Commission for
Communications Regulation

Response to Consultation

Review of the Period 2008 – 2010 & Proposed Strategy for Managing the Radio Spectrum: 2011 – 2013.

Document No:	**11/88**
Date:	**22 November 2011**

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1 Introduction

In April 2011 ComReg published a consultation on its proposed strategy for managing the use of the radio spectrum in Ireland over the period from 2011 – 2013 (Consultation 11/28)[1]. Consultation 11/28 reviewed the previous strategy period (2008 – 2010) and identified ComReg's proposed plan for delivery of key priorities over the next two years.

This Response to Consultation only addresses issues raised in responses received to Consultation 11/28 and does not restate ComReg's proposed approach, policy or position where there has been general agreement expressed with ComReg's proposal and where, as a result, this approach, policy or position is unchanged from that proposed in Consultation 11/28.

In doing so this document summarises the responses received from interested parties and outlines ComReg's position and the actions that ComReg intends to take in response to the points raised by interested parties.

1.1 Recent Developments

Since the publication of Consultation 11/28 in April 2011 there have been a number of recent developments that ComReg has taken into account in finalising its strategy statement. These include:

- the finalisation of the revision of the Common European Framework and the transposition of this framework into Irish legislation;
- the release of a number of spectrum bands across Europe, mostly through some form of auction process; and
- technology developments as evidenced by announcements made by manufacturers and the publication of new standards.

1.2 List of Respondents

18 interested parties provided a response to Consultation 11/28 by the 24 May deadline, being:

- Aviat Networks
- BT Communications Ireland Ltd
- Digital Europe
- Digiweb
- Ericsson
- ESB Networks
- Hutchison 3G Ireland Ltd
- IDA

[1] ComReg consultation document 11/28 – Review of the period 2008 – 2010 & proposed strategy for managing the radio spectrum: 2011 - 2013 – published 12 April 2011.

- Irish Radio Transmitters Society (IRTS)
- LoJack Equipment Ireland Ltd
- Eircom/Meteor Group
- Qualcomm Europe Inc
- RTÉ and RTÉNL
- Silver Spring Networks
- Telefónica Ireland Ltd
- Telecommunications and Internet Federation (TIF)
- UMTS Forum
- Vodafone Ltd

Non-confidential versions of all responses received by the 24 May deadline were published by ComReg in Document 11/28s[2] and ComReg is grateful to all respondents for their input.

Additionally, on **7 October** ComReg received a further response from Hutchison 3G Ireland Ltd, over four months after the period for consultation closed. ComReg has published this response in ComReg Document 11/87.

1.3 Next Steps

Having taken into account all responses and material received in response to this consultation, ComReg has now finalised its strategy for managing the use of the radio spectrum in Ireland over the period from 2011 – 2013 and published same in ComReg Document 11/89[3].

[2] ComReg Document 11/28s – Submissions received to Consultation 11/28 – 9 September 2011.

[3] ComReg document 11/89 – Spectrum management Strategy Statement: 2011 - 2013 – 22 November 2011.

2 Issues Raised Concerning Spectrum Management in Ireland

Section 3 of Consultation 11/28 introduced ComReg's role and function in managing the radio spectrum resource in Ireland. Responses were received in relation to:

- compliance and enforcement;
- the value of the multiplier used in determining the contribution of radio spectrum to Ireland's economy;
- Ireland's Test and Trial regime;
- spectrum opportunities; and
- expiring licences.

These responses are addressed in turn below.

2.1 Compliance and Enforcement [4]

In section 3.1.1 of Consultation 11/28 ComReg noted, in terms of compliance and enforcement, that it is obliged:

- under the Communications Regulation Act 2002-2010 Act ("the 2002 Act") to ensure the efficient management and use of the radio spectrum in Ireland; and
- to ensure that all radio equipment placed on the market is in compliance with the radio equipment and telecommunications terminal equipment (R&TTE)[5] and electromagnetic compatibility (EMC)[6] Directives.

2.1.1 *Views of Respondents*

Only one respondent (IRTS) commented on this section, expressing concern over power-line-transmission (PLT) and power-line adaptors (PLAs) causing interference to amateur services. The respondent referenced various studies which conclude that:

- users of sensitive radio systems may increasingly suffer interference from PLT devices;
- the notching of amateur bands and the introduction of interference mitigation measures such as power control and smart notching would be required to prevent interference; and
- it is considered that the Ethernet PLAs do not meet the Essential Requirements of the EMC Directive.

[4] See section 3.1.1 of Consultation 11/28

[5] The R&TTE Directive refers to Article 3(2) of Directive 1999/5/EC of The European Parliament and of The Council of 9 March 1999 On Radio Equipment And Telecommunications Terminal Equipment and the Mutual Recognition of Their Conformity O.J. 7.4.99 L 91/10.

[6] The EMC Directive refers to Council Directive 2004/108/EC of 15 December 2004 on the approximation of the laws of Member States relating to electromagnetic compatibility O.J. L 390/24.

This respondent claimed that PLAs are freely available in discount stores and through internet providers and requested that ComReg be pro-active in relation to market surveillance, in particular, to licence exempt devices, noting that some of these devices *"have the potential to cause significant harmful interference to HF and VHF frequencies"*.

This respondent asserted that there is also a need for more stringent restrictions on these devices in several areas noting that these are or should be dealt with by the appropriate standardisation bodies.

2.1.2 *ComReg's position*

Taking account of the submission on PLT devices, ComReg notes that it is the responsibility of each manufacturer of such equipment to ensure that the device they intend to bring to market complies with the essential requirements of the EMC Directive. Appropriate action will be taken by ComReg should any non-compliant device come to its attention.

ComReg is committed to ensuring that only lawful use is made of radio spectrum and will continue its enforcement programme, including market surveillance on devices that need to meet specific legislative requirements[7], throughout the life of this strategy statement.

2.2 The Value of the Multiplier used in Determining the Contribution of Radio Spectrum to Ireland's Economy

In section 3.2 of Consultation 11/28 ComReg noted that a key consideration in developing a strategy for radio spectrum management is the extent to which use of the radio spectrum contributes to the Irish economy and national competitiveness. Analysis carried out by ComReg, based on publicly available annual reports, concluded that the total contribution to Irish GDP arising from the use of radio spectrum in 2009 was almost €3.6 billion, or approximately 2.2 % of that year's total GDP. The wider impacts on the economy as a whole were estimated using a general economic multiplier of 1.1 to arrive at the final figures[8].

2.2.1 *Views of Respondents*

One respondent to this section (Vodafone), considered the assessment of the economic impact of spectrum usage to be a useful indication of the socioeconomic benefits arising from the use of the national spectrum resource. This respondent noted that the multiplier of 1.1 used to account for indirect impacts might be too conservative, adding that multipliers of around 1.4 to 1.5 have been used in other unspecified studies of this nature.

[7] In relation to new standards, ComReg notes that it has no role in the work of CENELEC the standards body mentioned by this respondent.

[8] This estimation does not include satellite operations due to the unavailability of financial information relating to the Irish economy from these firms

2.2.2 *ComReg's Position*

ComReg notes the point made that the multiplier used may be too conservative but unfortunately the respondent did not reference the other studies in which different multipliers have been used.

Noting that the multiplier used is that generated in an Irish context[9], which, being a small, open economy may be subject to a greater amount of leakage, ComReg has maintained the multiplier at 1.1. ComReg is satisfied that a conservative measurement is more appropriate than overestimating the contribution of radio spectrum. It is open to any party to employ a multiplier of its own choosing if conducting any further analysis.

ComReg has identified a calculation error in the figures published on contribution to GDP for the years 2005 and 2006. ComReg has published the corrected figures in the final strategy statement.

2.3 Spectrum used for Test and Trial Ireland

ComReg actively promotes and supports the use of radio spectrum for the provision of wireless and, in particular, the testing and/or trialling of wireless devices and services. ComReg noted in Consultation 11/28 that it is aware that alternative approaches, such as dedicating a particular portion of frequency band for test and trial purposes, could result in a less efficient use of spectrum if such reservations were not to be utilised and therefore hindered or prevented the provision of other services from using that frequency band.

Those who responded on this section strongly supported the current Test and Trial Ireland approach and recognised the benefits the scheme provides to encourage innovation in wireless technologies. In addition, most respondents also shared ComReg's view that spectrum should not be reserved solely for test and trial purposes.

Therefore, during this strategy period, to ensure the efficient ongoing use of spectrum as well as ensuring that there is no hindrance or prevention of other services gaining access to spectrum, ComReg will not seek to set aside specific dedicated spectrum for test and trial use.

2.4 Spectrum Opportunities

In Table 3 of Consultation 11/28 (section 3.4) ComReg detailed a number of frequency bands that have been identified by it for possible release during the period

[9] In economic theory, multipliers are premised on the notion that an initial spending rise can lead to even greater increase in national income as a result of indirect effects associated with the expenditure. In other words, an initial change in aggregate demand can cause a further change in aggregate output for the economy. The general economic multiplier used in this statement is reported in "The Macro-economy of Ireland," by Leddin and Walsh.

covered by this strategy period. Views were received on five of these bands as detailed below.

2.4.1 *The 800 MHz digital dividend, 880-892.8/925-937.8 MHz and 1710–1785/1805 – 1880 MHz bands*

All respondents supported the timely availability of the 800 MHz, 900 MHz and 1800 MHz bands. Some respondents expressed that the majority of broadband and machine-to-machine (M2M) connections will be carried over mobile networks. Almost all respondents acknowledged that the release of this spectrum is significant for providing cost effective broadband services.

One respondent (TIF) representing the views of a number of its members stated that the minimum reserve prices currently proposed by ComReg in its consultation regarding the 800 MHz, 900 MHz and 1800 MHz bands are too high and fail to take account of, amongst other things, investment, macroeconomic circumstances and social policy objectives. As a result, this respondent claimed that the proposed multi-band auction would fail to deliver the desired benefits for Ireland.

ComReg supports the views expressed on making these three bands available as soon as possible.

As noted in section 6.1.1 of Consultation 11/28, ComReg has devoted considerable resources to its multi-band award proposals and, in addition, ComReg has only recently published a response to consultation and draft decision on this matter together with three supporting reports from external consultants.[10] Noting that the issue of minimum prices has been comprehensively addressed in those documents, ComReg will not rehearse any of the issues raised in the context of this consultation and instead refers all interested parties to that ongoing consultation work.

For the avoidance of doubt, the release of the 800 MHz, 900 MHz and 1800 MHz bands is ComReg's highest spectrum management priority and, as such, this may impact on the timing of other potential spectrum releases, some of which are mentioned as possibilities below.

2.4.2 *The 1452 – 1492 MHz band (L-Band)*

Most respondents to this section supported harmonisation of the L-Band across Europe and elsewhere to provide economies of scale, enable roaming and mitigate cross-border issues in line with the Maastricht agreement.

In support of this position respondents noted that:

- CEPT has agreed to initiate a review of this band and created Project Team FM50 to study the band's future use;

[10] See ComReg document 11/60 and 11/60a together with supporting documents 11/57, 11/58 and 11/59.

- the L-Band offers the combination of significant capacity (40 MHz) and adequate propagation properties to access and support enhanced mobile broadcasting, unicasting and other multimedia applications; and
- a portion of the L-Band could be used to provide communications for future electricity networks.

Another respondent argued against releasing this band on the basis that:

- no current significant demand exists for the use of this band in Ireland for the provision of mobile multimedia services; and
- there would be no requirement for allocation of spectrum in this band within the time period of this strategy.

One respondent requested that any decision on the future use of the L-Band should be consulted on separately by ComReg.

ComReg has noted the advantages claimed by respondents as well as the growing interest expressed in the use of this currently vacant spectrum band by respondents to this consultation and industry groups involved in CEPT project team FM50.

The prospect of new European harmonisation of the L-Band, permitting a range of services, not limited to just mobile multimedia services, through technology-neutral and service-neutral release of the band, is particularly attractive. ComReg also recognises the advantages offered by a harmonised band and the attraction in bringing about such a measure in advance of any spectrum release. The use of a number of spectrum bands (e.g. WDMDS (400 MHz and 900 MHz bands) and the All-Island spectrum award (1785-1805 MHz)) have been hampered by the lack of harmonisation of the spectrum bands and by the unavailability of equipment for use in these bands. Indeed, this very point came to the fore when ComReg considered the release of the 2.3 GHz band, the efficient use of which may well require cross European harmonisation.

ComReg will remain open to releasing the L-Band, possibly starting the process within the lifetime of this strategy period if adequate European harmonisation measures are put into place. In accordance with ComReg's usual policy and procedures, any such release will be consulted upon before a decision on the future use and release of this band is taken.

