these as part of a formula for setting fees. While this would not be as accurate as a fully modelled approach (assuming data was even available), it constitutes a more realistic approach to providing a coherent schedule of fees for the Fixed Link Bands.

A 1.29 This formula-based pricing should effectively encourage more efficient use of the spectrum as long as the fees (and parameters informing same) are set at a level that does not choke off efficient demand. Indeed, such fees may be above the administrative cost if there is information available regarding the willingness of licensees to pay for spectrum rights of use in the delivery of services. This is particularly helpful in guarding against the risk of setting fees too low which could encourage spectrum hoarding and ultimately impede the availability of spectrum for more efficient users in the future.

A 1.30 The formula-based approach used in this methodology also has the advantage that it may be possible to retain the formula but to update specific parameters within it if future circumstances change. Therefore, it provides a reasonable compromise with providing predictability and clarity for licenses, but still provide flexibility for ComReg to modify fees if circumstances change.

A 1.31 In particular, the formula can be extended to include areas that are congested and reflect estimates of opportunity cost under different scarcity conditions. As noted by DotEcon, "*Although opportunity cost modelling is still necessary, the assumptions become less critical (e.g. ComReg can calculate opportunity costs under the assumption that there is scarcity, and use this as one of a number of inputs to the fees, rather than relying on detailed congestion estimates, which are complex given the interference analysis required).*"[184] These are estimated by comparing the costs incurred by fixed links operators to those they would incur in a counterfactual scenario in which some fixed links bands were switched off.

A 1.32 Therefore, ComReg is of the view that there may be benefit in considering whether the **USPP (as an AIP proxy) methodology** proposed by DotEcon is a valid regulatory option in the RIA.

[183] See ComReg Document 21/134A
[184] See ComReg Document 21/134A

Annex 2: Parameter values in Option 2

A 2.1 This Annex provides a formal description of the formula used to calculate fees under Option 2. Further, it outlines the values for each parameter under that option and explains the motivation for each value. The remainder of this Annex is laid out as follows:

- Section A 2.1 provides a formal description of the formula used under Option 2; and
- Section A 2.2 provides the justification for the proposed parameter values in the formula.

A2.1 Formal description of the formula

A 2.2 The fee for a link of bandwidth h in band i, and area s is given by the following formula:

$$\text{Fee} = \max\left[x \times r_i \times c_{is} \times b(i,h), \quad A\right]$$

A 2.3 Table 9 below provides a description of each of each of the variables and how each variable is mathematically represented.

Variable	Description and proposed values
The base price: $\boldsymbol{x}$	A base price per MHz, x; **ComReg propose setting x = €1.20** (i.e., €1.20 per MHz)
The frequency gradient is determined by $\boldsymbol{r_i}$,	r_i, is a schedule of band specific values that determine the relative minimum prices per MHz across bands; The level of the schedule parameter for each band (i.e., the value of each r_i) is defined by ComReg and is not a formal part of the proposed formula. ComReg proposes initially setting the values of r_i (for bands other than 80 GHz) such that the ratio of per MHz charges for modal bandwidth links reflects the approximate ratio of estimated opportunity costs for the highest frequencies and the lowest frequencies. Specifically, with the bands numbered from 1 to N in ascending order of frequency, for band i: $$\hat{r_i} = 1 + (R-1)\frac{F_i - F_N}{F_1 - F_N}$$ $$r_i = \hat{r_i}\frac{\bar{h}_i}{b(i,\bar{h}_i)}$$ where *F*i is the frequency midpoint of band i, and R represents the ratio of estimated opportunity costs for the highest band and the lowest band. $\bar{h}_i$ is the modal bandwidth in band i and $b(i,\bar{h}_i)$ is the effective bandwidth of a modal bandwidth link in band i (discussed below)

	ComReg proposes setting the 'top to bottom' ratio: R = 30. **For 80 GHz, ComReg proposes setting $\mathbf{r_i = 0.2}$** instead of using the formula, given the greater availability of of spectrum in the band.
An 'effective bandwidth': $\widehat{h_\iota}$	For each band, a 'effective bandwidth', generally reflecting the largest bandwidth in common use within that band, $\widehat{h_\iota}$; Let $\widehat{h_\iota}$ be the largest commonly used bandwidth of band i. For links at or above this channel size, the effective bandwidth is equal to bandwidth. For links below this channel size, the fees are set assuming as if the link had a 25% chance of forgoing a larger link, that is the effective bandwidth for a link with bandwidth h in band i is given by: $$b(i,h) = \begin{cases} h & \text{if } h \geq \widehat{h_\iota} \\ (1-m)h + m\, b(i,2h) & \text{if } h < \widehat{h_\iota} \end{cases}$$ The values for the effective bandwidths for each band are set out in Table 4. **ComReg proposes setting $m = 0.25$**
The congestion intensity: c	The levels that the congestion intensity, c, can take. **ComReg proposes setting $c = 3$ for congested fixed links.**
An administrative cost floor: A	An administrative cost floor, A, to ensure the recovery of the administrative cost of a Fixed Link licence. **ComReg proposes to set a price floor of €100 per fixed link.**

Table 7: The values for the proposed model parameters under Option 2

A2.2 Parameter values

A 2.4 DotEcon has suggested a range of valuations for each parameter which it considers should provide the correct level of incentive to licensees to mitigate the risks it has identified and best provide for the efficient use of the radio spectrum.

A 2.5 The values chosen by ComReg are those used as the basis for the assessment of Option 2 in the R.I.A and in the DotEcon assessment of the impact of fees (see Section 4.3.8 of the DotEcon Report).

A 2.6 ComReg discusses the parameters for each component of the formula in order below:

- Top to Bottom Radio;
- Base price;
- Congestion;

- Administrative costs; and
- Bandwidth.

Top to bottom Ratio

A 2.7 DotEcon makes two recommendations[185] in respect of the top to bottom ratio.

- First, that r_i is based on a ratio of at least R = 30 (i.e., ratio of 1:30) across bands from 1.3/1.4 GHz up to 42 GHz, noting there are grounds for setting an even steeper gradient, up to around R = 40; and
- Second, that $r_i = 0.2$ for the 80 GHz Band in the initial set of band schedule parameters, rather than basing this on the ratio of opportunity costs.

A 2.8 In relation to the first recommendation[186], ComReg is of the view that the frequency gradient should be strengthened relative to the current fee schedule to encourage use of the higher bandwidths in order to preserve spectrum for Fixed Links in lower bands. ComReg provides its detailed views on the frequency gradient in Section 5.6.1 including its view that the existing gradient level (1:10) is unlikely to be at a level that sufficiently reflects value differences between the bands, given that the cost modelling[187] suggests that a more appropriate ratio is the range of 1:15 to 1:54.

A 2.9 Given same, DotEcon advises[188] that:

- 1:15 is unreasonably low (because it is based on high bandwidth links that are unavailable below 11 GHz); and
- all ratios likely underestimate the difference in opportunity cost across the full range of bands, because the bands were grouped for the opportunity cost calculations. [189]

A 2.10 ComReg agrees with DotEcon that a ratio set too low and closer to R = 15 is unlikely to provide a strong enough incentive to avoid the lower bands when higher frequency bands would be sufficient. That said, there is little to be gained in setting the gradient too high and closer to R = 54 because that is only representative of a very specific bandwidth usage (20 – 40 MHz) and only in urban areas.

[185] See p44-46 of ComReg Document 21/134A
[186] See p45 of ComReg Document 21/134A
[187] See Table 9, 10 and 11 of ComReg Document 21/134A.
[188] See p45 of ComReg Document 21/134A
[189] These are ratios of average opportunity cost in the 1.3 – 8 GHz band to average opportunity cost in the 23 – 38 GHz bands).

A 2.11 Alternatively, a ratio in the R = 30/40 range is likely more reflective of the estimated opportunity costs across different bands given the bandwidth requirements users will have in both urban and rural areas (i.e. opportunity costs differ across bands, but also between rural/urban in a given band). R = 30/40 provides the best fit across those characteristics).

A 2.12 In its latest report, DotEcon recommends that the 1:30 ratio should apply to per MHz charges for the most common channel widths (modal bandwidth links). To implement this, it is necessary to scale down the *ri* values listed in 21/134 by the ratio of the modal bandwidth and the effective bandwidth of a modal bandwidth link (in bands where the modal bandwidth is strictly less than the largest bandwidth in common use).

A 2.13 ComReg proposes to set $R = 30$[190] [191] at the lower end of the DotEcon recommendation (for bands up to 42 GHz), in line with DotEcon's updated methodology (using modal bandwidth links), noting that should this level of gradient prove ineffective in encouraging operators to organise themselves efficiently within the bands, ComReg could address the matter by adjusting the band schedule parameters in the future.

A 2.14 In relation to the second recommendation, in its latest report DotEcon suggests[192] setting $\mathrm{r_i} = 0.2$ for the 80 MHz Band instead of using the formula. The opportunity cost modelling suggests that opportunity cost for the 80 GHz band is higher than for bands in the 23 – 42 GHz range because the large bandwidths used mean that it is not possible to switch into alternative (lower frequency) bands, and opportunity costs are driven by the need to use dual polarisation. DotEcon advises that the 80 GHz fees need to be matched to (uncongested) 42 GHz fees to avoid inefficient migration between the two bands. In that regard, applying a 1:4 ratio for the 80 GHz band relative to the 42 GHz band would roughly reflect both relative channel sizes and relative supply in the bands, thereby leaving fees for 80 GHz broadly unchanged.

[190] ComReg considers that this incentive does not disadvantage users with preferred bandwidths relative to the status quo, given that in fact that average fees for Fixed Links across all bands besides U6, 13, 18, 32 and 80 GHz are decreasing.

[191] Specifically, the *ri* formula with R=30 for bands from 42GHz or below, and *ri*=0.2 for 80 GHz.

[192] In 21/134a, DotEcon advised the setting $\mathrm{r_i} = 0.25$ and has revised this figure and the R recommendation, as a result of the recently updated analysis using more recent data as described in Annex A of the DotEcon Report.

A 2.15 Setting the position of the 80 GHz band in the set of round schedule parameters on the basis of relative opportunity cost would result in a higher r_i for 80 GHz compared to 42 GHz Band which would not be reflective of the level of substitutability between these bands. This would create potential distortions with licensees potentially applying for 42 GHz spectrum when they would have preferred spectrum in the 80 GHz band. This would run counter to ComReg's view that the frequency gradient should encourage use of the higher bandwidths to preserve spectrum for Fixed Links needing the propagation of the lower bands.

A 2.16 Therefore, ComReg agrees that setting $\mathrm{r_i} = 0.2$ is a practical approach to ensuring the 80 GHz Band and other substitutable bands are used more efficiently in the future.

A 2.17 The $\mathrm{r_i}$ for each band and the associated calculations are set out in tab 'Details of Bands' in the Assessment Tool.

The Base Price

A 2.18 DotEcon recommends that ComReg set the formula parameters in a way that restructures the fees rather than leading to a fundamental change in the fee levels. DotEcon advises that a reasonable approach might be to set x such that the standard fees for largest commonly used bandwidths in the most commonly used bands, 11 – 23 GHz, remains similar to those under the current regime. With that in mind, in its latest report DotEcon recommends[193] setting $x = 1.2$ which would keep the general level of charges for uncongested links at typical bandwidth broadly similar for the 11 - 23 GHz bands (given $R = 30$).

A 2.19 ComReg agrees with DotEcon that the proposed approach should restructure the fees (i.e., according to frequency gradient, bandwidth requirements, congestion etc) rather than concern itself with the overall fee levels[194]. Note that this view is informed by the clear evidence that existing fees levels have not appeared to have choked off efficient demand. Obviously, if ComReg was approaching this issue absent this information, it may initially set a different base price and review at a later time. However, the existing fees paid by licensees provide highly relevant information about the extent to which the rollout of services are impacted by a particular fee level.[195] In this case, the existing fee levels are highly unlikely to choke off efficient demand.

[193] In 21/134A, DotEcon advised the setting x=1.3 and has revised its recommendation, as a result of the recently updated analysis.
[194] ComReg does not have a revenue raising objective. Consequently, revenue generating issues are not relevant in determining an appropriate fees framework. The overall fees collected would be a by-product of an efficient fees framework.
[195] This reduces concerns that ComReg might normally have about fees being set too high.

A 2.20 Setting $x = 1.2$ would result in a decline in overall fee levels on a static basis (i.e., if licensees make no changes to their existing deployment overall fees would not change). However, this approach would also provide incentives for Existing Licensees to deploy these links more efficiently over a period of time and reduce the fees paid by individual licensees. Reducing the base price would likely reduce the incentives for Existing Licensees to deploy links more efficiently because the savings from such a deployment would be reduced. Existing Licensees are more likely to choose a more efficient deployment where the savings from doing so are higher.

A 2.21 Separately, the fees for any new links, whether with existing or new licensees, would be those that are most cost effective from the outset. The extent to which overall fees would change in the future would be irrelevant and would simply be a by-product of the decisions made by licensees in the deployment of Fixed Links.

A 2.22 Therefore, ComReg agrees that $x = 1.2$ is an appropriate base price.

Congestion

A 2.23 DotEcon estimate that the current opportunity cost for the congested 13, 15 and 18 GHz bands for a 56 MHz bandwidth is over €10k per annum. To implement congestion charging to reflect opportunity costs of that scale would require setting $c \approx 6$ for congested cases, rather than the current $c = 1.2$. DotEcon recommends that a first step might be to set c in the region of 2 - 4 for congested bands/areas[196]. An initial sharp increase above 4 is unnecessary because, among other things, the relative scarcity in particular bands may in any case be reduced by the proposed pricing formula.

A 2.24 ComReg is of the view that a value at the lower end of the 2 – 6 range is appropriate. ComReg proposes to set $c = 3$ in Dublin for congested bands only and $c = 1$ in all other cases. ComReg notes that as $c = 3$ is at the lower end of the 2 – 6 range, there is scope for c to be readjusted following future analysis in the future review. This may arise due to further or persistent congestion in the congested bands and areas of emerging congestion in bands or areas not currently designated as congested.

A 2.25 This represents a larger difference between the fees for Fixed Links in congested bands/areas and uncongested areas/bands compare with the current fee structure[197]. ComReg considers the increase in fees for congested Fixed Links to be appropriate given that congestion charges do not appear to have had the desired impact by failing to reduce congestion to date in the congested bands.

[196] See ComReg Document 21/134A

[197] As DotEcon note, the existing regime has an implicit congestion factor of 1.2 in Dublin for congested bands.

Effective Bandwidths

A 2.26 In 21/134A, DotEcon advised the adoption of a "Typical Bandwidth", using the modal bandwidth for Fixed Links within a given band. DotEcon has revised its recommendation to setting fee to target fragmentation using the highest bandwidth in common use bandwidth, as a result of the potential impact of this approach on smaller Fixed Links in bands with multiple bandwidths in common use which could result in fees disincentivising fairy common bandwidths and their use cases.

A 2.27 As noted by DotEcon in some bands, the largest bandwidth in common use is also the modal bandwidth, but this is not always so. In the 18 GHz band, the modal bandwidth is still 56 MHz, but there is use being made of 112 MHz as well. DotEcon advise the use of effective bandwidths that set as the largest bandwidth in common use for each Fixed Link Band as of November 2022.

A 2.28 ComReg agrees that choosing the highest bandwidth in common use bandwidth is an appropriate approach for setting the effective bandwidth for each Fixed Link Bands. ComReg notes the issues identified by DotEcon would have been exacerbated by future trends, considering the strong trend towards wider channels (e.g., 110/112 MHz).

A 2.29 The effective bandwidth for each band and the associated calculations are set out in tab 'Details of Bands' in the Assessment Tool, which is available on request.

A 2.30 In relation to the small link gradient m, ComReg is of the view that setting $m = 0.25$, is appropriate.

A 2.31 The fee for a TDD link equivalent to the fee of a FDD link using a channel half the size.

Administrative Cost Floor

A 2.32 DotEcon considers that €100 is a reasonable level at which to set the administrative cost floor[198], based on the analysis of administrative costs by Axon.

A 2.33 This is estimated by DotEcon/Axon as follows:

A 2.34 First, ComReg's costs fall into three categories:

- one-off (e.g., equipment used to assess interference complaints);
- recurring (e.g., support and maintenance fees for the interference modelling software); and

[198] See Section **Error! Reference source not found.** of ComReg Document 21/134A

- staff costs (e.g., salaries).

A 2.35 Second, for each item in these categories, the annual expenses are multiplied by the estimated proportion of the expense attributable to Fixed Links, and sum these to give an estimate of ComReg's total annual Fixed Links administrative cost. This comes to approximately EUR 835,000 per year. Dividing this by the total number of links in operation (as of 2021) gives an average cost estimate of €67 per link, which DotEcon recommends rounding up to €100 per link.

A 2.36 ComReg considers this approach to be appropriate noting that it is based on data confidentially provided by ComReg on its administrative costs for spectrum licencing[199]. ComReg considers the proposed weighting of the "*administrative price floor"* ($A = €100$) to be appropriate noting that this estimate only serves as a floor on fees and only becomes the actual fee for a relatively small number of links (all of which face a decrease in fees relative to the existing charges).

[199] For further information on the calculation of administrative cost for Fixed Links licences, see Annex B of ComReg Document 21/134A

Annex 3: Relevant Legal Framework and Statutory Objectives

A 3.1 The Communications Regulation Act 2002 (as amended) (the "2002 Act"), the European Electronic Communications Code (which has repealed the EU Common Regulatory Framework, namely the Framework and Authorisation Directives), as transposed by S.I. No. 444 of 2022, the European Union (Electronic Communications Code) Regulations 2022 and the Communications Regulation and Digital Hub Agency (Amendment) Act 2023;[200]), and the Wireless Telegraphy Acts 1926 to 2009[201] set out, amongst other things, ComReg's functions and objectives that are relevant to the management of the radio frequency spectrum in Ireland and to this Response to Consultation and Decision document including Regulations.

A 3.2 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, and Regulation 4 of S.I. No. 444 of 2022.

A 3.3 This annex is intended as a general guide as to ComReg's role in this area, and not as a definitive or exhaustive legal exposition of that role. Further, this annex restricts itself to consideration of those functions, objectives powers, and duties of ComReg that appear most relevant to the matters at hand and generally excludes those not considered relevant (for example, in relation to postal services, premium rate services or market analysis). For the avoidance of doubt, however, the inclusion of particular material in this annex does not necessarily mean that ComReg considers same to be of specific relevance to the matters at hand. All references in this annex to enactments are to the enactment as amended at the date hereof, unless the context otherwise requires. All references in this annex to enactments are to the enactment as amended at the date hereof, unless the context otherwise requires.

The European Electronic Communications Code

A 3.4 On 20 December 2018, Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code ("EECC") entered into force.

[200] Directive 2018/1972 of the European Parliament and of the Council of 11 December 20181 establishing the European Electronic Communications Code.
[201] The Wireless Telegraphy Acts 1926 to 1988 and Sections 181 (1) to (7) and (9) and Section 182 of the Broadcasting Act 2009.

A 3.5 **It is important to note that further to Article 125 ("Repeal") of the EECC, with effect from 21 December 2020, the EECC replaced the EU Common Regulatory Framework adopted in 2002 (and amended in 2009) under which ComReg has regulated electronic communications since 2003**[202]**.**

A 3.6 With some limited exceptions (see Article 124 of the EECC), Member States had until 21 December 2020 to transpose the EECC into national law[203]. The statutory instrument transposing key provisions of the EECC has been published as S.I. No. 444 of 2022[204] and has been commenced by the Minister[205]. Other provisions of the EECC have been transposed in the Communications Regulation and Digital Hub Agency (Amendment) Act 2023, which has also been commenced[206].

A 3.7 All references in this annex to enactments are to the enactment as amended at the date hereof unless the context otherwise requires.

Primary Functions and Objectives and Regulatory Principles under the 2002 Act and EECC as transposed

A 3.8 ComReg's relevant functions pursuant to Section 10 of the Communications Regulation Act 2002, as amended, include the management of the radio frequency spectrum and the national numbering resource. ComReg's primary objectives in carrying out its statutory functions in the context of electronic communications are to:

- ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under section 13 of the 2002 Act;
- Promote competition[207];
- Contribute to the development of the internal market[208]; and
- Promote the interests of users within the Community[209].