2.4.3 *The 2010 – 2025 MHz band*

The two responses received on this band expressed support for its release. One respondent suggested that the upcoming TDD LTE technology standard should considerably increase the appeal of the 2010 – 2025 MHz band to market players. The respondent also suggested that the release of this spectrum should be considered alongside the introduction of a spectrum cap, although no support for such a proposal was provided. Another respondent recommended that the band should be made available on a technology-neutral basis, providing sufficient demand exists.
Noting that there is some growing interest in this harmonised band and, importantly, technology is being developed with this band in mind, ComReg is minded to release this band, either on its own or in conjunction with other capacity bands (e.g. 2.3

GHz) at an appropriate time, perhaps in the lifetime of this strategy statement, noting the constraints on the timing of the availability of different bands and the different stages and level of harmonisation across such bands.

2.4.4 *The 2300 – 2400 MHz (2.3 GHz) band*

There was considerable support expressed for the release of this band as soon as possible. Respondents noted the following:

- for efficient usage of UMTS/IMT applications, a band plan based on a spectrum arrangement with a channel granularity of 5 MHz would be optimal as users could aggregate channels to suit their specific needs, noting that the LTE specification provides for several different channel bandwidths; and
- mobile broadband terminal devices currently operating in the 2.3 – 2.4 GHz band may also be able to support some of the traditional FDD bands (such as the 800 MHz, 900 MHz, 1800 MHz, 2100 MHz and/or 2.6 GHz bands).

One respondent (IRTS) expressed concern that changes to primary allocations in this band might make the band unusable for secondary services, where deployment is often restricted in either location or time or both.

ComReg refers interested parties to its initial consultation, the responses received and ComReg's response to consultation response already concluded on the use of the 2.3 GHz band[11] (see section 6.4 of Consultation 11/28). In that consultation and response to consultation, ComReg determined that 5 MHz bandwidth blocks were appropriate and that channel aggregation would be possible, within a spectrum cap limitation. It is now apparent that the issue of using either TDD or FDD technologies, or some combination (if possible) needs to be further addressed to maximise the use of the band. This issue will be addressed in any subsequent consultation on the 2.3 GHz band.

Concerning the use of the band by secondary services, ComReg acknowledges that a secondary service may be displaced by changes in the primary allocation and/or that secondary services may be unable to use the band due to the intensity of use by the primary service. In determining whether this is an acceptable consequence, ComReg will have regard to its statutory function, objectives and duties when making any decision, following its normal consultation procedures.

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[11] ComReg 09/49 – Release of Spectrum in the 2300 – 2400 MHz Band Proposed Options & Licence Conditions. – 15 June 2009

ComReg 09/76s – Release of Spectrum in the 2300 – 2400 MHz Band Submissions received from respondents – 6 October 2009

ComReg 09/76 – Release of Spectrum in the 2300 – 2400 MHz Band Proposed Options & Licence Conditions – 6 October 2009

ComReg 10/30 - Notes from 2.3 GHz Briefing held on 1 March 2010 – 15 April 2010

ETSI Document TR 102 837 - Electromagnetic compatibility and Radio spectrum Matters (ERM); System Reference Document; Broadband Wireless Systems in the 2 300 MHz to 2400 MHz Range – 16 August 2010

2.4.5 *The 2500 – 2690 MHz (2.6 GHz) band*

Almost all respondents to this section requested that ComReg issue detailed proposals for the release of spectrum rights in the 2.6 GHz band as soon as possible. Various respondents sought to link the release of 2.6 GHz spectrum rights with the release of the 800 MHz, 900 MHz and 1800 MHz bands and others presented their views on the future use of the band. Both of these points are addressed below.

Linking the release of the 2.6 GHz band with ComReg's multi-band spectrum award proposals

Views expressed in this context include that:

- any information in relation to the intended approach for future use of the 2.6 GHz band should be provided in advance to any award of spectrum rights in the 800 MHz, 900 MHz and 1800 MHz bands; and
- parties interested in ComReg's proposed award process for spectrum rights in the 800, 900 and 1800 MHz bands would require a "holistic view" of the timing of availability and of the rights attached to such spectrum in order to participate effectively and that a decision in relation to the 2.6 GHz band might have a material impact on participants' strategy with regard to this award process.

ComReg has addressed these concerns in paragraphs A3.40 to A3.51 of Consultation Document 11/60a as part of the multi-band spectrum award process consultation and does not, therefore, intend to rehearse this issue again in this paper and instead refers all interested parties to that ongoing consultation work.

Future use and assignment of the 2.6 GHz band

A number of views were expressed on the future use and assignment of the 2.6 GHz band as follows:

- current licences in the 2.6 GHz band should not be renewed and the band should be released for other uses as soon as possible. The reasons given in support of this argument included:
  - a number of existing licences in the band have expiry dates in 2012. These expiry dates were set as a result of past non-compliance by the relevant licensee. In the absence of a final decision it is possible that the current licensee could seek to have the licences rolled over on an interim basis, as has happened in respect of two 900 MHz licences. This would call into question the effectiveness of ComReg's enforcement measures; and
  - in the absence of evidence to the contrary, it is highly questionable whether Ireland is compliant with the in- and out-of-block power levels contained in the annex to Decision 2008/477/EC;
- the timely clearance and release of this band would ensure that Ireland reaps the benefits of more efficient use of this band, adding that in the year since ComReg's call for input, the number of subscribers using MMDS has seen further continued decline;

ComReg has recently published a consultation[12] in relation to the expiry in April 2012 of some of the existing MMDS licences and on the potential sharing of the 2.6 GHz band.

Following the closing date of that consultation, ComReg will carefully consider all responses received, including those wide ranging views received to its call for input[13] in 2010, before issuing a further consultation on the future use of the band.

2.5 Expiring Licences

Section 3.5 of Consultation 11/28 provided a summary list of long term licences that are due to expire within the next decade and the associated spectrum ranges that will become available as a result.

ComReg received one response to this section (Eircom/Meteor), in relation to the expiry of 400 MHz and 900 MHz wide band digital mobile data services (WDMDS) licences, stating that ComReg has not identified a work plan in respect of this licensed spectrum over the lifetime of this strategy. This respondent requested ComReg to carry out a review of the future licensing of 400 MHz and 900 MHz WDMDS during this strategy period.

ComReg agrees that a review of the future use and/or licensing of these two bands would be appropriate well in advance of expiry of existing licences and has added this item to its work programme for attention towards the end of this strategy period.

[12] ComReg 11/80 – Consultation –Future of the 2.6 GHz radio spectrum band – 2nd November 2011

Also see ComReg 11/80a – Consultant's Report – Future use of 2.6 GHz radio spectrum band – 2nd November 2011

[13] ComReg 10/38 – Information Notice - Call for input on potential uses and licensing options of the 2.6 GHz spectrum band -14th May 2010

Also see ComReg 10/58s – Information Notice - Call for input on potential uses and licensing options of the 2.6 GHz spectrum band -27th July 2010

3 Current Spectrum Management Issues

3.1 Revised Regulatory Framework - Implications for Spectrum Management

In section 4.1 of Consultation 11/28, ComReg identified two notable developments that would have significant implications for spectrum management. These were:

- revisions to the Common Regulatory Framework for Electronic Communications Networks and Services ("Common Regulatory Framework") being transposed into national legislation in July 2011[14]; and
- the first multi-annual Radio Spectrum Policy Programme (RSPP)[15] proposal being submitted by the European Commission (EC) to the European Parliament and Council in September 2010.

The RSPP proposal is part of a package of EU measures regarding broadband communications and outlines, at a strategic level, how the use of spectrum can contribute to the most important political objectives of the EU from 2011 to 2015. Various objectives are set out in the proposal and, in particular, the RSPP seeks to ensure that sufficient spectrum is made available by 2013 for wireless broadband. The RSPP proposal is still under consideration by the European Parliament and Council and, depending on its final agreed wording, may require an adjustment of ComReg's work programme over the strategy period.

3.2 The use of auctions for granting of spectrum rights of use

In the last five years ComReg has developed the use of auctions, where appropriate, to assign spectrum rights. A number of examples were detailed in Consultation 11/28.

In the context of granting spectrum rights for electronic communications services (ECS) and networks (ECN), usually in the form of a limited number of licences granted under the Wireless Telegraphy Act, ComReg is obliged to, amongst other things:

- use selection criteria which are objective, transparent, non-discriminatory and proportionate and which give due weight to the achievement of the objectives set out in section 12 of the 2002 Act; and
- establish open, transparent and non-discriminatory procedures for the grant of licences and cause any such procedures to be made publicly available.

[14] The European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No. 333 of 2011) and the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (S.I. No. 335 of 2011) respectively which revoke and replace S.I.307 of 2003 and S.I. 306 of 2003 respectively. Impacts on spectrum management arising from the Common Regulatory Framework include: limits on the restrictions that can be placed on the rights of use of Electronic Communications Services (ECS), with the aim of moving to a more technology- and service-neutral licensing environment; and allowing for the transfer or lease of individual usage rights for radio frequencies between undertakings.

[15] See http://ec.europa.eu/information_society/policy/ecomm/radio_spectrum/eu_policy/rspp/index_en .htm

These obligations do not, of themselves, indicate a preference for any particular assignment mechanism (e.g. administrative assignment, comparative selection procedure, auction or other form). Accordingly, ComReg is obliged to choose the most appropriate assignment mechanism having regard to the particular circumstances of each award and which, in ComReg's opinion, would best achieve its statutory objectives.

That said, ComReg made the following observations in Consultation 11/28 regarding its preferred use of auction mechanisms for the grant of spectrum rights for ECN/ECS:

- auctions have proven in Ireland and abroad to be a fast, fair, effective and transparent assignment mechanism. One reason which may explain this is that they avoid any perceived subjective element that might be associated with comparative selection procedures, and avoid issues related to administrative assignments, especially where the spectrum manager does not have access to complete information;
- auctions also allow firms which most value the spectrum rights to obtain access to same. By doing so, auctions promote innovation and investment in new infrastructures and contribute to the efficient use of the spectrum rights assigned by providing real economic incentives for winners to make use of the spectrum rights obtained. This also ensures that consumers and citizens derive the maximum benefit in terms of the provision of end-services using that spectrum; and
- auctions also promote, amongst other things, regulatory certainty, competition (both for spectrum rights and in downstream markets), and the internal market by ensuring there is no favourable treatment of particular undertakings thereby providing fair opportunities for new entry from within the State and throughout the EU.

3.2.1 *Views of Respondents*

There was general support expressed by respondents on the increased use of market-based tools such as auctions to assign spectrum rights, but only in cases where this is appropriate. The following views were expressed:

- the decision on how to assign spectrum should be made on a case-by-case basis as acknowledged by ComReg, subject only to the selection criteria being objective, transparent, non-discriminatory, proportionate, and consistent with statutory objectives; and
- where rights to use spectrum are to be renewed, or where there are considerations relating to continuity of service or consumer disruption, auctions might not be flexible enough to take all necessary considerations into account;
- an auction would be the most efficient means for spectrum assignment in the case of "virgin" spectrum which is unencumbered;
- on the basis of concerns that an incumbent operator could entrench its existing dominance and damage the competitive environment, auction rules should ensure that the key valuable spectrum is not offered to a single

provider, but is split into packages with an overall competition spectrum cap allowing multiple parties to enter the market;
- an undertaking's position in capital markets may unfairly determine its chances in a spectrum rights auction and allow incumbent operators to consolidate their positions and/or prevent new entrants from entering the market with each re-release.

3.2.2 *ComReg's Position*

Having taken due account of responses received, ComReg maintains its view that each spectrum release must be judged on a case-by-case basis and that in all cases the selection criteria must be objective, transparent, non-discriminatory, proportionate, and consistent with statutory objectives.

ComReg notes the concern expressed that auctions may not be sufficiently flexible to take all necessary considerations into account where there are issues relating to continuity of supply or disruption to consumer services (through potential loss of access to spectrum rights). ComReg believes, however, that these concerns can be properly addressed using suitably designed auction mechanisms.[16] For instance, an auction with open rounds which would allow participants to better assess their valuations on business continuity and to update such valuations in light of information generated in an auction. Such a mechanism may also provide benefits to all participants where there may be significant common value uncertainty regarding the appropriate pricing of particular spectrum rights.

ComReg also notes the view that auctions would be the most efficient means to assign spectrum rights in "virgin" or "greenfield" scenarios. ComReg generally agrees with this view but also maintains that a suitably designed auction is equally appropriate in a so called "brownfield" setting, as the auction design can address matters germane to the particular circumstances.