[202] For the correlation table between relevant articles of the repealed Directives and the EECC, please see Annex XIII of the EECC available here- EUR-Lex - 02018L1972-20181217 - EN - EUR-Lex (europa.eu)
[203] With the exception of Articles 53(2), (3) and (4), and Article 54 (See Article 124).
[204] S.I. No. 444 of 2022, The European Union (Electronic Communications Code) Regulations 2022.
[205] By virtue of S.I. No. 300 of 2023, the European Union (Electronic Communications Code) (Amendment) Regulations 2023.
[206] By virtue of S.I. No. 299 of 2023, the Communications Regulation and Digital Hub Development Agency (Amendment) Act 2023 (Commencement) (No.2) Order 2023.
[207] Section 12 (1)(a)(i) of the 2002 Act.
[208] Section 12 (1)(a)(ii) of the 2002 Act.
[209] Section 12(1)(a)(iii) of the 2002 Act.

A 3.9 ComReg, in carrying out its regulatory tasks specified in S.I. No. 444, shall take all reasonable measures which are necessary and proportionate for achieving the objectives set out in Regulation 4(3), including the objective to promote connectivity and access to, and take-up of, very high-capacity networks, including fixed, mobile and wireless networks, by all consumers and businesses in the State[210].

Management of radio spectrum

A 3.10 Regulation 27 of S.I. No. 444 of 2022 governs the management of radio spectrum. Regulation 27(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, Regulation 4 of S.I. No. 444 of 2022, and Article 4 of the Directive, ensure:

(a) the effective management of radio frequencies for ECNs and ECS;

(b) that the allocation of, the issuing of general authorisations in respect of, and the granting of individual rights of use for radio spectrum for ECNs and ECSs are based on objective, transparent, pro-competitive, non-discriminatory and proportionate criteria; and

(c) ensure that harmonisation of the use of radio frequency spectrum by ECNs and ECSs 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 competition, economies of scale and interoperability of networks and services, having regard to all decisions and measures adopted by the European Commission in accordance with Decision No.676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in EU (namely the Radio Spectrum Decision).

A 3.11 Regulation 27(3) provides that, without prejudice to Regulation 27(4), ComReg must ensure that all types of technology used for the provisions of ECNs or ECSs may be used in the radio spectrum declared available for ECSs in the Radio Frequency Plan published under Section 35 of the 2002 Act in accordance with EU law.

A 3.12 Regulation 27(4) provides that, notwithstanding Regulation 17(3), 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 ECSs where this is necessary to:

(a) avoid harmful interference;

[210] Regulation 4(3)(a) of S.I. No. 444 of 2022.

(b) protect public health against electromagnetic fields;

(c) ensure technical quality of service;

(d) ensure maximisation of radio frequency sharing;

(e) safeguard the efficient use of spectrum; or

(f) 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 27(7).

A 3.13 Regulation 27(5) provides that without prejudice to Regulation 27(7), ComReg must ensure that all types of ECSs may be provided in the radio spectrum, declared available for ECS in the Radio Frequency Plan published under Section 35 of the Act of 2002 in accordance with EU law.

A 3.14 Regulation 27(6) provides that, notwithstanding Regulation 17(4), ComReg may provide for proportionate and non-discriminatory restrictions to the types of ECS to be provided, including where necessary, to fulfil a requirement under the International Telecommunication Union Radio Regulations ("ITU-RR").

A 3.15 Regulation 27(7) requires that measures that require an ECS to be provided in a specific band available for ECS shall be justified in order to ensure the fulfilment of a general interest objective as laid down by or on behalf of the Government or a Minister of the Government in accordance with EU law including, but not limited to:

(a) safety of life;

(b) the promotion of social, regional or territorial cohesion;

(c) the avoidance of inefficient use of radio frequencies; or

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

A 3.16 Regulation 27(8) provides that ComReg may only prohibit the provision of any other ECS in a specific radio spectrum frequency band where such a prohibition is justified by the need to protect safety of life services. ComReg may, on an exceptional basis, extend such a measure in order to fulfil other general interest objectives as laid down by or on behalf of the Government or a Minister of the Government in accordance with European law.

A 3.17 Regulation 27(9) provides that ComReg shall regularly review the necessity of any restrictions imposed under Regulation 27 and shall make the results of such reviews publicly available.

A 3.18 Regulation 27(10) requires ComReg to, in the fulfilment of its obligations under Regulation 27, respect relevant international agreements, including the ITU-RR and other agreements adopted in the framework of the ITU applicable to radio spectrum, any public policy considerations brought to its attention by the Minister.

Authorisation of use of radio spectrum

A 3.19 Regulation 28(1) of S.I. No. 444 of 2022 provides that ComReg shall facilitate the use of radio spectrum, including shared use, under a general authorisation under Regulation S.I. No. 444 of 2022 and limit the granting of individual rights of use for radio spectrum where such rights are necessary to maximise efficient use in light of demand and taking into account the criteria set out in Regulation 28(2).

A 3.20 Regulation 28(2) of S.I. No. 444 of 2022 provides that ComReg may decide to grant individual rights of use for radio frequencies by way of a licence taking account of:

a) the specific characteristics of the radio spectrum concerned;

b) the need to protect against harmful interference;

c) the development of reliable conditions for radio spectrum sharing, where appropriate;

d) the need to ensure technical quality of communications or service;

e) objectives of general interest as laid down by or on behalf of the Government or a Minister of the Government in conformity with EU law; and

f) the need to safeguard the efficient use of spectrum.

A 3.21 Regulation 28(3) provides that when considering whether to issue general authorisations or to grant individual rights of use for the harmonised radio spectrum, taking into account technical implementing measures adopted in accordance with Article 4 of the Radio Spectrum Decision, ComReg shall seek to minimise problems of harmful interference, including in cases of shared use of radio spectrum on the basis of a combination of general authorisation and individual rights of use.

A 3.22 Regulation 29(1) of S.I. No. 444 of 2022 provides that ComReg shall attach conditions to individual rights of use for radio spectrum in accordance with Regulation 9(1) in such a way as to ensure optimal and the most effective and efficient use of radio spectrum. Regulation 29(7) provides that Regulation 29 is without prejudice to the Act of 1926.

Publication of procedures

A 3.23 Regulation 30(2)(a) of S.I. No. 444 of 2022 requires that ComReg shall, having regard to the provisions of Regulation 27 of the S.I. No. 444 of 2022, establish open, objective, transparent, non-discriminatory and proportionate procedures for the granting of individual rights of use for radio spectrum and cause any such procedures to be made publicly available.

Duration of rights

A 3.24 Regulation 31(1) of S.I. No. 444 of 2022 provides that rights of use for radio spectrum shall be in force for such period as ComReg considers appropriate in light of the objectives pursued in accordance with Regulation 36(2) and (3), taking due account of the need to ensure competition, as well, as in particular, effective and efficient use of radio spectrum, and to promote innovation and efficient investments, including by allowing for an appropriate period for investment amortisation.

A 3.25 Regulation 31(2) provides that where ComReg decides to grant individual rights of use for radio spectrum for which harmonised conditions have been set by technical implementing measures in accordance with the Radio Spectrum Decision in order to enable its use for wireless broadband electronic communications services for a limited period, it shall ensure regulatory predictability for the holders of the rights over a period of at least 20 years regarding conditions for investment in infrastructure which relies on the use of such radio spectrum, taking account of the requirements referred to in Regulation 31(1).

Conditions attached to rights of use for radio spectrum

A 3.26 Regulation 9(1) of S.I. No. 444 of 2022 provides that, notwithstanding Section 5 of the Wireless Telegraphy Act,1926, but subject to any regulations under Section 6 of that Act, where ComReg specifies conditions to be attached to rights of use for radio spectrum, it may only attach such conditions as are listed in Part D of the Schedule 1. Part D lists the following conditions which may be attached to rights of use:

- Obligation to provide a service or to use a type of technology within the limits of Regulation 27, including, where appropriate, coverage and quality of service requirements.
- Effective and efficient use of radio spectrum in conformity with the Regulations.
- Technical and operational conditions necessary for the avoidance of harmful interference and for the protection of public health against electromagnetic fields, taking utmost account of Recommendation 1999/519/EC where such conditions are different from those included in the general authorisation.

- Maximum duration in conformity with Regulation 31, subject to any changes in the National Frequency Allocation Plan.
- Transfer or leasing of rights at the initiative of the holder of the rights and conditions of such transfer in conformity with these Regulations.
- Fees for rights of use in accordance with Regulation 24.
- Any commitments which the undertaking obtaining the rights of use has made in the framework of an authorisation or authorisation renewal process prior to the authorisation being granted or, where applicable, to the invitation for application of rights of use.
- Obligations to pool or share radio spectrum or allow access to radio spectrum for other uses in specific regions or at national level.
- Obligations under relevant international agreements relating to the use of radio spectrum bands.
- Obligations specific to an experimental use of radio frequencies.

A 3.27 Regulation 9(2) provides that (a) any attachment of conditions under Regulation 1) or (b) non-application under paragraph (1) of conditions to undertakings of a class or type as may be determined by ComReg, to rights of use for radio spectrum shall be non-discriminatory, proportionate and transparent and in accordance with Regulation 27.

A 3.28 Pursuant to Regulation 9(3) of S.I. No. 444 of 2022, an undertaking shall comply with the conditions attaching to rights of use for radio spectrum applicable to it.

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

A 3.29 Regulation 36(1) of S.I. No. 444 of 2022 provides that, without prejudice to Regulation 35, where ComReg concludes that a right to use radio spectrum cannot be subject to a general authorisation and where it considers whether to limit the number of rights of use to be granted for radio spectrum, it shall, inter alia, without prejudice to Sections 13 and 37 of the 2002 Act:

- clearly state the reasons for limiting the rights of use, in particular by giving due weight to the need to maximise benefits for users and to facilitate the development of competition and review the limitation at intervals which it considers reasonable or at the reasonable request of any undertaking affected as appropriate;, and
- give all interested parties, including users and consumers, the opportunity to express their views in accordance with Regulation 101.

A 3.30 Regulation 36(2)(a) of S.I. No. 444 of 2022 provides that ComReg may decide , having taken into account the matters referred to in paragraph (1)(a) and (b), that the number of rights of use for radio spectrum referred to in that paragraph ought to be limited and, where the Regulator so decides, it shall clearly establish, and give reasons for, the objectives pursued by means of a competitive or comparative selection procedure under this Regulation, and where possible quantify them, giving due weight to the need to fulfil national and internal market objectives.

A 3.31 Regulation 36(7) provides that where the granting of rights of use for radio spectrum needs to be limited, ComReg shall grant such rights on the basis of selection criteria and a selection procedure which are objective, transparent, non-discriminatory and proportionate. Any such selection criteria shall give due weight to the achievement of the objectives and requirements of section 12 of the Act of 2002 and Regulations 4, 16 and 27.

Fees for spectrum rights of use

A 3.32 Regulation 24(1) of S.I. No. 444 of 2022 permits ComReg, subject to sections 13 and 37 of the Act of 2002, to impose fees for rights of use for radio spectrum, which reflect the need to ensure the optimal use of the radio spectrum.

A 3.33 Pursuant to Regulation 24(2) of S.I. No. 444 of 2022, 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 the general objectives of the Directive and Regulation S.I. No. 444 of 2022. Regulation 23(3) provides that with respect to rights of use for radio spectrum, ComReg shall seek to ensure that applicable fees are set at a level which ensures efficient assignment and use of radio spectrum by: (a) setting reserve prices as minimum fees for rights of use for radio spectrum by having regard to the value of those rights in their possible alternative uses; (b) taking into account costs entailed by conditions attached to those rights; and (c) applying, to the extent possible, payment arrangements linked to the actual availability for use of the radio spectrum.

Amendment of rights and obligations

A 3.34 Regulation 14(1) of S.I. No. 444 of 2022 permits ComReg to amend rights, conditions and procedures concerning rights of use for radio spectrum, provided that any such amendment may only be made in objectively justified cases and in a proportionate manner, taking into consideration, where appropriate, the specific conditions applicable to transferable rights of use for radio spectrum or for numbering resources.

Other Relevant Legislation and Policy Instruments

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

A 3.35 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 3.36 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 withdrawal) as may be prescribed in regard to it by regulations made by ComReg under Section 6.

A 3.37 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 3.38 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 3.39 Section 6(2) provides that Regulations made by ComReg under Regulation 6 may authorise and provide for the granting of a licence under Section 5 subject to special terms, conditions, and restrictions to persons who satisfy it that they require the licences solely for the purpose of conducting experiments in wireless telegraphy.

A 3.40 Regulation 9(1) of S.I. No. 444 of 2022 provides that, notwithstanding section 5 of the Act of 1926 but subject to any regulations made under section 6 of that Act, where ComReg specifies conditions to be attached to rights of use for radio spectrum, it may only attach such conditions as are listed in Part D of Schedule 1 to S.I. No. 444 of 2022.

A 3.41 Regulation 30(7) of S.I. No. 444 of 2022 provides that for the purpose of Regulation 30, a general authorisation for the use of radio spectrum shall be facilitated by way of an order made by ComReg under section 3(6) of the 1926 Act, declaring that a particular class or description of apparatus for wireless telegraphy is one to which the licence requirements of section 3 of the 1926 Act do not apply.

Broadcasting Act 2009 (the "2009 Act")

A 3.42 Section 132 of the 2009 Act relates to the duties of ComReg in respect of the licensing of spectrum for use in establishing digital terrestrial television multiplexes and places an obligation on ComReg to issue:

- two DTT multiplex licences to RTÉ by request (see Sections 132(1) and (2) of the 2009 Act; and
- a minimum of four DTT multiplex licences to the BAI by request (see Sections 132(3) and (4) of the 2009 Act) for the provision of commercial TV content.

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

A 3.43 Article 4 of the Competition Directive[211] 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."*

[211] Commission Directive 2002/77/EC of 16 September 2002 on competition in the markets for electronic communications networks and services.

Radio Spectrum Policy Programme

A 3.44 On 15 February 2012, the European Parliament adopted, via a Decision[212], the five-year Radio Spectrum Policy Programme ("RSPP") which establishes a multi-annual radio spectrum policy programme for the strategic planning and harmonisation of the use of spectrum. The objective is to ensure the functioning of the internal market in the Union policy areas involving the use of spectrum, such as electronic communications, research, technological development and space, transport, energy and audiovisual policies.

A 3.45 Among other things, Article 5 of the RSPP, entitled "Competition", provides:

> "*1. Member States shall promote effective competition and shall avoid distortions of competition in the internal market for electronic communications services in accordance with Directives 2002/20/EC and 2002/21/EC.*
>
> *They shall also take into account competition issues when granting rights of use of spectrum to users of private electronic communication networks."*

Policy Directions[213]

A 3.46 Section 12(4) of the 2002 Act provides that, in carrying out its functions, ComReg must have appropriate regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to the Commission, in relation to the economic and social development of the State. Section 13(1) of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources ("the Minister") as he or she considers appropriate, in the interests of the proper and effective regulation of the electronic communications market, the management of the radio frequency spectrum in the State and the formulation of policy applicable to such proper and effective regulation and management, to be followed by ComReg in the exercise of its functions. Section 10(1)(b) of the 2002 Act also requires ComReg, in managing the radio frequency spectrum, to do so in accordance with a direction of the Minister under section 13 of the 2002 Act, while Section 12(1)(b) requires ComReg to ensure the efficient management and use of the radio frequency spectrum in accordance with a direction under Section 13.

A 3.47 The Policy Directions which are most relevant in this regard include the following:

[212] Decision No 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme.

[213] ComReg also notes, and takes due account of, the Spectrum Policy Statement issued by the Department of Communications Energy and Natural Resources in September 2010

Policy Direction No.3 on Broadband Electronic Communication Networks

A 3.48 ComReg shall in the exercise of its functions, take into account the national objective regarding broadband rollout, viz, the Government wishes to ensure the widespread availability of open-access, affordable, always-on broadband infrastructure and services for businesses and citizens on a balanced regional basis within three years, on the basis of utilisation of a range of existing and emerging technologies and broadband speeds appropriate to specific categories of service and customers.

Policy Direction No.4 on Industry Sustainability

A 3.49 ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.

Policy Direction No.5 on Regulation only where necessary

A 3.50 Where ComReg has discretion as to whether to impose regulatory obligations, it shall, before deciding to impose such regulatory obligations on undertakings, examine whether the objectives of such regulatory obligations would be better achieved by forbearance from imposition of such obligations and reliance instead on market forces.

Policy Direction No.6 on Regulatory Impact Assessment

A 3.51 ComReg, before deciding to impose regulatory obligations on undertakings in the market for electronic communications or for the purposes of the management and use of the radio frequency spectrum or for the purposes of the regulation of the postal sector, shall conduct a Regulatory Impact Assessment in accordance with European and International best practice and otherwise in accordance with measures that may be adopted under the Government's Better Regulation programme.

Policy Direction No.7 on Consistency with other Member States

A 3.52 ComReg shall ensure that, where market circumstances are equivalent, the regulatory obligations imposed on undertakings in the electronic communications market in Ireland should be equivalent to those imposed on undertakings in equivalent positions in other Member States of the European Community.

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

A 3.53 ComReg shall ensure that, in its management of the radio frequency spectrum, it takes account of the interests of all users of the radio frequency spectrum.

General Policy Direction No.1 on Competition (2004)

A 3.54 ComReg shall focus on the promotion of competition as a key objective. Where necessary, ComReg shall implement remedies which counteract or remove barriers to market entry and shall support entry by new players to the market and entry into new sectors by existing players. ComReg shall have a particular focus on:

- market share of new entrants;
- ensuring that the applicable margin attributable to a product at the wholesale level is sufficient to promote and sustain competition;
- price level to the end user;
- competition in the fixed and mobile markets; and
- the potential of alternative technology delivery platforms to support competition.

Promotion of Competition

A 3.55 Section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:

- encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector; and
- ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality.

A 3.56 Regulation 34(1) of S.I. No. 444 of 2022 provides that ComReg shall promote effective competition and avoid distortions of competition in the internal market when deciding to grant, amend or renew rights of use for radio spectrum for electronic communications networks and services in accordance with these Regulations.

Contributing to the Development of the Internal Market

A 3.57 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:

I. removing remaining obstacles to the provision of ECN, ECS and associated facilities at Community level;

II. encouraging the establishment and development of trans-European networks and the interoperability of transnational services and end-to-end connectivity; and

III. 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 3.58 In so far as consolidating the development of the internal market is concerned, Regulation 17(2) of S.I. No. 444 of 2022 provides that in carrying out its tasks under these Regulations, ComReg shall, taking the utmost account of its objectives under section 12 of the Act of 2002 and Regulation 4, contribute to the development of the internal market by working with national regulatory authorities in other Member States, BEREC and the European Commission in a transparent manner to ensure the consistent application of the Directive.

Promotion of Interests of Users

A 3.59 Section 12(2)(c) of the 2002 Act requires ComReg, when exercising its functions in relation to the provision of electronic communications networks and services, to take all reasonable measures which are aimed at the promotion of the interests of users within the Community, including:

- ensuring that all users have access to a universal service;
- ensuring a high level of protection for consumers in their dealings with suppliers, in particular by ensuring the availability of simple and inexpensive dispute resolution procedures carried out by a body that is independent of the parties involved;
- contributing to ensuring a high level of protection of personal data and privacy;
- promoting the provision of clear information, in particular requiring transparency of tariffs and conditions for using publicly available ECS;
- encouraging access to the internet at reasonable cost to users;
- addressing the needs of specific social groups, in particular disabled users; and
- ensuring that the integrity and security of public communications networks are maintained.

Technological Neutrality

A 3.60 Further to Regulation 4(5) of S.I. No. 444 of 2022, ComReg, in pursuit of the policy objectives referred to in paragraph (3), shall apply impartial, objective, transparent, non-discriminatory and proportionate regulatory principles by, inter alia —(c) applying European Union law in a technologically neutral fashion, to the extent that this is consistent with the achievement of the objectives set out in paragraph (3).