In relation to the concerns expressed about auctions of spectrum rights potentially resulting in anti-competitive spectrum holdings, ComReg notes that one of its key objectives in relation to its spectrum management role is to promote competition, both for spectrum rights and, consequently, on related downstream markets. For this reason, ComReg continues to favour the appropriate use of spectrum caps in auctions to ensure that this objective is promoted.

3.3 **Secondary trading / transfer of spectrum rights**

In Consultation 11/28, ComReg noted, amongst other things that:
- although there are a number of recent studies discussing the potential benefits of introducing trading of spectrum rights, the number of spectrum trades, where permitted, had been very few and little evidence was therefore available to support such claims;

[16] It should be noted that this view is in relation to ECN/ECS services and may not apply to non-commercial uses.

- the EC, with a view to ensure harmonisation across the EU and via the recent revisions to the Common Regulatory Framework, is seeking to identify spectrum bands (other than bands used for broadcasting) for which spectrum rights may be transferred or leased between undertakings;
- under the provisions of the Common Regulatory Framework, Member States may decide to extend these rights to other bands not covered by the EC;
- secondary markets could potentially play a role in ensuring the efficient assignment and use of the spectrum in some areas; and
- spectrum trading needs to be underpinned by legislation which takes into account potential concerns including, but not limited to, spectrum hoarding and distortions to competition and, it was expected that such legislation would most likely follow the transposition of the new Framework into Irish law.

3.3.1 *Views of Respondents*

All respondents to this issue supported the introduction of spectrum trading in general. Views put forward by these respondents included that:

1. there were no remaining barriers to the timely introduction of spectrum trading in Ireland and ComReg was requested to clarify what additional legislative changes are needed to introduce spectrum trading;
2. having noted ComReg's intention to consider the potential benefits of spectrum trading for specific licence categories, ComReg has not opened the discussion for public consultation;
3. the draft Radio Spectrum Policy Programme (RSPP) prioritises the implementation of trading rights in harmonised spectrum bands including the 800 MHz, 900 MHz and the 1800 MHz bands with one respondent asserting that ComReg's approach is therefore out of line with EU policy;
4. ComReg should be cautious in drawing conclusions from any of the few existing instances in which spectrum trading has been applied because:
    a. periodic re-releases of spectrum are not necessary to realise the benefits of spectrum trading; and
    b. the nature of market and technological changes in harmonised bands would tend to cause spectrum rights to be traded relatively infrequently;
5. where spectrum hoarding is concerned, a so-called "use it or lose it" provision could be attached to any spectrum rights granted to prevent hoarding in most cases;
6. with regard to the risk of over-concentration of spectrum rights in a few hands, the risk arises primarily in the valuable spectrum below 1 GHz and in this case limits could be built into the trading mechanism to prevent one undertaking from accumulating excessive spectrum rights;
7. with regard to the risk of undertakings "holding out" spectrum rights to increase their market value, ComReg should not overstate this problem as market value could fall as well as rise due to technological or economic changes, and in any case there has been a "general downward trend" in spectrum pricing in bands assigned using market-based mechanisms - for example in harmonised mobile communications bands;

8. spectrum trading should improve overall spectrum efficiency in the bands in which it is applied;
9. one of the key benefits of trading is that in principle the opportunity cost of "holding" spectrum is fully internalised – at least for commercial undertakings and accordingly, undertakings are forced to consider trading spectrum periodically and are encouraged to make the most efficient use of spectrum possible;
10. harmonisation decisions would not be constrained by a spectrum trading regime in which spectrum usage rights would be of indefinite duration, provided such rights were granted with a minimum term upon initial award and a defined minimum notice period of revocation; and
11. the implementation of spectrum trading would not impede or prevent changes in spectrum allocation for the purposes of harmonisation, as such changes occur infrequently and are made known well in advance of their implementation.

3.3.2 *ComReg's position*

ComReg welcomes the views of respondents on this issue and sets out its view on same below.

In relation to bullet points 1 and 2, ComReg accepts that the transposition of the recent amendments to the EU Common Regulatory Framework would provide a legislative basis for the introduction of spectrum trading and leasing. In putting a regime in place in Ireland, ComReg recognises that there are a number of issues which need to be considered, which include:

- a need to provide regulatory certainty in relation to the rights and obligations associated with secondary trading likely to be required by potential traders. For instance, the relevant provision of the Framework Directive requires in this regard, amongst other things, that conditions attached to individual rights of use shall continue to apply after a transfer or lease (unless otherwise specified by the national authority);
- the provision of sufficient safeguards to protect the public interest, such as the need to ensure transparency and regulatory supervision of potential spectrum trades; and
- provision of appropriate protections against, and redress for, spectrum hoarding and other potentially harmful outcomes. In their absence, it is difficult to envisage efficient spectrum use or competition being promoted.

Accordingly, and to give effect to the obligations in respect of spectrum trading arising from the recent revisions to the Common Regulatory Framework, ComReg has initiated a project team tasked with establishing the procedures and measures required to implement spectrum trading in Ireland and ComReg will issue a consultation on such matters in due course.

In relation to bullet point 3, ComReg pointed out in Consultation 11/28 that it has held a number of consultations in which the issue of secondary trading was either directly or indirectly addressed both by ComReg and respondents to those consultations. ComReg does not intend to revisit these individual arguments and

interested parties are therefore referred to the specific consultations. In any event, and speaking generally, ComReg would note that, at the time of publication of this document, the RSPP Decision has not been formally adopted by the Council (the Member States) or the European Parliament. In other words, no conclusions have been drawn on the final text of the RSPP. Nevertheless, ComReg recognises the list of potential frequency bands being proposed for trading in the RSPP and intends to facilitate trading in due course in those bands. In this regard, it should be noted that in Document 11/75[17], ComReg has proposed that any licences subsequently issued under this process would allow the licensee to trade or lease the spectrum rights associated with its liberalised use licence in line with any rules which ComReg may determine in line with the Authorisation and Framework Regulations.

In relation to bullet point 4, ComReg would note that it has not drawn, or sought to draw, conclusions from the limited examples of spectrum trading, adverse or otherwise. Rather, ComReg believes it is acting pragmatically and prudently by, amongst other things, seeking to assess the validity of the various potential benefits claimed in relation to spectrum trading against the evidence available from those jurisdictions where spectrum trading has been implemented. In relation to the first sub-bullet point, ComReg does not consider that indefinite licence durations are required to substantially realise the claimed potential benefits of spectrum trading, notwithstanding the efforts of certain interested parties to continue to conflate these distinct issues. ComReg further considers the issue of licence duration in the following section of this response to consultation.

In relation to bullet points 5, 6 and 7, ComReg would make the following observations:

- whilst the imposition of "use it or lose it" conditions in spectrum rights could have the effect of minimising or avoiding the inefficient use of spectrum once obtained by an undertaking, this regulatory tool can and should be distinguished from other potential measures (such as conducting a competition review in respect of an actual or potential transfer to determine whether competition would be distorted by the transfer or accumulation of rights and/or ex-ante rules to prevent such distortive accumulations of spectrum rights);
- the potential for over-concentration of rights in relation to valuable or critical spectrum (such as below 1 GHz) as identified by a respondent is noted; and
- the view expressed that ComReg should not overstate the "hold out" issue as the market value of spectrum usage rights have been on a general downward trend does not deal with the main concern identified by ComReg. In particular, whatever the level of spectrum rights of use values in a number of years, an incumbent firm in a co-ordinated band has the potential to act as a hold out on the next round of co-ordination and, in that regard, the relative expected payoff at that date between the two courses of action will likely determine its behaviour.

In relation to bullet points 8 and 9, ComReg notes that not all trades that would improve welfare will occur as, in many cases, strategic considerations on the part of the holder of spectrum rights will mean that it would not take up its option to transfer

[17] "Multi-band Spectrum Release, Draft Information Memorandum"

spectrum rights. For instance, in addition to not trading rights to critical spectrum bands (such as those likely to be required for effective entry into a particular market or for the provision of particular services), an undertaking may also not trade spectrum rights not being used intensively at one point in time to allow for increased demands in its own future use. In relation to bullet point 10, ComReg addresses the issue of licence duration in the following section.

In relation to bullet point 11, ComReg considers that trading activity in relation to highly valuable bands that are co-ordinated at an EU level is unlikely to happen very often, the frequency of trading being a decision that rights holders will make.

Finally, and as noted above, ComReg will initiate a consultation with a view to establishing the procedures and measures required to properly implement a spectrum trading regime, and would welcome all interested parties' views on same in due course.

3.4 Licence Duration

In the context of spectrum rights of use for the purposes of ECN/ECS, the Common Regulatory Framework requires that where spectrum rights of use are granted for a limited period of time, the duration is to be appropriate for the service concerned in view of the objective pursued taking due account of the need to allow for an appropriate period for investment amortisation.

ComReg sought views and empirical evidence on these issues and raised in Consultation 11/28 a number of points that would also need to be considered when discussing the notion of indefinite licences:

3.4.1 *Views of Respondents*

Respondents agreed that licence terms are independent of spectrum tradability. However, most respondents disagreed with ComReg's view on licence duration that the periodic re-release of spectrum is an appropriate mechanism to prevent entrenchment and presented views including the following:

1. periodic spectrum re-release creates an environment of uncertainty;
2. in rejecting the examples cited by ComReg of mobile operators in Ireland investing heavily towards the end of their licence terms, respondents stated that these investments were only made on the assumption that licences would be renewed or otherwise extended to prevent widespread disruption to consumers. In this regard, respondents also noted that ongoing investment in 2.1 GHz band services was being made in the context of licences which are valid for another 10 years or so;
3. licence durations should depend on the nature of the technology and service involved, making it impossible to determine a finite duration for a licence in a technology- and service-neutral regime;
4. ComReg's preference for periodic re-release of spectrum and licences of fixed duration arose from an overly-literal interpretation of the concept of

"indefinite" licences. This respondent drew a clear distinction between "indefinite" licences - for which an expiry date has not been specified - and "irrevocable" licences which cannot be revoked;

5. periodic re-releases of spectrum would not be an impediment to the implementation of major allocation changes for harmonisation (for example), provided that spectrum rights would have a minimum initial term and a minimum notice period for revocation attached. In relation to this argument some respondents suggested a minimum notice period of up to five years and added that revocations should be justified by major changes in spectrum allocation at EU level;
6. the periodic re-release of spectrum should not be necessary and does not act as a mechanism to prevent entrenchment as:
    a. an undertaking's position in capital markets may unfairly determine its chances in a spectrum rights auction, preventing new entrants from entering the market[18]; and
    b. undertakings already established in the market could consolidate their positions with each re-release, thereby damaging competition;
7. the Authorisation Directive Article 7(1) states that spectrum rights may be renewed and does not preclude the granting of rights with indefinite duration; and
8. fixed licence duration may have to be introduced in certain situations:
    - for bands under 1 GHz and that the licence duration should be chosen carefully to ensure operators could amortise their investments over the period of the licence; and
    - for bands above 1 GHz, there was no need for fixed-duration licences outside of the occasional need of ComReg to re-farm the band.

In addition to responses received by the 24 May deadline, ComReg received, on 7 October (over 4 months after the public consultation closed), a further submission from H3GI in which it attached a report commissioned by it from NERA on the issue of indefinite licences for mobile spectrum. In summary, NERA put forward the following arguments to support its view that a move to indefinite licences would create better incentives for efficient use of spectrum over the longer term:

9. as fixed term licences approach their expiry date, incentives for operators to trade spectrum in a secondary market and/or invest in networks dependent on spectrum diminish;
10. licence expiry is associated with market illiquidity because the value of a licence will diminish toward the end of the licence term which is likely to hinder the development of trading markets. This will result in a lower volume of trading, and some of the benefits of a flexible and efficient market based approach to spectrum allocation will be lost;
11. fixed term licences also carry the risk that spectrum lies idle as reassignment by the spectrum manager normally takes significant time and resources;
12. in contrast, indefinite licence terms which can be revoked under well-defined and specific circumstances, liberalisation and spectrum trading offer a simpler and less expensive approach to ensure that spectrum is utilised efficiently;

[18] This respondent cited the example of E-plus in the recent German 800 MHz spectrum auction

13. liberalised indefinite term tradable spectrum usage rights may provide more flexibility with regard to entry timing as a potential entrant can acquire spectrum from the market. This will allow entry and exit decisions to be based on market developments and business plans and not be constrained by the timing of expiry of existing fixed term licences or new spectrum release; and
14. consumers are also likely to be better off with indefinite term licences because the additional flexibility with regard to entry timing should make the market more contestable and competitive, and provide incentives for operators to invest adequately to meet growing traffic demand, to expand their network footprint and roll-out new services like mobile broadband more extensively.

3.4.2 *ComReg's position*

Before addressing the specific views identified above, it is important to re-state some important points on how radio spectrum is managed at an EU wide level.

Background – radio spectrum management at EU-wide level

Unlike as presented in the NERA report and by some interested parties, radio spectrum at an EU level for some harmonised, important bands is not, in fact, entirely service- and/or technology-neutral. The present regime can be seen as "liberalised" when compared to previous regimes which specified a service and/or a technology for each band (e.g GSM technologies for the 900 MHz and 1800 MHz bands). For instance, in the EC's 900 MHz and 1800 MHz decision, only technologies compatible with existing technologies in terms of non-interference may be introduced. Similarly, service-neutrality is somewhat overstated in that what has actually occurred is that mobile services that were previously delivered over separate spectrum bands can now be delivered over a combination of the same bands.

At a fundamental level, radio spectrum in important bands requires a harmonised approach at an EU level. This is to ensure that both within and between Member States these bands are co-ordinated to eliminate the risk of interference so that they produce the best outcome in terms of value added for EU citizens. A co-ordinated approach at an EU level also contributes to the development of the internal market by, amongst other things, allowing equipment manufacturers to develop for a market of over 450 million people as opposed to the much smaller populations of individual Member States, such as Ireland.

In this context, it can be seen that finite licence durations allow a spectrum manager to seamlessly maintain the co-ordination of the most important bands.[19]
In contrast, a move to indefinite licences, within a spectrum trading regime, would mean that these important co-ordination decisions would be delegated to the market. However, in ComReg's view, such a move is inconsistent with what is actually happening and this inconsistency explains why trading in the important bands is

[19] For example the future use of the 2.6 GHz band is currently under consultation. As discussed in section 2.4.5, a number of views submitted in relation to this band proposed that the current licences should not be renewed and the band should be released for other uses as soon as possible.

unlikely to occur. In that regard, in Consultation 11/28, ComReg identified a primary concern, being that indefinite licences (or licences that are automatically renewed) could potentially lead to strategic behaviour whereby one or more firms resist the bands being co-ordinated in perhaps different manner with a view to obtaining some of the higher rents from a new potential use. For instance, if a broadcaster could have maintained a claim of a property right in a substantial part of the digital dividend spectrum it could have extracted much of the rents due to that spectrum from the new mobile broadband users.

For this reason, ComReg considers that the periodic re-release of spectrum:

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

Specific comments

ComReg now addresses the specific points identified above.

In relation to **bullet points 1, 2, 9 and 11**, ComReg considers the arguments regarding the uncertainty associated with periodic re-release of spectrum to be overstated and not to accord with the likely economic incentives of incumbent operators facing such a situation. In this regard, ComReg observes that:

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

- with indefinite licences there would not be the same incentive to fear new entry and hence investment rates would likely fall, once a stable market equilibrium emerges[20]; and
- in relation to the view regarding the potential for spectrum to lie idle, ComReg notes that this can be addressed by considering, and where appropriate, consulting on decisions in relation to the future use of spectrum bands with fixed term licences significantly in advance of expiry of same.

In relation to **bullet point 3** and NERA's view that ComReg cannot know in advance the optimal licence length to coincide with the investment cycle or action to co-ordinate at an EU wide level, ComReg would make the following observations:

- it would refer to its view regarding service and technology-neutrality in respect of some harmonised bands set out in the above background;
- when determining the appropriate duration for finite spectrum rights of use, actual and potential spectrum users (and other interested parties) are, through ComReg's consultation procedures, given ample opportunity to make their views known. This is an important input that ComReg takes into account when making a decision in this regard;
- ComReg's usual duration of 15 years for the most important bands is similar in length to the duration of licences issued by other spectrum managers within the EU. To ComReg's knowledge, there is only one country in Europe, the UK, which has issued licences of indefinite duration.[21]; and
- it is always open to ComReg to propose adjustments (without compromising on the notion of fixed termination dates) if very unexpected developments occur.

In relation to **bullet points 4, 5 and 12**, ComReg is, of course, aware of the difference between indefinite and irrevocable licences and further notes that indefinite licences could also include provisions under which a licence can be revoked (for instance, in specific circumstances and/or with a minimum notice period as suggested by some interested parties). Nevertheless, ComReg believes that this view overlooks the uncertainty, delay and potential litigation that could well be associated with a spectrum manager seeking to recover spectrum rights via such measures.[22] [23]

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

[21] See www.cullen-international.com/ a pay subscription website)

[22] In that regard, one could usefully explore the proposed implementation of the GSM Amendment Directive in the context of the 900 MHz band in the UK and note, amongst other things, that:

- Hutchison, which commissioned the NERA analysis and supports the implementation of indefinite licences for mobile spectrum licences in Ireland, argued that the spectrum associated with the indefinite licences of Vodafone and O2 in the UK should be released via a full-band auction; and

- the various claims and arguments made by Vodafone and O2 in response to such a proposal.

In relation to **bullet point 6**, ComReg believes the issue of concern identified can be addressed via spectrum caps and/or appropriate rules to prevent spectrum hoarding.

In relation to **bullet point 7**, ComReg is aware of the provisions of the Authorisation Directive and would also reiterate that rights of use for a limited time are specifically provided for.

In relation to **bullet point 8** and NERA's general argument regarding indefinite licences, ComReg notes:

- the arguments made by NERA may have more relevance in bands that are not (nor are likely to be) co-ordinated at an EU wide level. In these bands trading into other uses and users may have its benefits. As such and circumstances permitting, rights of use of at least as long as in the co-ordinated bands could be seen to facilitate trading of such rights. ComReg will keep this under consideration for when it next looks at these matters when it renews its spectrum strategy at the next iteration;
- at the same time, ComReg notes that different EU countries may adopt different approaches in relation to these bands and the need to harmonise such bands could arise in the future. Again for this reason, ComReg thinks it also prudent to maintain its position of term limited licences in these bands;
- One respondent put forward a variant on this theme, maintaining that such an approach as ComReg outlines may have to be introduced in certain situations for bands under 1 GHz. However, for bands above 1 GHz, the respondent did not see the need for fixed-duration licences "outside of the occasional need of ComReg to re-farm the band." For the reasons outlined earlier such an approach may not be optimal. ComReg does not see why a different approach should be taken to above and below 1 GHz bands when these will be used to provide the same retail services and no justification for this view was proffered by the respondent.

In relation to **bullet points 10, 13 and 14**, ComReg considers that much of the large welfare benefits from the European harmonisation approach are likely to come from allowing a more liberalised approach to the deployment of technologies within the relevant bands rather than from the notion of trading these licences *per se*. Indeed, NERA recognises that trading may not result in a socially optimal redistribution of strategically important mobile spectrum (for example sub-1 GHz spectrum bands),

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[23] In 2009, the UK spectrum regulator, Ofcom, issued a consultation titled the "Application of spectrum liberalisation and trading to the mobile sector – A further consultation" (See http://stakeholders.ofcom.org.uk/binaries/consultations/spectrumlib/summary/spectrumlib.pdf).

In this document, it was proposed that the current holders of the 900 MHz spectrum in the UK (Vodafone and O2) would each surrender a proportion of their respective 900 MHz spectrum holdings (2 x 2.5MHz out of a current total of 2 x 17.4MHz for each operator) to allow a third operator to have access to this particularly important spectrum.

Considerable comment and debate was received on this proposal. One operator, O2, took a case to the Competition Appeals Tribunal and, ultimately, the Secretary of State of the UK government issued a direction to Ofcom in relation to a number of matters relating to mobile spectrum. (See http://www.legislation.gov.uk/uksi/2010/3024/introduction/made)

Following this direction, in January 2011 Ofcom released a Regulatory Statement varying the licences in the 900 MHz and 1800 MHz bands to permit the use of these bands on a liberalised basis. No spectrum in the 900 MHz band was surrendered by Vodafone or O2 in this process.

because, given the competitive advantage of holding such spectrum, incumbents may be reluctant to sell any spectrum they hold in these bands. In that regard, NERA note that spectrum caps or forced divestment of spectrum may be required when secondary spectrum trading is not efficient. In addition, ComReg refers to its above views regarding fixed term licences and investment incentives.

In light of the above, ComReg continues to see its approach to licence durations as being wholly compatible with the EU Common Regulatory Framework and would provide sufficient flexibility with which to respond to EU developments as they emerge, thereby contributing to the achievement of the important objectives of ensuring efficient use of spectrum, promotion of competition and consolidating the internal market.

3.5 Collaboration Between Wireless Operators

In Consultation 11/28, ComReg noted the recent trend towards increased collaboration between operators in the provision of wireless/mobile services. There are various drivers for this, including operators' desire to reduce costs and/or provide a higher quality of service to consumers by combining resources. In addition, it was noted that there are many forms of collaboration and the benefits and drawbacks of each type will, of course, vary depending on the specifics of the collaboration.

ComReg further noted that it continues to assess the situation across the EU and more broadly and remains open to considering collaboration proposals on a case-by-case basis and would welcome feedback from stakeholders on this issue.

3.5.1 *Views of Respondents*

One respondent noted that ComReg's understanding of spectrum sharing seems to refer to the interference-free use of the same spectrum by different operators acting independently. This respondent took the view that spectrum sharing instead referred to the co-ordinated use of assigned spectrum by several operators on a shared basis.

Respondents noted that ComReg has no plans in the spectrum strategy to advance a policy framework for spectrum sharing and pooling. One respondent specifically requested ComReg to put forward a work programme to advance policy in the area of spectrum sharing and pooling.

Respondents also highlighted that as ComReg is proposing to assign mobile licences that would run until 2030, it is impossible to forecast what type of collaboration between operators may be needed over this period. Accordingly, it was submitted that ComReg should ensure that such do not become a barrier to future collaboration. In particular, respondents asked ComReg to clarify whether the current regulatory framework supports spectrum sharing and to clarify both its own position and that of the DCENR on spectrum sharing.

3.5.2 *ComReg's position*

ComReg notes that most of the comments received focused on the issue of spectrum sharing and pooling, as opposed to other forms of collaboration, and that the understanding of these terms may differ somewhat between parties.
At a high level, ComReg understands the notion of spectrum sharing as the simultaneous usage of specific radio frequency assignments in a band (or the full band) in a specific geographic area by a number of independent parties. It is noted that the level of co-ordination between these parties and the mechanisms used to share the spectrum may vary.[24] When considering this issue in relation to the collaboration between wireless operators, however, ComReg would expect the spectrum sharing mechanism to refer to the co-ordinated use of assigned spectrum by several operators on a shared basis.

In relation to calls for ComReg to advance a policy framework for spectrum sharing and pooling and to clarify its position and that of the DCENR on spectrum sharing, ComReg would firstly state that it is clearly a matter for the DCENR to set out its position on spectrum sharing.

In relation to ComReg's view on spectrum sharing and pooling, ComReg notes that while respondents have requested further clarity, the respondents themselves recognise that it is not possible to forecast what form collaboration between operators may take over the medium to long term. Given this and the fact that the nature and extent of spectrum sharing will depend upon the type of collaboration, ComReg reiterates its position as set out in Consultation 11/28 that each collaboration proposal will need to be examined on its merits in the context of relevant electronic communications and competition law (for which the competition authority also has responsibilities[25]).

However, in any event, interested parties will be aware that ComReg's examination of a collaboration proposal will, of course, occur within the context of its statutory functions, objectives and duties and, given this, interested parties should be in a position to identify for themselves the types of potential issues and concerns that could be raised by collaboration. For example, potential issues and concerns, such as in relation to:

- competition issues arising from proposed collaboration between actual and potential competitors;
- the impact of collaboration proposals on efficient spectrum use and effective spectrum management; and/or
- whether any potential restriction on competition (and other potential draw-backs) would be more than compensated for by the cost savings and other benefits that would be passed on to final consumers.

[24] For example, spectrum sharing can be enabled via technologies such as cognitive radio which would identify "unused" portions of spectrum and share that spectrum without interfering with the existing users. Once the rules for cognitive radio have been set, this spectrum sharing mechanism is likely to require less ongoing co-ordination activities between the parties involved than other mechanisms.

[25] In addition to assessing mergers under competition law, the Competition Authority will also assess whether agreements have an anti-competitive object or effect.

Given that the nature and extent of such issues will clearly depend on the specifics of the proposed collaboration, ComReg cannot be said to have a firm view on the issue of spectrum rights sharing (or pooling) other than that it would look more favourably on agreements that do not overly restrict competition and deliver demonstrable benefits that are shared with final consumers.