Regulatory Principles

A 3.61 Further to Regulation 4(5) of S.I. No. 444 of 2022, ComReg, in pursuit of the policy objectives referred to in paragraph (3), shall apply impartial, objective, transparent, non-discriminatory and proportionate regulatory principles by, inter alia: promoting regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods and through cooperation with each other, with BEREC, with the RSPG and with the European Commission:

- ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing ECNs and ECSs;
- 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 infrastructure, competition, the circumstances of end-users and, in particular, consumers that exist in the various geographic areas within the State, including local infrastructure managed by individuals on a not-for-profit basis, and
- imposing ex-ante regulatory obligations only to the extent necessary to secure effective and sustainable competition in the interest of end-users where there is no effective and sustainable competition and relaxing or lifting such obligations as soon as that condition is fulfilled. BEREC

A 3.62 Under Regulation 4(4) of S.I. No. 444 of 2022, ComReg must:

- having regard to its objectives under section 12 of the 2002 Act and its tasks under these Regulations, actively support the goals of BEREC of promoting greater regulatory coordination and consistency; and
- take the utmost account of guidelines, opinions, recommendations, common positions, best practices and methodologies adopted by BEREC when adopting decisions for the markets in the State.

Other Obligations under the 2002 Act

A 3.63 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;[214]
- have regard to international developments with regard to the radio frequency spectrum[215]; 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.[216]

[214] Section 12(3) of the 2002 Act.
[215] Section 12(5) of the 2002 Act.
[216] Section 12(6) of the 2002 Act.

Annex 4: Final Draft Licensing Regulations

A 4.1 **Any final version of these regulations, which would be made by ComReg under section 6 of the Wireless Telegraphy Act 1926, is expressly subject to the consent of the Minister for the Environment, Climate and Communications under section 37 of the Communications Regulation Act 2002, as amended.**

A 4.2 ComReg may make such editorial changes to the text of any final regulations as it considers necessary and without further consultation, where such changes would not affect the substance of the regulations

STATUTORY INSTRUMENTS.

S.I. No. of 2023

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WIRELESS TELEGRAPHY (FIXED RADIO LINK LICENCE) REGULATIONS 2023

S.I. No. of 2023

WIRELESS TELEGRAPHY (FIXED RADIO LINK LICENCE) REGULATIONS, 2023

The Commission for Communications Regulation, in exercise of the powers conferred on it by section 6(1) of the Wireless Telegraphy Act 1926 (No. 45 of 1926) as substituted by section 182 of the Broadcasting Act 2009 (No. 18 of 2009), and with the consent of the Minister for the Environment, Climate and Communications (as adapted by the Communications, Climate Action and Environment (Alteration of Name of Department and Title of Minister) Order 2020 (S.I. No. 373 of 2020)) in accordance with section 37 of the Communications Regulation Act 2002 (No. 20 of 2002), hereby makes the following Regulations:

Citation

1. (1) These Regulations may be cited as the Wireless Telegraphy (Fixed Radio Link Licence) Regulations 2023.

(2) These Regulations shall come into force on the day on which they were made, and the Fees set out in Schedule 2 shall apply for the periods as set out therein.

Interpretation and Definitions

2. (1) In these Regulations, except where the context otherwise requires:

“Act of 1926” means the Wireless Telegraphy Act 1926 (No. 45 of 1926);

“Act of 1972” means the Wireless Telegraphy Act 1972 (No. 5 of 1972);

“Act of 2002” means the Communications Regulation Act 2002 (No. 20 of 2002);

“Apparatus” means apparatus for wireless telegraphy as defined in section 2 of the Act of 1926 for terrestrial systems capable of providing Electronic Communications Services;

“Wireless Telegraphy” has the same meaning as set out in section 2 of the Act of 1926;

“Annual Fee” means the Licence Fee which applies to a Fixed Radio Link From the 1st October 2026;

“Bandwidth” or “BW” means the frequency range occupied by a modulated carrier signal;

“Commission” means the Commission for Communications Regulation established under the Act of 2002;

“Congestion Area” means the geographic area wherein a Congestion Charge applies to a Point-to-Point Fixed Radio Link or Point to Multi-Point Fixed Radio Link operating on a Congested Frequency Band;

“Congestion Charge” means the charge applied to links a Fixed Radio Link in a Congestion Area and set out in Schedule 2;

“Congested Fixed Radio Link” means a Point-to-Point Fixed Radio Link or Point to Multi-Point Fixed Radio Link that is in both a Congested Frequency Band and the Congestion Area;

“Congested Band” or “Congested Frequency Band” means the frequency band, or bands, which has been identified as being congested within a specific geographic area;

“Consumer Price Index” or “CPI” means the consumer price index number as published from time to time by the Central Statistics Office;

“Central Statistics Office” means the Central Statistics Office of Ireland or its successor;

“ECC” means the Electronic Communications Committee;

“EECC Regulations” means the European Union (European Electronic Communications Code) Regulations 2022 (S.I. No. 444 of 2022);

“FDD” means Frequency Division Duplexing;

“Fixed Radio Link” means a fixed wireless link in frequency bands above 1 GHz by means of apparatus for wireless telegraphy;

“Fixed Radio Link Licence” means a Licence to which these Regulations apply;

“Fixed Radio Link Path” means a unique path as defined by the specified fixed points of a Fixed Radio Link;

“Frequency Band” means a specific range of frequencies in the electromagnetic frequency spectrum as designated by the ITU and/or ECC;

“Harmful Interference” has the meaning set out in the EECC Regulations;

“High Usage Path” means a Fixed Radio Link Path on which a Licensee has Fixed Radio Links on the same Fixed Radio Link Path occupying 50% or greater of the available bandwidth within a Frequency Band;

“High Usage Path Fixed Radio Link” means Fixed Radio Link on a High Usage Path;

“ICNIRP” means the International Commission on Non-Ionizing Radiation Protection;

"Initial Fee" means the Licence Fee which applies to a Fixed Radio Link from the day on which these Regulations were made until 30th September 2024;

“ITU” means the International Telecommunication Union;

“Licence” means a non-exclusive licence granted in accordance with section 5 of the Act of 1926 in accordance with and subject to the matters prescribed in these Regulations to keep, have possession of, install, maintain, work and use Apparatus in a specified place in the State granted to the licensee;

"Licence Fee" means the fee associated for Fixed Links are set out in Schedule 2 to the Radio Links Regulations;

"Licensee" means the holder of a Licence;

"Non-exclusive", in relation to a Licence, means that the Commission is not precluded from authorising the keeping and having possession by persons other than the Licensee, on a Non-Interference and Non-Protected Basis, of apparatus for wireless telegraphy for the radio frequency spectrum specified in the Licence;

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

"Point-to-Point Fixed Radio Link" means a Fixed Radio Link between two specified fixed geographic points;

"Point-to-MultiPoint Fixed Radio Link" means a Fixed Radio Link between a specified fixed geographic point and multiple geographic points;

"Radio Equipment Regulations" means the European Union (Radio Equipment) Regulations 2017 (S.I. No. 248 of 2017);

"Radiocommunication Service" means a service as defined in the Radio Regulations of the International Telecommunication Union involving the transmission, emission or reception of radio waves for specific telecommunication purposes;

"Regulations" means the Wireless Telegraphy (Fixed Radio Link Licence) Regulations, 2023;

"TDD" means Time Division Duplexing;

"Temporary Licence" means a Licence that is issued only for a period up to a maximum of eleven months and which shall not be renewed;

"Undertaking" means a person engaged or intending to engage in the provision of electronic communications networks or services or associated facilities.

(2) In these Regulations –

(a) a reference to an enactment or regulation shall be construed as a reference to the enactment or regulation as amended or extended by or under any subsequent enactment or Regulation;

(b) a reference to a Regulation or a Schedule is to a Regulation of, or a Schedule to, these Regulations, unless it is indicated that reference to some other enactment is intended;

(c) a reference to a paragraph or subparagraph is to the paragraph or subparagraph of the provision in which the reference occurs unless it is indicated that reference to some other provision is intended;

(e) A word or expression that is used in these Regulations and that is also used in the Act of 1926 has, unless the context otherwise requires, the same meaning in these Regulations that it has in that Act;

(f) A word or expression that is used in these Regulations and that is also used in the Act of 2002 has, unless the context otherwise requires, the same meaning in these Regulations that it has in that Act;

(g) A word or expression that is used in these Regulations and that is also used in the EECC Regulations has, unless the context otherwise requires, the same meaning in these Regulations that it has in those Regulations.

Licences to which these Regulations apply

3. These Regulations apply to Licences to keep, have possession of, install, maintain, work and use apparatus for wireless telegraphy for the purpose of the provision of a Point to Point Fixed Radio Link or a Point to Multi-Point Fixed Radio Link in Frequency Bands above 1 GHz, having the characteristics set out in Part 2 of the First Schedule of the Licence and operating in accordance with the technical conditions set out in Part 2 of the First Schedule of the Licence and at the locations set out in Part 2 of the First Schedule of the Licence.

Limitation of Licence

4. (1) A Licence granted under these Regulations does not grant to the Licensee named therein any right, interest or entitlement other than the right to keep, install, maintain, work and use, at a specified locations in the State, apparatus for wireless telegraphy for the purpose of the provision of a Point-to-Point Fixed Radio Link or a Point to Multi-Point Fixed Radio Link.

(2) Nothing in these Regulations shall absolve the Licensee from any requirement in law to obtain such additional approvals, consents, licences, permissions and authorisations that may be necessary for the discharge of the obligations or the exercise of entitlements under the Licence. The Licensee is responsible for all costs, expenses and other commitments, financial and non-financial, in respect of the Licence and the provision of a Point-to-Point Fixed Radio Link or a Point to Multi-Point Fixed Radio Link and the Commission shall bear no responsibility for such costs, expenses or commitments.

Application for Licences and Form of Licences

5. (1) An application for a Licence will be made to the Commission and shall be in writing in such form as may be determined by the Commission.

(2) A person who makes an application under paragraph (1) of this Regulation shall furnish to the Commission such information as the Commission may reasonably require

for the purpose of assessing the application and carrying out its functions under the Act of 1926, the Act of 2002 and the EECC Regulations and, if the person, without reasonable cause, fails to comply with this paragraph, the Commission may refuse to grant a Licence to the person.