Finally, ComReg expects that licences that it will issue will permit an undertaking to contemplate any form of collaboration that it may wish to consider. Clearly, however, ComReg will need to satisfy itself that collaboration proposals are not objectionable having regard to its statutory functions, objectives and duties and that the said proposals are compatible with competition law.

3.6 ComReg's Position on the use of Spectrum Caps in Competitions

In Consultation 11/28 ComReg noted that a spectrum cap is a mechanism that limits the amount of spectrum that an entity can obtain. It is generally considered (and possibly used) in the running of a spectrum competition, but the amount of spectrum that an entity holds can also be a relevant consideration in other circumstances, such as the merger of two or more entities.

In addition, ComReg noted that in a spectrum competition, the setting of a spectrum cap is an important consideration as it can influence the level of demand that may be expressed for spectrum in the competition and that there are many factors to consider in setting a competition spectrum cap. Ultimately, this can influence the degree of competition in relevant downstream market(s). For instance, setting a spectrum cap too tightly might prevent operators from obtaining sufficient spectrum to give effect to their business plans whilst, on the other hand, setting an overly relaxed cap could enable the hoarding of spectrum rights and have adverse effects on the efficient use of spectrum and on competition in the relevant markets concerned.

3.6.1 *Views of Respondents*

Respondents' views were divergent on this issue. One respondent (Telefónica) claimed spectrum caps represented an "inflexible tool" which could inhibit the efficient use of spectrum in some situations. This respondent cited the example of an operator suffering network congestion which might be prevented from obtaining access to additional spectrum in its preferred band. The same respondent did note, however, that spectrum caps were useful to facilitate policy objectives - for example during an auction or other assignment process. According to this respondent, spectrum caps should only remain in place until the end of an assignment process and should never be allowed to interfere with "desirable outcomes" such as spectrum sharing.

Another respondent (Digiweb) strongly encouraged the use of spectrum caps on the basis that they help small and medium-sized organisations gain a foothold in markets sometimes dominated by large multinational companies with considerable resources.

In this way, spectrum caps, the respondent claimed, could help prevent an "oligopolistic situation" from arising.
No respondents commented on the specific details of how spectrum caps should be applied.

3.6.2 *ComReg's position*

In relation to the view that spectrum caps represent an inflexible tool which could inhibit the efficient use of spectrum in some situations, ComReg notes that it presently only envisages the use of spectrum caps during spectrum assignment competitions.

As such, it can be seen that a competition spectrum cap would not, of itself, prevent the acquisition of additional spectrum rights following such a competition subject, of course, to competition law and/or any rules or measures in relation to efficient spectrum use, spectrum trading and/or spectrum hoarding that may apply.

In relation to the view that spectrum caps can help small and medium-size organisations to gain a foothold in markets sometimes dominated by large multinational companies with considerable resources, ComReg's current preferred approach is to use spectrum caps in a spectrum assignment competition to prevent significantly adverse competitive effects from arising in a market.[26]

Absent a stated and justified concern in relation to the level of competition in a market, ComReg would not normally consider reserving spectrum for new entrants and ComReg would consider that the reservation of rights of use for new entrants as being quite a different type of regulatory action than simply setting a spectrum cap.

ComReg remains of the view that competition spectrum caps are an important measure by which to ensure that competition in downstream markets is not harmed or stifled by the spectrum assignment competition itself.

[26] Additionally, the level of a spectrum cap should ensure that the distribution of spectrum would be decided by the spectrum assignment competition and would not be dictated by the spectrum caps on the amount of spectrum that individual bidders could be awarded.

4 Strategy for Specific Radio Services

In section 6 of Consultation 11/28 ComReg examined the different types of services that make use of the radio spectrum in Ireland. Input, comments and proposals received in relation to these matters are addressed in this section.

4.1 Public Mobile Services

Co-existence with services in the 800 MHz band

One respondent (RTÉ) commented on "*the importance for Ireland of adopting an innovative and forward-looking strategy with regard to spectrum use and the development of new radio services, especially with regard to the delivery of audiovisual content across a range of platforms*". *"…also believes that further to the consideration of research into sharing studies between service in the 790-862MHz band, it is important that ComReg develops a solution to allow mobile service in this band to co-exist with broadcast services below 790MHz, as outlined in RTÉ's comments in response to the ComReg 800MHz consultation (800 MHz, 900 MHz & 1800 MHz spectrum release consultation, ComReg doc. 10/71), and ComReg's comments in its Inclusion of the 1800 MHz Band into the Proposed joint award of 800 MHz and 900 MHz Spectrum document 10/105, section 3.10.3.2., regarding interference mitigation from users the same frequency band. This action being undertaken by ComReg should be included under section 6.1.2. of the current document*".

ComReg has addressed these matters in Annex 10.4 of Document 11/60a as part of that consultation process and therefore does not intend to rehearse this issue in this document or in ComReg's Strategy Statement.

Quality of Service Surveys

One respondent (ESBN) commented on Quality of Service (QoS) Surveys. This respondent stated that the information published by ComReg on Quality of Service surveys "lacked detail". Furthermore, the respondent noted that the information derived from the bi-annual surveys in which measurements are taken on the mobile networks is not published by ComReg. The respondent requested ComReg to publish more information on the quality of the mobile service and its geographical reach in greater detail to *"assist a business user making significant use of the mobile communications networks for a variety of services, a greater level of detail on the quality of the mobile service and its geographical reach would be of great value …."*.

ComReg conducts QoS surveys primarily to ensure that MNOs are compliant with their licence obligations and secondly as a tool that allows ComReg to perform an independent investigation of any area-specific coverage complaints that it has received. The QoS surveys provide verification in the form of spot checks which are only valid for the time period in which the individual samples are taken. Used in conjunction with confidential evidence in the form of coverage maps and network

logs[27] supplied by each MNO, ComReg determines if each licensee is compliant with their respective licence obligations on a year-by-year basis.

ComReg does not assess the information it gathers or that is provided beyond that required to ensure that licensees are in compliance with their licence conditions and that all obligations are being met. The information supplied is not suitable to determine, for example, the absolute geographical coverage of a network.

4.2 Broadcasting Services

The Role of Public Service Broadcasting

Concern was raised by RTÉ that the central role fulfilled by public service broadcasting in leveraging the social benefits of spectrum use is not highlighted to the same extent in Consultation 11/28 relative to previous consultations.

ComReg accepts the points raised and has added appropriate text to its spectrum strategy statement to address RTÉ's concerns.

Digital Audio Broadcasting (DAB)

One respondent (RTÉ) clarified that DAB services are available in Kildare, Laois, Offaly, Meath and Louth in addition to Cork, Dublin and Limerick. This respondent also suggested that an additional strategic objective be included in relation to DAB/+ under *Innovation* as follows:

- "engage with BAI and RTÉ as to spectrum requirements and complete spectrum coordination functions to facilitate a national DAB/+ network; and
- engage with UK authorities and regulators to scope all Island spectrum plan and network".

ComReg welcomes the suggestions made by RTÉ in relation to broadcasting, in particular DAB and DAB+. Spectrum coordination is an integral part of ComReg's statutory functions, in accordance with ComReg's statutory functions and in line with relevant international treaties. Under the Broadcasting Act 2009, ComReg is obliged to licence spectrum to both RTÉ and BAI to provide services upon their request.

In 2008 ComReg issued to RTÉ at its request a licence to facilitate the provision of a national DAB network. ComReg is also mindful that as a spectrum regulator, it is obliged to keep an open mind on the technologies that are and may be used to provide digital radio, including but not limited to DAB and DAB+ technologies. ComReg will continue to engage with both RTÉ and BAI regarding their spectrum requirements and will continue to monitor the development of digital modulation techniques that have the potential to augment or replace the analogue (radio and television) service services in the most spectrally efficient manner.

[27] All confidential information received is subject to ComReg's guidelines for the treatment of confidential information. See document 08/24 at www.comreg.ie.

It is ComReg's view that these two requests are covered by ComReg's proposed strategy for broadcasting service and no additional strategic objectives need to be included.

The use of Administrative Incentive Pricing in the Broadcasting Sector[28]

One respondent noted ComReg's intention (in section 6.2.2 of Consultation 11/28) to review whether AIP should be applied in respect of Commercial, Community and public broadcasters. The respondent added that such a review may also be appropriate in respect of public sector use of spectrum where a market-based approach to spectrum release has not been adopted.

ComReg notes this comment on applying AIP to public sector use of spectrum where an administrative assignment of spectrum has been made. In line with its statutory obligations ComReg has already implemented AIP in a number of areas where administrative assignment has been used. Examples include the application of AIP to the Emergency Service Digital Network (see ComReg document 08/67), the proposed implementation of GSM-R (see ComReg document 10/84) and fixed links that operate in congested areas. In addition AIP will be considered in the proposed review of the business radio bands, which are still used by a number of public sector services.

4.3 The Terrestrial Fixed Services

4.3.1 *Mandatory use of Dual Polarisation and Adaptive Coding and Modulation*

Given the benefits identified from the use of Adaptive Coding & Modulation (ACM) in terrestrial Fixed Links, in Consultation 11/28 ComReg proposed to make the deployment of ACM mandatory for all new fixed link applications across all fixed link frequency bands from 01 June 2012.

With a view to encouraging spectrum efficiency in congested frequency bands, ComReg proposed to make dual polarisation mandatory for all **new** fixed link applications, where more than one link is required on the same path in the same frequency band, from 1 June 2012.

Whilst all respondents agreed on the benefits that ACM and dual polarisation provide, the following views were also put forward:

- the decision to use these measures should be left to the operators as they are not suitable for use on all links;
- both ACM and dual polarisation should only be used for new links deployed after June 2012, while existing links deployed prior to that date should not be impacted to avoid unnecessary capital expenditure;

[28] See also section 5.2 dealing the principles of AIP.

- licence renewal or minor amendments to licences should not trigger a requirement to introduce ACM or dual polarisation as this would require premature replacement of equipment;
- the deployment of dual polarisation antennas on low capacity tail links should not be mandatory as this requirement would impose an unwarranted additional cost and would not be necessary to meet the capacity requirements of those links;
- XPIC[29] functionality is generally much more costly in terms of hardware and installation services requiring cross-polarised antennae, more complex outdoor installation, and in some cases additional mast support; and
- there are different propagation impacts on vertical- versus horizontally-polarised links at certain frequencies in that for example horizontal polarisation requires a higher link budget than vertical at higher frequencies;

The following suggestions were received:

- instead of mandating dual polarisation, ComReg should encourage operators to use polarisation discrimination to get greater throughput from existing spectrum. An example of how this could be achieved is by allowing operators to add an additional carrier at cross polarisation to existing links without requiring any additional licence fee;
- for self-managed channels such as 26 GHz, the operator already has an incentive to maximise use of their assigned channel;
- ACM and polarisation should be required from the 1st of June 2012 in congested areas only with the policy extended to the full territory from the 1st of June 2013; and
- that ComReg should conduct a survey of experiences from operators and revise the engineering guidelines for transmit power and link length in order to achieve higher throughput for a specified availability.

ComReg's Position on the use of XPIC

As part of considering the use of cross polarisation in Consultation 11/28 ComReg did not consider mandating XPIC and does not consider going forward, that XPIC should be mandated at this stage, preferring to leave this at the discretion of licensees.

ComReg's Position on the use of dual polarisation

Acknowledging that there are costs involved in the implementation of dual polarisation ComReg's objective in this case is to ensure the efficient management and use of the radio spectrum resource. As noted in consultation 11/28 the number of licensed radio links grew by 10% in the period June 2009 to June 2010 and ComReg continues to licence on a sustained basis approximately 80 to 100 new links per week. Clearly, ComReg cannot await severe spectrum congestion before implementing efficiency enhancing techniques which are then difficult and expensive to retrospectively implement on existing licensees.

[29] XPIC = Cross Polarisation Interference Cancellation.

ComReg accepts that there are circumstances where the mandating of dual polarisation cannot be justified, for example, where only a single polarisation link is all that is required and the other polarisation will be unused. In this case, the costs of implementing dual polarisation cannot be justified and will not be required as detailed below.

Therefore, ComReg intends to mandate the implementation of dual polarisation for new links deployed after 1 December 2012[30] where licensees require more than one channel on the same link. ComReg can confirm that licence renewal or minor amendments will not trigger a requirement to introduce dual polarisation.

ComReg accepts that licensees are in general best placed to determine if they wish to use dual polarisation or not. However, ComReg will not licence any additional links on the same path where the licensee has one or more existing links that are not utilising dual polarisation, i.e. ComReg will expect licensees to utilise dual polarisation on existing links before applying for a new frequency for use on the same link. In the same manner ComReg will not license any new applications that seek to use more than one frequency on the same link if dual polarisation is not implemented.

ComReg's Position on the use of Adaptive Coding Modulation

Having considered the inputs received and on further reflection ComReg notes that the contribution of ACM has more applicability to ensuring the robustness of fixed links and only marginally contributes to spectrum efficiency in some limited cases, for instance where links are not planned against a minimum percentage of non-availability.

Therefore ComReg will continue to encourage the use of ACM but while it will keep the matter under review it does not intend to mandate ACM at this time.

Revising the guidelines for fixed links

Following on from the suggestions received ComReg intends to conduct a survey of experiences from operators, particularly those who have implemented a large number of links and have considerable experience, and if necessary revise the current engineering guidelines.

4.3.2 *Further Licencing in the 26 GHz band*

As part of the process for the auction of national block licences in the 26 GHz band in mid- 2008, ComReg committed to refraining from any further assignment of lots (including guard blocks) for a period of at least 18 months. As this period has expired, ComReg sought expressions of interests in reopening the 26 GHz block licence scheme for a further round of assignments within the next two year period.

[30] The date of 1 June 2012, originally expected to be 12 months after the publication of this strategy statement has been changed to 1 December 2012 to reflect the delay in the publication of this strategy statement.

Four responses were received in relation to the 26 GHz band with most respondents expressing an interest in the band.

One respondent (BT) urged ComReg to consider amending existing point-to-point (PTP) and point-to-multi-point (PMP) blocks in the 26 GHz band to remove the distinction between topologies, such that licence holders should be permitted to put their allocations to either use. In their view such an amendment would also align with the principle of service and technology neutrality, which is encouraged by the European Union and the CEPT.

Other respondents stated that there are a few issues relating to the 26 GHz band which need to be resolved before any further licences are issued. It seems that these issues revolve around ComReg's policy to avoid High-Low interference and that some relaxation in ComReg's requirements in particular in dense urban areas (i.e. reducing the co-ordination distance of 200 meters to 100 meters) may remove a *"significant limitation"*.

ComReg's view on the removal of the distinction between PTP and PMP

As part of the 26 GHz auction process ComReg stated that in order to minimise the potential for interference between PTP and PMP systems operating in adjacent bands, a 28 MHz guard band is necessary between the two systems to limit the potential for interference. This requirement is fully in line with CEPT proposals that examined the best way to make this band available for both technologies.

On this basis in its guidelines document for National Point-to-Point (P2P) and Point-to-Multipoint (PMP) Block Licences in the 26 GHz band (ComReg document 06/37cR1), which was published at the time of the 26 GHz auction, ComReg mandated that PTP assignments could only be used for PTP applications in order to protect adjacent PTP licensees – the structure of the auction ensured that the necessary 28 GHz guard band would exist between the PTP and PMP allocations to ensure protection of each technology from the other.

Applicants for both P2P and PMP assignments in the auction process would have based their spectrum valuations on this basis and bid accordingly. As such it would not be appropriate for ComReg to remove this distinction between P2P and PMP assignments following the auction process. ComReg is open to consider a change in use from PTP to PMP or vice versa as long as adequate protection is afforded to licensees but it is not willing to allow a mix and match of PTP and PMP without the necessary guard band.

ComReg's view on the current requirements on high-low interference mitigation

In the four to five year period since the opening of the 26 GHz band it appears that licensees have gained valuable experience with which to leverage the efficient use of this spectrum band.

Following representation from one licensee ComReg has indicated that it is willing to reduce the co-ordination distance, subject to sufficient technical proof that

interference will not be increased and subject to the agreement of current licensees in the 26 GHz band.

4.3.3 *Opening New Fixed Link Frequency Bands*

In Consultation 11/28 ComReg proposed to assess both the potential of, and demand for a number of potential fixed link bands that are not yet available for licencing in Ireland, with a view to developing some of these bands for new Fixed Link services and/or point to multipoint systems where appropriate. These included the 28 GHz, Lower 31 GHz, Upper 31 GHz, 50 GHz, 52 GHz, 55 GHz, 60 GHz and 65 GHz bands.

In section 6.3 of 11/28 ComReg noted that "*appropriate licensing schemes will also be considered; for example, with regard to many frequency bands above 50 GHz, where interference potential is lower than in lower frequency bands, a light licensing structure may be feasible. Furthermore, block licensing will also be considered in addition to the more traditional case-by-case frequency channel licensing approach and, where appropriate, a mix of these two approaches as used in the 26 GHz band*".

Respondents welcomed the opening of new fixed link bands, priority was expressed for the 28 GHz and 32 GHz bands. Reasons offered in support of opening these two bands first included:

- that current products already supported both these bands; and
- that these bands have been opened across other jurisdictions.

One respondent was of the view that the 40.5 – 43.5 GHz ("40 GHz") band could offer greater market interest than the other potential bands identified by ComReg in the consultation document. This respondent referred to the demand expressed in the recent UK auctions for licences in bands up to and including the 40 GHz band. The respondent suggested that ComReg should expedite offering of licences in all of the bands on a service and technology neutral basis.

In relation to the question posed by ComReg regarding the maximum bandwidth of 28 MHz applied to most bands, the following views were received:

- that a 28 MHz bandwidth was a limiting factor and that an option for 56 MHz channel spacing should be made available;
- that 56 MHz channel spacing is supported by most equipment vendors ranging from lower 6 GHz to the 42 GHz bands; and
- that the use of 56 MHz bandwidth should be allowed on very high capacity trunk systems and that this would ensure spectrum efficiency, noting that dual polarisation systems utilizing 56 MHz channels would reduce the licensing and equipment overhead while still meeting the capacity requirements.

Regarding channel aggregation, most respondents supported channel aggregation as a useful tool to increase microwave link throughput. One respondent was of the view that radio link aggregation is a feature now provided by many microwave vendors.

Only one respondent commented on CCTV services, stating that service and technology neutrality from a regulatory perspective would help operators select the most appropriate frequency band for their application.

ComReg's view on opening new fixed link bands

Having taken into account the views expressed by respondents, in general, when opening new fixed link bands, ComReg, subject to its normal consultation procedures, will adopt the following:

- for a new band to be opened it should have been released in other EU Member States and it should have an ERC/ECC or ITU-R band plan;
- when opening a new band, this should be done in a manner that facilitates both the licensing of individual links as well as national block licences, if not at the same time then at some future date; and
- when opening a new band, the option for including channel bandwidths of 56 MHz should be considered.

ComReg's priority in opening new bands will be on the 28 GHz and 32 GHz fixed link bands followed by the 40 GHz fixed link band.

Concerning existing bands, ComReg intends to conduct a review of its existing radio link guidelines document[31] and publish an update to bring these proposals into effect. This review will also take into account the results of ComReg's survey of fixed link licensee's experiences (see section 4.3.1).

4.3.4 *Different licensing regime for 70 GHz and 80 GHz bands*

ComReg sought interest in the best form of assignment method that could be used for licensing Fixed Radio Links in the 70 GHz and 80 GHz bands and received two opposing views. One respondent supported the introduction of a light licensing regime for the 70 GHz and 80 GHz bands as this would significantly increase the number of fixed links in these bands within the next two years. In opposing a light licensing scheme, the second respondent suggested that most operators would not be prepared to risk operating links in an unknown or possibly unstable environment.

ComReg's view on different licensing regime for 70 GHz and 80 GHz bands

While ComReg accepts that there is a low risk of radio interference between Fixed Radio Links in the 70 GHz and 80 GHz bands, ComReg's experience of a light licencing regime that only requires notification has not been positive. The light licencing regime in the 5.8 GHz band has not been adhered to across the board and the time and cost of enforcement action has outweighed the benefits of the light licencing regime[32].

[31] ComReg document 09/89 "Guidelines to Applicants for Radio Link Licences"

[32] For example, the detailed use of the band is not available. Furthermore, only a small amount of users enter the information correctly.

Furthermore, ComReg notes that moving to a light licensing regime may reduce the attractiveness of the 70 GHz and 80 GHz band for some operators, as noted by one respondent.

Overall, ComReg is of the view that it is not appropriate to introduce a light licensing regime to the 70 GHz and 80 GHz bands.

4.4 Wireless Broadband Services

A general comment was made by one respondent (Eircom/Meteor) that it is no longer relevant to make any distinction between Public Mobile Services and Wireless Broadband Services, for the following reasons:

- there is widespread take up of mobile broadband services that fit easily into ComReg's definition of Wireless Broadband Services; and
- the future licensing and use of bands such as 2.3 GHz, 3.5 GHz and 3.6 GHz referred to by ComReg in section 6.4 are increasingly relevant to the mobile community. For example, as ComReg highlights, "the 2.3 GHz band has great potential to enhance competition and capacity for mobile broadband in Ireland."

ComReg accepts that the boundaries between the two services are becoming less clear. However, ComReg believes that at this time the distinction is valid, as not all public mobile service providers offer broadband access and vice versa. The time may well come when this is not the case, and the distinction will lose its relevance, but that time is not yet upon us.

4.4.1 *Review of the FWALA licensing scheme in the 3.5 GHz band*

In Consultation 11/28 ComReg noted, that having set the end date of 31 July 2017 for the 3.5 GHz FWALA licensing scheme and following the completion of the introduction of mobility into the 3.6 GHz band, ComReg intends to complete its review of the FWALA licensing scheme.

ComReg also detailed in Consultation 11/28 that:

- this review will look at all FWALA frequency bands (3.6 GHz, 10.5 GHz and 26 GHz) and consider how these bands might be utilised in the future;
- 2013 is an appropriate timeframe to consult on use of the bands post 2017; and
- it is intended that this review will include consideration of matters such as licence conditions, licence fees, frequency channel arrangements, whether channels will be licensed on a local, regional or national basis, and appropriate mechanisms for the future assignment of the 3.6 GHz spectrum band.

One respondent (Eircom/Meteor) noted ComReg's intention to consult on the future use of these bands in 2013 given that all current licences will expire no later than

July 2017 and agreed that such a review will be timely given the potential for these harmonised bands to support high speed mobile broadband services.

Another respondent (UMTS Forum), promoting the use of these bands for Mobile Services, stressed that the 3400-3800 MHz band has been identified as IMT-Spectrum in Europe during the last World Radio Conference (WRC 07) and is currently under study in CEPT for the definition of a band plan for mobile broadband in this band.

A further respondent (Digiweb) stated that the ending of the FWALA scheme causes some fundamental uncertainty on several FWALA operators' ability to continue to invest or stay in business noting that the investment involved will not be recovered if ComReg were to cease the FWALA scheme on the 10.5 GHz band, just as it did on the 3.5 GHz spectrum. On this basis Digiweb argued that ComReg should discuss the best approach with FWALA operators.

ComReg's View on the review of the FWALA licensing scheme in the 3.5 GHz band

In responding to the view that the 3.6 GHz band has been identified as IMT-spectrum for mobile services ComReg notes that the current work of CEPT in respect of this band is not exclusively focused on mobile use. Moreover, the binding European Commission Decision[33] mandates Member States to make the band available for fixed nomadic as well as mobile use.

ComReg notes both the support expressed by stakeholders for its approach in respect of the 3.6 GHz band and the concerns raised regarding operator investment in the 10.5 GHz band, however it should be noted that at this time no end date has been set for the current 10.5 GHz FWALA scheme. ComReg envisages a public consultation (in which all interested parties including current FWALA operators can at their discretion respond to) on its proposals for the future use of 10.5 GHz spectrum as part of its 2013 review.

4.4.2 *Additional Spectrum in the 3.6 GHz band*

The current arrangement of the 3.6 GHz band is shown in Figure 1. This figure is modified from that shown in figure 9 of Consultation 11/28 as it now takes into account the expiry of Eircom's 3.5 GHz FWPMA licences and the issue of point-to-multipoint link licences in the band to Eircom.