(3) The Commission may issue a Temporary Licence for a period up to a maximum of eleven months which shall not be renewed.

(4) The grant of a Licence is subject to payment of the prescribed fee as set out in Schedule 2 to these Regulations.

(5) Subject to Regulation 7, a Licence shall be in the form specified in Schedule 1 with such variation, if any, whether by addition, deletion or alteration as the Commission may determine from time to time or in any particular case in accordance with the EECC Regulations.

Duration and Renewal of Licences

6. (1) A Licence shall, unless it has been withdrawn or had its duration reduced under Regulation 8 , remain in force from the date of grant for a period of one year unless renewed under these Regulations.

(2) A Licence may be renewed from time to time by the Commission under this Regulation.

(3) A Temporary Licence shall, unless it has been withdrawn or had its duration reduced under Regulation 8, remain in force from the date of grant until the expiry date as specified in the licence, which shall not be greater than an eleven-month period, and shall not be renewed.

(4) Prior to the expiration of a Licence, the Commission may, by notice in writing given to the Licensee or sent to the Licensee at the address of the Licensee specified in the Licence, renew the Licence for one year from the day following the expiration of the last previous period during which it was in force. The granting or renewal of a Licence shall be subject to the payment of the relevant fees in advance of the grant or expiry date and shall not be construed as warranting that the Licence shall be renewed at any time in the future.

(5) In considering whether to renew a Licence, the Commission shall have particular regard to:

(a) whether the Licensee has complied with these Regulations and the conditions attached to the expiring Licence;

(b) the efficient management and use of radio spectrum; and

(c) the avoidance of Harmful Interference.

Conditions of Licences

7. (1) It shall be a condition of a Licence that:

(a) the Licensee shall comply with these Regulations and the conditions attached to the Licence;

(b) the Licensee shall ensure that the Apparatus is used only on such radio frequency spectrum as may be specified in the Licence and such radio frequencies shall be used in an efficient manner having utmost regard to any guidelines that may be issued and amended by the Commission from time to time in relation to the keeping, installing, maintaining, working and use of apparatus for wireless telegraphy forming part of a Radio Link;

(c) the Licensee shall make payments of the fees as set out in Schedule 2 to these Regulations, and in accordance with Regulation 9 of these Regulations;

(d) the Licensee may not, without the prior written consent of the Commission, which shall not be unreasonably withheld, assign the Licence or any of the powers, duties or functions conferred by it or otherwise transfer any of the rights or obligations conferred by it;

(e) the Licensee shall ensure that non-ionising radiation emissions from the Apparatus operated by the Licensee are within the limits specified by the guidelines published by ICNIRP, any radiation emission standards adopted and published by ICNIRP, or its successors, from time to time, any radiation emission standards of the European Committee for Electrotechnical Standardization and any radiation emission standards specified by national and European Community law;

(f) the Licensee shall as soon as possible request the Commission to consider and decide on an amendment to the licence to reflect any proposed changes to the information contained in the Licence;

(g) the Licensee shall furnish such information and reports in respect of the Licence, including relating to the Apparatus and its use, as may be requested by the Commission from time to time;

(h) the Licensee shall ensure that the Apparatus, or any part thereof, shall be installed, maintained, operated and used so as not to cause Harmful Interference;

(i) the Licensee shall ensure compliance with any special conditions imposed under section 8 of the Act of 1972 and subject to which this Licence is deemed by subsection (3) of that section to be issued;

(j) the Licensee shall ensure that, save as may be required by law, access to, and use of, the Apparatus is restricted to the Licensee, employees or agents of the Licensee, and persons authorised by or on behalf of the Licensee;

(k) where the Commission is satisfied that a Licensee has failed to comply with any provision of these Regulations or a condition of the Licence, and the Commission has served on the Licensee a written notice prohibiting the use of

Apparatus by such date and time as may be specified in the notice, then the Licensee will cease to use that Apparatus on or before the applicable date and time until such notice has been withdrawn by the Commission, and the Licensee shall take such measures as may be specified by the Commission in the notice;

(l) the Licensee shall upon becoming aware of any event likely to materially affect their ability to comply with these Regulations, or any conditions set out or referred to in the Licence, notify the Commission of that fact in writing within 5 working days;

(m) the Licensee shall on request from an authorised officer of the Commission permit the inspection of the Apparatus, enable access to the site or sites on which the Apparatus is located and produce the associated Licence for inspection

(n) Having notified and obtained the written consent of the Commission, the Licensee may transfer the Licence to another undertaking where the attached conditions are maintained.

(o) the Licensee shall comply with all obligations under relevant international agreements relating to the use of Apparatus or the frequencies to which they are assigned; and

(p) ensure that all Apparatus, or any part thereof, complies with the Radio Equipment Regulations.

Enforcement, Amendment, Withdrawal and Suspension

8. (1) Enforcement by the Commission of compliance by a Licensee with conditions attached to their Licence shall be in accordance with the EECC Regulations, and any other requirements under applicable national or European Community law.

(2) The Commission may amend the Licence from time to time where objectively justifiable and in a proportionate manner. Any amendment shall be made subject to and in accordance with the EECC Regulations, and any other requirements under applicable national or European Union law.

(3) Where the Commission is of the opinion that, in the interest of the efficient and orderly use of apparatus for wireless telegraphy or radio frequency spectrum, it is desirable to do so, it may amend the Licence in accordance with the EECC Regulations.

(4) Without prejudice to paragraph (2) of this Regulation, at the request of the Licensee, the Commission may, if it considers it appropriate to do so, amend the Licence by adding to, deleting from or altering the radio frequency spectrum specified in the Licence on which the Apparatus may be used. Any such amendment shall be effected by notice in writing from the Commission specifying the amendment and given to the Licensee or sent to the Licensee at the address specified in the Licence or notified to the Commission pursuant to the Licence.

(5) A Licence may be suspended or withdrawn by the Commission in accordance with the EECC Regulations, and any other requirements under applicable national or European Community law.

Licence Fees

9. (1) Fees as set out and provided for in the fees table in Schedule 2 are hereby prescribed in relation to Licences for the purpose of section 6 of the Act of 1926, as amended.

(2) The fees set out and provided for in Schedule 2 shall be payable by the Licensee to the Commission prior to the grant or renewal of a Licence.

(3) Fees shall be paid to the Commission by way of Electronic Funds Transfer or such other means, and on such terms (including terms as to the place of payment) as the Commission may decide. Where the date of payment falls on a Saturday, a Sunday or a public holiday payment shall be made on or before the last working day before the date of payment.

(4) Fees for any period of less than one year shall be calculated on a pro rata monthly basis for such period.

(5) If a Licence is suspended or withdrawn, the Licensee may be entitled to a refund on a pro rata monthly basis for the remaining period of the Licence of the relevant Licence Fee.

(6) If a Licence is suspended or withdrawn due to a finding by ComReg of non-compliance with any relevant licence conditions, the Licensee shall not be entitled to be repaid any part of the Licence Fee paid by the Licensee, but shall still be liable to pay any sums, including interest, that are outstanding.

(7) An amount payable by a Licensee may be recovered by the Commission as a simple contract debt in any court of competent jurisdiction.

(8) The fees will be implemented, on a phased-in basis, in accordance with Schedule 2.

Congested Fixed Radio Links

10. (1) The Congested Area is the geographic area as defined by National Grid 3122 and 3123 (Tailte Éireann). A Fixed Radio Link is within this area when one or more of its' specified fixed points is located in this geographic area.

(2) For the purpose of calculating the Initial Fees the Congested Frequency Bands are:

(a) the 18 GHz Frequency Band (17.7 GHz to 19.7 GHz); and

(b) the 23 GHz Frequency Band (22.0 GHz to 22.6 GHz and 23.0 GHz to 23.6 GHz).

GHz).

(3) For the purpose of calculating the Annual Fees the Congested Frequency Bands are:

(a) the 18 GHz Frequency Band (17.7 GHz to 19.7 GHz); or

(b) the 23 GHz Frequency Band (22.0 GHz to 22.6 GHz and 23.0 GHz to 23.6 GHz);

(c) the 13 GHz Frequency Band (12.75 GHz to 13.25 GHz); and

(d) the 15 GHz Frequency Band (14.5 GHz to 15.35 GHz);

Transitional Arrangements

12. (1) Subject to paragraph 2, the Wireless Telegraphy (Radio Link Licence) Regulations 2009 (S.I. No. 370 of 2009) are hereby revoked.

(2) A licence issued under the Wireless Telegraphy (Radio Link Licence) Regulations 2009 (S.I. No. 370 of 2009) in force immediately before the commencement of these Regulations will continue in force as if it had run continuously from the date of its issue until its next renewal date.

SCHEDULE 1

WIRELESS TELEGRAPHY ACT, 1926

WIRELESS TELEGRAPHY (FIXED RADIO LINK LICENCE) REGULATIONS, 2023

LICENCE CERTIFICATE

Part 1

Licence Number: .....

The Commission for Communications Regulation, in exercise of the powers conferred on it by section 6(1) of the Wireless Telegraphy Act, 1926 (No. 45 of 1926), as substituted by section 182 of the Broadcasting Act 2009 (No. 18 of 2009), grants to the Licensee specified, authorisation to keep, have possession of, install, maintain, work and use apparatus as specified in Part 2 of this Licence subject to the Licensee observing the conditions contained in Regulation 7 of the Wireless Telegraphy (Fixed Radio Link Licence) Regulations, 2023 (S.I. of 2023)

Licensee: .....

Address: .....

Licence Type: .....

Commencement and Termination Dates (if applicable):

The Licence comes into effect on ***DD/MM/YY*** and, subject to withdrawal or suspension, expires on ***DD/MM/YY*** unless renewed in accordance with these Regulations.

or

This Temporary Licence comes into effect on ***DD/MM/YY*** and shall expire on ***DD/MM/YY.***

Signed: .....

on behalf of the Commission for Communications Regulation

Date: .....