[33] EC Decision 2008/411/EC

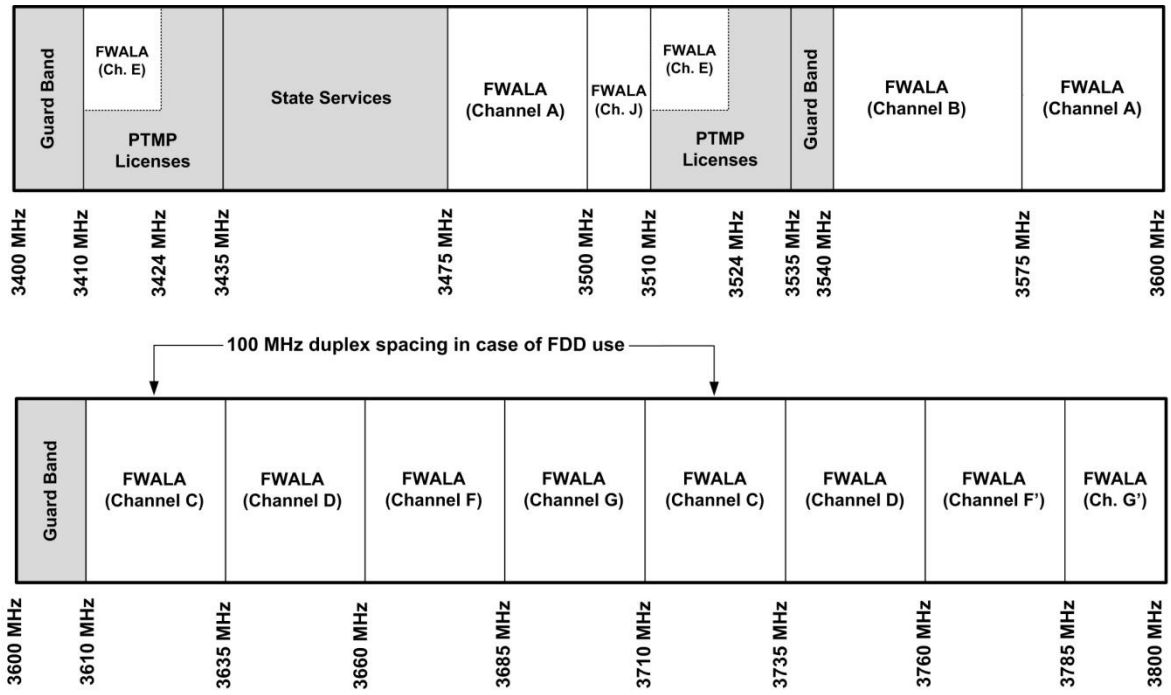

Figure 1: Current FWALA channel arrangements in the 3.6 GHz band

ComReg noted in consultation 11/28 that all of the "transitional" licences granted to Eircom in August 2010 will expire on 14 June 2012 and that the expiry of the Fixed Wireless Point to Multipoint Access (FWPMA) licence and the associated migration arrangements will enable ComReg to make additional spectrum available for licensing in due course. Taking into account the end date of 31 July 2017 for the 3.6 GHz FWALA licensing scheme, this could facilitate new licences using up to 2×25 MHz of spectrum, limited to 5 years duration.

On this basis ComReg sought expressions of interest in releasing the spectrum that will become available in 2012 following the expiry of Eircom's transitional licences, as well as using the existing guard bands in the 3.6 GHz band.

There was general support for the proposal to release this spectrum including the views that:

- a multitude of technologies are now being offered in the band 3.4 GHz / 3.6 GHz, including WiMax and LTE;
- the release of more spectrum in the band was strongly advocated, as Irish operators could make the most of a harmonised band and benefit from economies of scale, noting further that the "standards war" has considerably upped the performance for the end-customer; and
- that ComReg can confidently release the maximum amount of spectrum possible in the 3.6 GHz band as all the conditions are met so that competition can thrive on this platform.

Noting the support for this proposal, ComReg will seek to release the entire spectrum that can be made available following the expiry of Eircom's transitional

licences together with the reallocation of appropriate guard bands[34]. This will maximise the amount of spectrum in use up until the 31 July 2017 when all licences in the band will expire.

4.5 Business Radio Services (including Public Safety Services)

ComReg put forward its proposed strategy for managing the spectrum utilised by Business Radio Services in section 6.9 of Consultation 11/28 on which only two issues were raised in relation to this service.

4.5.1 *Telemetry and Telecontrol (T&T) systems*

In relation to Telemetry and Telecontrol Systems, one respondent (ESBN) commented that it supported ComReg's proposal to allocate spectrum to these systems. This respondent further stated that such a proposal would lead to a more efficient use of spectrum compared to the current regime.

ComReg will shortly be publishing a consultation on the allocation of spectrum for T&T systems to effect the efficient allocation of spectrum for these services and to separate these non-compatible services (for spectrum efficiency reasons) from traditional business radio services.

4.5.2 *Tracking, Tracing & Paging*

One respondent (Lo Jack Equipment Ireland Ltd) claimed that a single frequency centred on 164.175 MHz is used for existing tracking and asset tracking systems in a number of European countries. This respondent took the view that it is conceptually supportive of ComReg's proposal to allocate 169.6 – 169.8125 MHz for harmonising new high power tracking and asset tracing systems provided there is sufficient demand and if all European administrations award the same channel to assure true and effective harmonisation. However, the respondent further stated that, as it has currently installed a network of base stations and mobile transponders in customer vehicles as well as other related infrastructure, any obligation to migrate to 169.6 – 169.8125 MHz would incur substantial cost and operational complications that it cannot sustain.

On the issue of the 169.6 – 169.8125 MHz band, ComReg notes that under an EC Harmonisation Directive it is obliged to licence specific services (high power tracing and asset tracking systems and high power paging systems) that apply for use of this spectrum band. However this does not limit ComReg from allowing these services in other parts of the spectrum where there are justifiable reasons for doing so. ComReg is aware of the respondent's use of a specific frequency across a number of European countries and was in fact instrumental in having this recorded in the European Common Frequency Allocation Table.

[34] The two available guard bands are 3535 - 3540 MHz and 3600 – 3610 MHz. The guard band 3400 – 3410 MHz is not available for licencing as it is required to protect aeronautical radar systems.

ComReg accepts that the use of a specific frequency (164.175 MHz), while outside the EC harmonised band, may in the circumstances (de facto harmonised in a number of countries) be justifiably set aside for the specific use of tracking and asset tracing on a national basis. However the issue of licensing this specific frequency to a commercial entity needs to be addressed in line with ComReg's statutory obligations. ComReg will provide further information on the licensing of this specific frequency in the near future, as this specific frequency has now been released by the previous licensee and is thus available on a national basis.

4.6 Radio Amateur Services

One response (the IRTS) was received in relation to the proposed strategy for amateur services. This respondent made a number of recommendations for amateur services over the next two years:

Expansion of the 70 MHz band

This respondent proposed to extend the existing 70 MHz band currently allocated to amateur services by 175 kHz to 70.0 – 70.05 MHz for the following reasons:

- such an extension would bring the band into line with that in use by Northern Ireland licensed amateurs and the UK in general;
- that there has been an increase in activity on the 70 MHz band, particularly in Northern Ireland and some parts of the Republic of Ireland;
- that the potential exists for licensed amateur stations in Northern Ireland to cause interference with any residual low-band business radio users;
- that the proposed alignment of the band with that of Northern Ireland and the re-assignment of any remaining low-band business radio users to frequencies above 70.5 MHz would reduce this potential for interference; and
- that currently some 21 CEPT countries have amateur service allocations in the band; and use of the 70 MHz band in Ireland will increase as amateur allocations are granted by more European administrations.

ComReg is pleased to hear that there has been an increase in the use of this band and notes the use of the expanded band in the UK. On a general point it is not clear if it is being claimed that 21 CEPT countries allow amateur services across the whole of the 70.0 – 70.05 MHz, bearing in mind that the European Common Allocation table (the ECA) does not include an allocation for radio amateurs in this band and references footnote EU9 which states that *"In a growing number of CEPT countries, **parts** of the band 70.0-70.5 MHz are also allocated to the Amateur service on a secondary basis".*

For the avoidance of doubt, on the basis that radio amateurs are in this band on a secondary basis, no interference between radio amateurs and business radio users will be tolerated – irrespective of the location of interfering stations. In addition ComReg is not minded to move any business radio users that may exist in the band to protect a secondary service from causing interference to them.

ComReg will monitor developments across the CEPT and consider this request in line with current usage by primary services and harmonised CEPT and International Frequency Allocations.

Increase in the number of channels at 5 MHz

This respondent requested ComReg to consider the authorisation of three additional 3 kHz channels in the band 5.25 – 5.45 MHz. The respondent noted that after a consultation with the military authorities in July 2008, an agreement was reached to release four channels on a secondary basis to licensed experimenters centred on frequencies 5280, 5290, 5400 and 5405 kHz. Furthermore, the respondent stated that there have been no interference issues raised from the primary user. The respondent requests ComReg to examine the possibility of releasing further 3 channels on a secondary basis to the amateur services, centred on 5300, 5332 and 5348 kHz.

ComReg will consider this request following consultation with current user(s) of this spectrum.

An increase in power in the 10 MHz Band

This respondent requested ComReg to increase the power level in the 10.1 – 10.15 MHz band, currently allocated to amateur services on a secondary basis, from 20 dBW to 26 dBW. This respondent claimed that the power allowed in other countries, including Northern Ireland and UK, is 26 dBW and that there have been no cases of interference issues so far.

ComReg will consider this request after consultation with current user(s) of this spectrum.

Upgrading the Segment 50 – 51 MHz to Amateur Primary

This respondent requested ComReg to upgrade 50 – 51 MHz to primary status for Amateur services in Ireland. This respondent claimed that the band has been allocated to amateur primary services in the UK and that there have been no issues of interference by Northern Ireland amateur stations with services south of the border.

As there are no primary users in the 50 – 52 MHz band in Ireland it is no surprise to ComReg that there have been no issues of interference reported. As radio amateurs in Ireland are the only users of the 50 – 51 MHz portion of the band, the terms of allocation on either a primary or secondary manner are of no consequence. In these circumstances and noting that Amateurs are allocated on a secondary basis at this time in the European Common Frequency Allocations Table ComReg is not prepared to change the status of allocation at this time.

Use of the 3.6 GHz Band

This respondent suggested ComReg should implement ECA footnote EU17[35] and reflect in its Radio Frequency Plan for Ireland. Furthermore, the respondent requested ComReg to allocate 3400 – 3410 MHz to amateur services on a secondary basis suggesting that the band 3400 – 3475 MHz is allocated on a secondary basis to amateur services in the UK in general.

Considering that the ECA foot note EU17 pertains only to the reception of signals by Radio Amateurs, ComReg intends to implement foot note EU17 in the band 3400 – 3410 MHz in the next edition of the Radio Frequency Plan for Ireland[36].

Noting that:

- the band 3400 - 3410 MHz is currently reserved as a guard band to ensure the effective coexistence of Radiolocation services below 3400 MHz and BWA services in spectrum above 3410 MHz; and
- the 3.6 GHz band is licensed to a number of commercial services on a local area basis and as indicated in section 4.4.2 that further sections of the band will be released.

It is ComReg's view there is little scope for sharing between BWALA services and amateur services, therefore ComReg is not minded to allow the amateur service to utilise this band, even on a secondary basis.

[35] ECA footnote 17 states "In the sub-bands 3400 - 3410 MHz, 5660 - 5670 MHz, 10.36 - 10.37 GHz, 10.45 - 10.46 GHz the amateur service operates on a secondary basis. In making assignments to other services, CEPT administrations are requested wherever possible to maintain these sub-bands in such a way as to facilitate the reception of amateur emissions with minimal power flux densities."

[36] Current version is ComReg Document 08/90R2 – published 23 December 2010.

5 Medium Term Outlook (3-5 Year Period)

Section 7 of Consultation 11/28 detailed a number of emerging trends and developments that ComReg anticipates will have a longer term impact on spectrum management strategy. Noting that it is unlikely that all of these trends will have a significant impact over the lifetime of this strategy statement, ComReg considered it important to highlight these issues, at a high level, to raise awareness and stimulate debate amongst interested parties and comments were received on a number of these spectrum efficiency measures.

5.1 Annual Usage Fees

In Consultation 11/28 ComReg noted that to the degree that annual usage fees are to maintain their incentive power throughout the licence term it will increasingly become important to update them on an annual basis to account for the general rate of inflation. This will keep their value constant in real terms and maintain proper incentives for firms to continually assess whether they should continue to hold particular spectrum usage rights.

5.1.1 *Views of Respondents*

Several respondents disagreed with ComReg's proposal to link Annual Usage Fees with the general rate of inflation, making their value constant in real terms. Respondents provided several justifications for their views as follows:

- ComReg does not justify why spectrum pricing should be linked to some index of consumer prices (such as the CPI);
- ComReg also does not justify how such a linkage would promote competition and protect consumers;
- fixed (non-inflation-linked) usage fees have not been demonstrated to have led to inefficient use of spectrum by operators in the past;
- ComReg makes the implicit assumption that changes in the general price level of the overall economy have a direct impact on the incentives for efficient spectrum use (and therefore the level at which SUFs should be set), but this assumption is invalid because - as ComReg itself has illustrated in its recent quarterly communications market reports - the evolution of trends in communication prices over time has been "very different to that of the general price index";
- the prices of communication services generally have fallen in recent years, even as the consumer price index has risen, suggesting that creating a link between the two would be inappropriate;
- indexing spectrum pricing to consumer prices creates regulatory uncertainty, complicating the process of business planning; and
- annual Usage Fees which are set at a constant level are sufficient to ensure efficient spectrum use, contribute to easier business planning and promote investment in network infrastructure.