Part 2

Licence Details	**Apparatus**
Licence Reference: Licensee: Address: Licence Issue Date:	Radio Make: Model: Class: Antenna Make: Model: Class: Adaptive Modulation: Channel Plan:

Locations(s) and Technical Conditions of Apparatus:

Transmit Station	**Location**	**Frequency (MHz)**	**Channel Number**	**Frequency Band (GHz)**	**Receive Station**	**Bearing (degrees)**	**Distance (km)**	**Emission**	**Max EIRP (dBW)**	**Bandwidth (MHz)**	**Antenna**		
											Gain	**Height**	**Polarisation**
											dBi	**Meter (agl)**	**H/V**

SCHEDULE 2 FEES PAYABLE

From the day on which these Regulations were made until 30th September 2024, the annual payable fees ("Initial Fees") for Point-to-Point Fixed Radio Link Licences are set as per Table 1 and 2.

Table 1: Initial Fee schedule for Point-to-Point Fixed Radio Link licences

Frequency Band	Annual Licence Fee BW ≤ 3.5 MHz	Annual Licence Fee 3.5 MHz < BW ≤ 20 MHz	Annual Licence Fee 20 MHz < BW ≤ 40 MHz	Annual Licence Fee BW > 40 MHz
F ≤ 1 GHz	€750	N/A	N/A	N/A
1 GHz < F ≤ 17 GHz	€1,000	€1,100	€1,200	€1,500
17 GHz < F ≤ 37 GHz	€750	€825	€900	€1,125
37 GHz < F ≤ 39.5 GHz	€550	€605	€660	€825
F > 39.5 GHz	€100	€110	€120	€150

Table 2: Initial Fee schedule for Point-to-Point Fixed Radio Link Licences on a High Usage Path or in a Congested Area

Frequency Band	Annual Licence Fee BW ≤ 3.5 MHz	Annual Licence Fee 3.5 MHz < BW ≤ 20 MHz	Annual Licence Fee 20 MHz < BW ≤ 40 MHz	Annual Licence Fee BW > 40 MHz
F ≤ 1 GHz	€900	N/A	N/A	N/A
1 GHz < F ≤ 17 GHz	€1,200	€1,320	€1,440	€1,800
17 GHz < F ≤ 37 GHz	€900	€990	€1,080	€1,350
37 GHz < F ≤ 39.5 GHz	€660	€726	€792	€990
F > 39.5 GHz	€120	€132	€144	€180

The Initial Fee for a Point to Multi-Point Fixed Radio Link is four (4) times the Annual Fees (€) for a Point-to-Point Fixed Radio Link.

From the 1st October 2024 until 30th September 2026, the annual Licence Fee payable for Point-to-Point Fixed Radio Link Licences is set by the following formula:

$$Fee\ Payable = \sum_{t}^{n} \frac{n-t}{n}\ InitialFees + \frac{t}{n}\ AnnualFees$$

t represents the number of years from the 1st October 2023, therefore t=1 from 1st October 2024; and t=2 from 1st October 2025.

n represents the duration in years from the 1st October 2023 until 30th September 2026, therefore n=3.

$InitialFees$ represents the fees as shown in Table 1 and Table 2 above.

$AnnualFees$ represents the Licence Fees as calculated below.

Annual Fees

From the **1st October 2026**, the annual fee payable on a Point-to-Point Fixed Radio Link **(Annual Fee)** is equal to the fee for that Point-to-Point Fixed Radio Link in the base year of 2023 (the "Base Fee"), indexed to the annual rate of inflation since 2023 using the Consumer Price Index. The inflation adjustment, is set out in the following formula as follows:

$$\text{Indexing Multiplier} = \frac{CPI_t}{CPI_{2023}} * 100$$

Where CPI_t represents the 12-month Consumer Price Index figures published by the Central Statistics Office, for year *t*, the year immediately preceding the application. CPI_{2023} represents the 12-month Consumer Price Index figures published by the Central Statistics Office for 2023. The first indexation shall take place on the 1st October 2024 and shall occur annually thereafter on that same date.

The Base Fees are set out in Table 3, Table 4, Table 5 and Table 6 below, save for any adjustments outlined below for Radio Links in a Congested Area and/or on a High Usage Path and/or Multi-Point Fixed Radio Link.

The fee for a TDD Fixed Radio Link is half the fee of a FDD Fixed Radio Link using the same Bandwidth.

Table 3: Base Fee for a Point-to-Point Fixed Radio Link in the 1.3/1.4 GHz and 1.3/1.5 GHz Bands, by Bandwidth (MHz)

Frequency Band (GHz)	0.25 MHz	0.5 MHz	1 MHz
1.3/1.5	€100	€100	€100
1.3/1.4	€100	€100	€100

Table 4: Base Fee for a Point-to-Point Fixed Radio Link in the 2 GHz, 6 GHz, 7 GHz, and 8 GHz Bands, by Bandwidth (MHz)

Frequency Band (GHz)	3.5 MHz	7 MHz	14 MHz	20 MHz	28 MHz	29.65 MHz	40 MHz	56 MHz	59.3 MHz	80 MHz
2.0/2.3	€170	€310	€495							
L6						€947			€1894	
L7			€434		€868			€1736		
L8						€901			€1802	
U6				€786			€1257			€2514
U7		€296	€538		€861			€1722		
U8	€131	€210	€420		€841			€1682		

Table 5: Base Fee for a Point-to-Point Fixed Radio Link in the 11 – 42 GHz Bands, by Bandwidth(MHz)

Frequency Band (GHz)	3.5 MHz	7 MHz	14 MHz	27.5 MHz	28 MHz	40 MHz	55 MHz	56 MHz	80 MHz	110 MHz	112 MHz	220 MHz	224 MHz
11						€1105			€2210				
13	€134	€262	€502		€913			€1461					
15	€102	€201	€393		€753			€1368			€2189		
18				€641			€1166			€1865		€3730	
23	€100	€145	€285		€544			€990			€1584		€3167
26	€100	€145	€263		€421								
28	€100	€104	€203		€389			€706			€1130		€2261
38	€100	€100	€100		€136			€247			€396		€792
42		€100	€100		€100			€100			€108		

Table 6: Base Fee for a Point-to-Point Fixed Radio Link in the 80 GHz Band, by Bandwidth (MHz)

Frequency Band (GHz)	125 MHz	250 MHz	375 MHz	500 MHz	625 MHz	750 MHz	875 MHz	1000 MHz	1250 MHz	1500 MHz	1750 MHz	2000 MHz	2250 MHz
80	€100	€100	€118	€150	€178	€203	€223	€240	€300	€360	€420	€480	€540

Congested Fixed Radio Links and High Usage Path Fixed Radio Links.

The Annual Fee for a Fixed Link is increased by:

- 200% where that Fixed Radio Link is a Congested Fixed Radio Link; and /or
- 20% where that Fixed Radio Link is a High Usage Path Fixed Link.

Fees for Point to Multi-Point Fixed Radio Links

The Annual Fee is equal to the sum of the Annual Fees that would be payable for each equivalent Point-to-Point Fixed Link within the Point-to-MultiPoint system, up to the eighth link, and 25% of each link beyond the eighth link in the Point-t0- MultiPoint system.

Temporary Licence Fees

In all periods, temporary Licence Fees are applied pro-rata to the relevant fees payable using the number of months for which the licence is granted. (i.e., if a licence is granted for a period of less than one month, then, for the purpose of these calculations only, the licence shall be considered as a licence granted for a period of one month).

GIVEN under the Official Seal of the Commission for Communications Regulation,

day of 2023

On behalf of the Commission of Communications Regulation

The Minister for the Environment, Climate and Communications (as adapted by the Communications, Climate Action and Environment (Alteration of Name of Department and Title of Minister) Order 2020 (S.I. No. 373 of 2020)), in accordance with section 37 of the Communications Regulation Act, 2002, consents to the making of the foregoing Regulations.

GIVEN under the Official Seal of the Minister for the Environment, Climate and Communications

day of 2023

Minister for the Environment, Climate and Communications.

EXPLANATORY NOTE

(This note is not part of the Instrument and does not purport to be a legal interpretation.)

These Regulations provide for the issue of licences for apparatus for Wireless Telegraphy for the provision of a Fixed Radio Link for the regulation of such apparatus, and for the payment of fees by persons granted licences for that apparatus.

Annex 5: Frequency Bands and technical conditions

Fixed Radio Link Frequency Bands

A 5.1 Table 10 provides information about the frequency bands for Fixed Radio Links including the channel spacings.

Band	Frequency	Transmit / Receive Spacing (Duplex Direction)	Band Plan	Chanel Spacing
1.3 GHz	1370-1375 MHz and 1512-1517 MHz	142 MHz	CEPT Recommendation T/R 13-01 E, Annex A	0.25 MHz 0.5 MHz 1 MHz
1.4 GHz	1375-1385MHz and 1427-1437 MHz	52 MHz	CEPT Recommendation T/R 13-01 E, Annex B	0.25 MHz 0.5 MHz 1 MHz
2 GHz	2025 - 2110 MHz and 2200 – 2290 MHz	175 MHz	CEPT Recommendation T/R 13-01 E, Annex C	3.5 MHz 7 MHz 14 MHz
L6 GHz	5.925 - 6.425 GHz	252.04 MHz	CEPT/ERC/REC 14-01, Annex 1	29.65 MHz 59.3 MHz
U6 GHz	6.425 - 7.125 GHz	340 MHz	CEPT/ERC/REC 14-02, Annex 1	20 MHz 40 MHz 80 MHz
L7 GHz	7.125 – 7.425 GHz	154 MHz	CEPT/ECC/REC 02-06 Annex 1	14 MHz 28 MHz 56 MHz

Band	Frequency	Transmit / Receive Spacing (Duplex Direction)	Band Plan	Chanel Spacing
U7 GHz	7.425 – 7.725 GHz	154 MHz	CEPT/ECC/REC 02-06 Annex 1	7 MHz 14 MHz 28 MHz 56 MHz
L8 GHz	7.725 – 8.275 GHz	311.32 MHz	ITU-R F. 386-9, Annex 6	29.65 MHz 59.3 MHz
U8 GHz	8.275 – 8.5 GHz	126 MHz for 3.5 MHz, 7 MHz, 14 MHz & 56 MHz channel spacing and 119 MHz for 28 MHz channel spacing	ITU-R F. 386-9, Annex 2	3.5 MHz 7 MHz 14 MHz 28 MHz 56 MHz
11 GHz	10.7 - 11.7 GHz	490 MHz	CEPT/ERC/REC 12-06 Annex 1	40 MHz 80 MHz
13 GHz	12.75 - 13.25 GHz	266 MHz	CEPT/ERC/REC 12-02 E	3.5 MHz 7 MHz 14 MHz 28 MHz 56 MHz
15 GHz	14.5 - 15.35 GHz	420 MHz	ITU-R F. 636-5	3.5 MHz 7 MHz 14 MHz