5.1.2 *ComReg's Position*

Respondents claimed that ComReg's views as expressed in Consultation 11/28 are not justified in terms of promoting competition and protecting consumers and that no harm had heretofore been highlighted.

ComReg would point out that:

- spectrum licensing regimes should provide incentives to licence holders, and across all spectrum bands, to continually consider whether it should continue to hold its spectrum usage rights subject to the terms of its licence;
- harm to consumers and competition could occur in the future where firms have low annual spectrum fees and hold onto spectrum usage rights that they are not using intensively; and
- moreover, it would not appear sensible for the real value of annual spectrum fees to be falling in the future when other likely uses and users may emerge. This is particularly the case in the world of technology and service neutral licensing where it would be possible for such spectrum to have many different uses and potential users.

Thus, it appears to ComReg that the incentives across all spectrum bands should be maintained into the future and this can be achieved by maintaining the spectrum fees constant in real terms. ComReg notes that the indexation of SUFs is likely, by encouraging the deployment of more lucrative services, to have the effect of encouraging the efficient use of spectrum.

A general point was made by one respondent that if the annual fees are to be indexed then the CPI is not the correct index. Instead this respondent suggested that fees should be linked to the price of downstream retail services in the communications sector. ComReg does not accept this point as ComReg and undertakings in the industry use money to buy a whole range of goods and services in the economy, and not just services in the downstream retail communications market, and linking a fee to these prices will provide appropriate incentives to licence holders. The trend in the prices in this broader range of goods and services are captured only in the CPI. Although ComReg accepts that CPIs are constructed on the basis of final consumer behaviour patterns, the CPI is nonetheless the generally accepted means of maintaining any figure in constant real value terms.

One respondent stated that indexing spectrum pricing to consumer prices creates regulatory uncertainty, complicating the process of business planning. ComReg does not believe this to be the case as the process of business planning for firms should already consider factors such as changes in the CPI, as changes in the CPI reflect increases or decreases in consumer demand and firms are likely to track this factor as it could affect the turnover of the business. Additionally, ComReg would note that the fees for spectrum usage as a percentage of business turnovers are likely to be a very negligible amount and it is difficult to see how the indexation of those fees in line with the CPI could represent a material risk in the process of business planning. Regarding regulatory uncertainty, ComReg believes that clear rules on whether indexation is to be applied to a spectrum fees or not, provides certainty to a licensee. The calculation of CPI is also well established and well understood.

Finally, ComReg envisages that its role as spectrum manager (e.g. protecting the interest of primary users while also facilitating secondary use) may become more complex as technological improvements will allow multiple users within a single spectrum band. In this uncertain world ComReg must take steps to ensure that the resources at its disposal to continue to do this work are not reduced in real terms.

5.2 The Evolution of Administrative Incentive Pricing (AIP)

In consultation 11/28 ComReg noted that:

- AIP is a mechanism that is used to promote more intensive spectrum use through an annual administratively set fee. Firms holding spectrum rights of use will thus be given incentives to hand back spectrum that they are not using intensively;
- AIP is not simply a mechanism to recover spectrum management costs but also provides an incentive for licensees with unused spectrum to return it or to pay additional charges. This is appropriate where spectrum management cost recovery charges alone may be too low to impose an appropriate level of discipline on licensees and the risk of spectrum hoarding is heightened particularly where the spectrum has a high market value;
- a significant challenge in introducing AIP is assessing the appropriate opportunity cost and determining a fair price in an objective manner;
- AIP has been introduced in some countries already;
- AIP is one of several instruments for promoting efficient spectrum use, and while trading/leasing may become more important in a market-based approach to spectrum management, AIP is likely to have a long term role, particularly in respect of spectrum used by government and the defence forces; and
- having introduced AIP for radio links in its last strategy period to mitigate the risk of congestion on fixed link bands whilst encouraging established fixed link licensees to migrate to fibre-based infrastructure over time, empirical evidence suggests that the application of AIP in this area has been successful in achieving those objectives.

5.2.1 *Views of Respondents*

Respondents' views on AIP varied. In support, it was argued that AIP:

- is an appropriate mechanism to prevent spectrum hoarding and to discourage licence holders from using spectrum inefficiently;
- could be used to provide an incentive for operators to "take a risk in non-harmonised spectrum"; and
- may have a "useful role" in encouraging more efficient use of spectrum by public sector and non-commercial entities who may otherwise be relatively insensitive to the opportunity cost of inefficient spectrum use, hence AIP should be considered only in the case of public sector and non-commercial entities.

Those opposed to AIP argued that:

- AIP should not be used whenever spectrum is assigned by auction, claiming that a secondary market would inherently achieve the objective of ensuring efficient spectrum use; and
- AIP would instead act as a tax on spectrum users and their customers, especially for commercial undertakings already using spectrum as efficiently as possible.

5.2.2 *ComReg's position*

ComReg agrees with the respondents who argued that AIP is a good mechanism to prevent spectrum hoarding or under-utilisation in cases where spectrum rights were awarded in circumstances other than competitive situations. Respondents specifically mentioned cases where spectrum rights are held by public sector and non-commercial undertakings as being good examples where AIP should be used. As discussed in section 5.1.2 ComReg believes that spectrum licensing regimes should provide incentives to all licence holders, and across all spectrum bands, to continually consider whether it should continue to hold its spectrum usage rights subject to the terms of its licence. Licensees that obtained spectrum usage rights in a non-competitive situation must therefore also be given incentives both to use spectrum efficiently and to consider whether there were other potential users who may value the right more than they do.

ComReg does not generally intend to apply AIP when spectrum is assigned by auction, as the upfront spectrum fees obtained via the auction will have been submitted in light of the terms and conditions of the auction, which would have set out the annual spectrum usage fee associated with the duration of the fixed term licence.

ComReg does not accept the view that AIP would act as a tax on spectrum rights holders (and their consumers) when such spectrum is already being used efficiently. Efficiency has to be judged from the perspective of the value added that the spectrum rights are put to rather than just the intensity of usage by the current holder. Charging AIP (with the option to trade spectrum rights) ensures that the holders continually assess whether it is in their best interest to use the spectrum right themselves. This notion of efficiency is not a static concept and will change as the alternative uses for a particular spectrum band increases. ComReg does not accept that AIP will act as a tax on the consumers in the original use as AIP payments will not normally change behaviour on the retail market.

Overall ComReg will continue to consider the merits of applying AIP to various spectrum bands and licence types as it is one of several instruments at ComReg's disposal to promote the efficient use of spectrum in line with ComReg's statutory objectives and functions.

5.3 A Second Digital Dividend

Bearing in mind the importance of sub-1 GHz spectrum, ComReg noted in Consultation 11/28 that it intends to explore the potential for identifying additional Digital Dividend spectrum beyond that already identified, namely the 790 – 863 MHz band.

5.3.1 *Views of Respondents*

All respondents on this issue agreed that ComReg should explore the possibility of a second digital dividend band in Ireland. These respondents suggested that the band should first be harmonised across Europe before any decisions are taken to auction the band. One respondent noted that the UK is the only country in Europe that is currently exploring 600 MHz for the second digital dividend. Therefore, the UK approach of an isolated digital dividend in the 600 MHz band surrounded by broadcast services could prove inefficient for non-broadcast services. This respondent stated that ComReg should clarify its position in relation to the realistic capabilities and potential availability of the second digital dividend in its strategy document.

5.3.1 *ComReg's position*

ComReg agrees with respondents that any additional digital dividend spectrum that might become available will need to be harmonised across Europe. ComReg is obliged to ensure sufficient spectrum is available to meet Ireland's broadcasting needs as stipulated in legislation and will need to take this into account before making any such second digital dividend available. Taking into account the current status of work in the CEPT and the EC on this issue, ComReg does not envisage the availability of a second digital dividend within the timeframe of this strategy statement.

5.4 Machine to Machine Communications

In Consultation 11/28 ComReg noted that it has monitored developments in the area of Machine-to-Machine (M2M) communications in recent years and recognises that M2M technology will increasingly underpin key areas of the economy including smart metering, networked homes, healthcare in the home and transportation (e.g. the emergency eCall system for vehicles). ComReg also noted that it is expected that many of these applications will communicate over wireless networks and use licensed or licence-exempt spectrum depending on the specific application, the stakeholders involved and availability of standardised equipment.

5.4.1 *Views of Respondents*

One respondent (Silver Spring Networks) took the view that none of the existing technologies – Powerline Carrier (PLC), cellular or fixed consumer broadband – fully meet the requirements for various smart grid architectures stating that:

- Powerline carrier is an acceptable technology for basic meter reading but has several disadvantages, including that it is slow, has very low throughput and offers unpredictable response times;
- Broadband over Power Lines (BPL) technology offers greater potential than PLC but at a very high capital cost and with variable performance in the field; and
- if technology further advances in this area that most vendors would consider 'hybrid' technologies combining mesh and PLC.

In addition, this respondent highlighted the merits and demerits of some of the existing technologies for smart metering, including consumer broadband connectivity, tower-based star-topology (non-meshing) systems and cellular network approaches. The respondent pointed towards the recent Commission for Energy Regulation (CER) Smart Metering trials report[37] which discussed the lack of viable options to provide ubiquitous coverage across the entire Irish landmass. Furthermore, the respondent argued that spectrum be made available in Ireland to allow the introduction of sub-GHz mesh technologies and that ComReg should support work being carried out in CEPT and ETSI to release spectrum from 870-876MHz for use in Smart Grids at a minimum.

Another respondent (ESBN) shared the same view as to the recommendations set out in the CER report that a dedicated sub-1 GHz band should be kept aside for a communication network to support the Electricity sector. Furthermore, this respondent stated that such a network would facilitate safety, security of supply, energy efficiency and consumer choice across the Irish state. This respondent was of the view that an adaptation of innovative RF solutions currently in use in North America might represent a possible solution for smart meters. The respondent claimed that the North American system uses licence-exempt spectrum between 920 – 928 MHz that has the required propagation and building penetration characteristics essential for the Irish environment.

5.4.2 *ComReg's Position*

ComReg recognises that there are social, economic and environmental benefits to be gained from the adoption of M2M technologies and the energy sector, in particular, will see a significant deployment of M2M technologies for smart metering and smart grid applications in the coming years. To that end, ComReg has been supportive of the work carried out to date by the Commission for Energy Regulation, and its stakeholders, to inform a Cost Benefit Analysis for Smart Metering Rollout in Ireland[38].

ComReg is also aware of, and supports, the work carried out to date by CEPT and ETSI to investigate the possibility of a harmonised pan European spectrum solution for smart utility networks. The frequencies being considered are in bands adjacent to the 800 MHz and 900MHz bands (namely 863-870 MHz, 870-876 MHz and 915-

[37] Electricity Smart Metering Technology Trials Findings Report, CER, 16 May 2011

[38] The relevant reports are available at: http://www.cer.ie/en/information-centre-reports-and-publications.aspx?article=5dd4bce4-ebd8-475e-b78d-da24e4ff7339

921MHz) but, at this time, no agreement has been reached. This is partially due to the inability of the utility industries to agree on a particular technology solution with various and varied tests and trials still ongoing.

Setting aside spectrum below 1 GHz for Smart Utility Networks

Concerning the setting aside of any other spectrum below 1 GHz and after taking account of the interests of consumers, ComReg is not minded to consider any such request before there is European Harmonisation and certainty that Ireland will not be left with a proprietary system that is not in line with European harmonisation standards and the mass market advantages that such harmonisation often delivers.

The majority of the 870-876 MHz band noted by one respondent is licensed on a national basis in Ireland until December 2015 and is therefore currently unavailable.

Finally ComReg notes that it is making 130 MHz of sub 1 GHz spectrum available during the period of this strategy statement (see ComReg document 11/60) and interested parties wishing to establish new networks for M2M communications are at liberty to consider acquiring spectrum through this process to satisfy their perceived needs provided the proposed technologies are compatible with the relevant EC Decisions on the use of this spectrum. Alternatively, they may consider making appropriate arrangements with the new licence holder when the proposed award process has concluded.