Band	Frequency	Transmit / Receive Spacing (Duplex Direction)	Band Plan	Chanel Spacing
				28 MHz 56 MHz 112 MHz
18 GHz	17.7 - 19.7 GHz	1010 MHz	CEPT/ERC/REC 12-03, Annex 1	27.5 MHz 55 MHz 110 MHz 220 MHz
23 GHz	22.0 - 22.6 GHz and 23.0 – 23.6 GHz	1008 MHz	CEPT Recommendation T/R 13-02 Annex 1	3.5 MHz 7 MHz 14 MHz 28 MHz 56 MHz 112 MHz 224 MHz
26 GHz	Part of 24.5 - 26.5 GHz band namely: 25.277 – 25.445 GHz and 26.285 – 26.453 GHz	1008 MHz	CEPT Recommendation T/R 13-02 Annex 2	3.5 MHz 7 MHz 14 MHz 28 MHz
28 GHz	Part of 27.5 - 29.5 GHz band namely:	1008 MHz	CEPT Recommendation T/R 13-02 Annex 3 & 5	3.5 MHz 7 MHz 14 MHz 28 MHz 56 MHz

Band	Frequency	Transmit / Receive Spacing (Duplex Direction)	Band Plan	Chanel Spacing
	27.9405 - 28.4445 GHz paired with 28.9485 - 29.4525 GHz			112 MHz 224 MHz
38 GHz	37 - 39.5 GHz	1260 MHz	CEPT Recommendation T/R 12-01, Annex 1	3.5 MHz 7 MHz 14 MHz 28 MHz 56 MHz 112 MHz 224 MHz
42 GHz	40.5 - 43.5 GHz	1500 MHz	CEPT Recommendation (01)04 Annex 5	7 MHz 14 MHz 28 MHz 56 MHz 112 MHz
70 / 80 GHz	71-76 GHz / 81-86 GHz	10 GHz, < 5 GHz.	CEPT ECC/REC/(05)07 Annex 4	250 MHz – 2.25 GHz

Table 8: Fixed Radio Link Frequency bands

Technical Conditions for Deploying Fixed Radio Links

A 5.2 Table 11 provides information about the minimum requirements for deploying Fixed Links.

Band	Maximum Transmit Power	Minimum path length per link (km)	Minimum Transmission Capacity	Minimum Antenna Requirement	Mandatory Equipment Class	Notes
1.3 GHz	Minimum required to obtain required availability level	N/A	-	Class 2 EN 302 217-4	Classes 1, 2, 3 EN 302 217-2	Open The use of ATPC is permissible
1.4 GHz	Minimum required to obtain required availability level	N/A	-	Class 2 EN 302 217-4	Classes 1, 2, 3 EN 302 217-2	Open The use of ATPC is permissible
2 GHz	Minimum required to obtain required availability level	25 Km	4 Mbit/s	Class 3 EN 302 217-4	Classes 2, 3 EN 302 217-2	Open The use of ATPC is permissible
L6 GHz	Minimum required to obtain required availability level	25 Km	140 Mbit/s	Class 3 EN 302 217-4	Class 3 EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
U6 GHz	Minimum required to obtain required availability level	25 Km	140 Mbit/s	Class 3 EN 302 217-4	Class 3 EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible

Band	Maximum Transmit Power	Minimum path length per link (km)	Minimum Transmission Capacity	Minimum Antenna Requirement	Mandatory Equipment Class	Notes
L7 GHz	Minimum required to obtain required availability level	25 Km	4 Mbit/s 28 MHz - 140 Mbit/s	Class 3 EN 302 217-4	Class 3 EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible Note: Part of the L7 band (7.125 - 7.425 GHz) may be allocated towards unidirectional links such as ENG/OB
U7 GHz	Minimum required to obtain required availability level	25 Km	140 Mbit/s	Class 3 EN 302 217-4	Class 3 EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
L8 GHz	Minimum required to obtain required availability level	25 Km	140 Mbit/s	Class 3 EN 302 217-4	Class 3 EN 302 217-2	Open The use of ATPC is permissible

Band	Maximum Transmit Power	Minimum path length per link (km)	Minimum Transmission Capacity	Minimum Antenna Requirement	Mandatory Equipment Class	Notes
						The use of MBA is permissible
U8 GHz	Minimum required to obtain required availability level	25 Km	4 Mbit/s	Class 3 EN 302 217-4	Classes 1, 2, 3 applicable EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
11 GHz	Minimum required to obtain required availability level	10 Km	140 Mbit/s	Class 3 EN 302 217-4	Class 3 EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
13 GHz	Minimum required to obtain required availability level	9 Km	4 Mbit/s 56 MHz - 310 Mbit/s (2 x STM-1)	Class 3 EN 302 217-4	Classes 1, 2 applicable EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible

Band	Maximum Transmit Power	Minimum path length per link (km)	Minimum Transmission Capacity	Minimum Antenna Requirement	Mandatory Equipment Class	Notes
15 GHz	Minimum required to obtain required availability level	9 Km	4 Mbit/s 56 MHz - 310 Mbit/s (2 X STM-1) 112 MHz - 620 Mbit/s (4 X STM-1)	Class 3 EN 302 217-4	Classes 1, 2 applicable EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
18 GHz	Minimum required to obtain required availability level	6 Km (≤34Mbit/s) 0 Km (> 34Mbit/s)	34 Mbit/s 55 MHz - 310 Mbit/s (2 X STM-1) 110 MHz / 220 MHz - 620 Mbit/s (4 X STM-1)	Class 3 EN 302 217-4	PDH: Classes 1 & 2 applicable EN 302 217-2 SDH Classes 4,5 Applicable EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
23 GHz	Minimum required to obtain required availability level	3 Km (≤34Mbit/s) 0 Km (> 34Mbit/s or 34Mbit/s in 14MHz channel spacing)	4 Mbit/s 56 MHz - 310 Mbit/s (2 X STM-1) 112 MHz / 224 MHz - 620 Mbit/s (4 X STM-1)	Class 3 EN 302 217-4	PDH: Class 2 applicable EN 302 217-2 Class3 applicable to SDH. EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
26 GHz	Minimum required to obtain required availability level	3 Km (≤34Mbit/s) 0 Km (> 34Mbit/s or 34Mbit/s in 14MHz channel spacing)	4 Mbit/s	For Point to Point antennas: Class 3 EN 302 217-4 Note for Point to	Class2 applicable to PDH. EN 302 217-2	Open The use of ATPC is permissible

Band	Maximum Transmit Power	Minimum path length per link (km)	Minimum Transmission Capacity	Minimum Antenna Requirement	Mandatory Equipment Class	Notes
				Multipoint antennas: EN 302 326-3	Class3 applicable to SDH. EN 302 217-2 Class B equipment applicable (PDH and SDH) EN 302 326-1	The use of MBA is permissible
28 GHz	Minimum required to obtain required availability level	3 Km (≤34Mbit/s) 0 Km (>34Mbit/s or 34Mbit/s in 14 MHz channel spacing)	4 Mbit/s 56 MHz - 310 Mbit/s (2 X STM-1) 112 MHz / 224 MHz - 620 Mbit/s (4 X STM-1)	Class 3 EN 302 217-4	Class 2 applicable to PDH. EN 302 217-2 Class 3 applicable to SDH. EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
38 GHz	Minimum required to obtain required availability level	0 Km	4 Mbit/s 56 MHz - 310 Mbit/s (2 X STM-1) 112 MHz / 224 MHz - 620 Mbit/s (4 X STM-1)	Class 3 EN 302 217-4	Class 2 applicable to PDH. Class 3 applicable to SDH. EN 302 217-2	Open The use of ATPC is permissible The use of MBA is permissible
42 GHz	Minimum required to obtain required availability level	0 Km	4 Mbit/s 56 MHz - 310 Mbit/s (2 X STM-1)	Class 3 EN 302 217-4	Class 2 applicable to PDH. Class 3 applicable to SDH.	Open The use of ATPC is permissible

Band	Maximum Transmit Power	Minimum path length per link (km)	Minimum Transmission Capacity	Minimum Antenna Requirement	Mandatory Equipment Class	Notes
			112 MHz - 620 Mbit/s (4 X STM-1)		EN 302 217-2	The use of MBA is permissible
70 / 80 GHz	Minimum required to obtain required availability level	0 Km	150 Mbit/s (STM-1)	Class 3 EN 302 217-4	EN 302 217-3	Open These bands are open for both FDD and TDD systems The use of ATPC is permissible The use of MBA is permissible

Table 9: Technical Conditions for Deploying Fixed Links

Hi/lo search radius for given frequency band

A 5.3Table 12 provides information about the high/low search radius for Fixed Links.

Frequency Band (GHz)	Hi/Lo search radius (metres)
1.3	500
1.4	500
2	500
L6	500
U6	500
L7	500

U7	500
L8	500
U8	500
11	500
13	500
15	400
18	300
23	100
26	100
28	100
38	100
42	100

Table 10: Hi/lo search radius for given frequency band

Congestion Bands and Zone

A 5.4Table 13 provides information about the congestion zone and congestion bands for Fixed Links.

Band	Frequency	Congested Area[217]
13 GHz	12.75 - 13.25 GHz	falls within the range E310000 to E320000 and N220000 to N240000
15 GHz	14.5 - 15.35 GHz	falls within the range E310000 to E320000 and N220000 to N240000
18 GHz	17.7 - 19.7 GHz	falls within the range E310000 to E320000 and N220000 to N240000

[217] If either ends of a 13 GHz, 15 GHz, 18 GHz or 23 GHz link falls within the range E310000 to E320000 and N220000 to N240000, then a congestion charge applies.

23 GHz	22.0 - 22.6 GHz and 23.0 – 23.6 GHz	falls within the range E310000 to E320000 and N220000 to N240000

Table 11: Congestion Bands and Zone