Commission for
Communications Regulation

Response to Consultation

Digital Dividend in Ireland

A new approach to spectrum use in the UHF Band

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Contents

1 Foreword

The migration process from analogue to digital terrestrial television, which is happening throughout Europe, opens up the possibility of a greater volume of information being carried within the same spectrum. Such improved spectrum efficiency has the potential not only for additional and enhanced television content but also new and innovative non-broadcasting services as part of a 'digital dividend'.

The so called 'digital dividend' spectrum will not only support new types of broadcasting products and services but also will, in freeing up a significant amount of UHF spectrum, improve the way we communicate and access audio-visual content, including for example, the economies of scale in radio equipment manufacture and roaming of services.

In Ireland and throughout Europe, the digital dividend offers the potential for a new approach to spectrum use in the UHF band, a band highly valued given its propagation characteristics. This new approach to spectrum use is likely to lead to significant economic and societal benefits for Ireland.

Perhaps reflecting its potential, the deployment of any digital dividend is an intensively studied matter. It is an example of how technological evolution can trigger changes in the use of spectrum with a far reaching impact on telecommunications strategy and spectrum policy. ComReg is pleased to set out in this document its position in relation to a number of high-level issues, which must be addressed in order to move Ireland closer to identifying, and realising, its digital dividend.

This document forms the response to ComReg's recent consultation on the digital dividend (*ComReg Doc. No. 09/15)* and reflects the valuable and insightful comments received both in terms of the level of detail provided and the understanding shown of both the national and international dimension associated with digital dividend spectrum.

ComReg considers this paper to be an important step in the development of Ireland's roadmap to digital dividend.

In concert with many respondents, ComReg believes that the digital dividend spectrum must be managed effectively and used efficiently in order to maximise the benefits to Ireland. ComReg proposes to further develop its position on Ireland's digital dividend and to consult again on the matter, having regard not only to the matters raised in this paper but also to developments at a national and international level.

Mike Byrne
Commissioner

2 Executive Summary

This document reports on the consultation document entitled *"Digital Dividend in Ireland: A new approach to spectrum use in the Ultra High Frequency (UHF) Band"* (ComReg doc. no. 09/15, "the Consultation").

In so doing, this response to consultation takes into account the views of respondents to the Consultation on the following six high level issues:

1. Value and use of spectrum for non-broadcasting services;
2. Reservation of spectrum for experimental purposes;
3. A "mixed approach" to spectrum allocation in the UHF band;
4. Frequency harmonisation issues;
5. Accelerating access to a sub-band; and
6. Other issues including service- and technology-neutrality;

ComReg is grateful for respondents' views and believes it has gained a deeper understanding of how these consultation issues could impact Ireland's potential digital dividend spectrum. ComReg proposes to take forward the views of respondents on these issues in devising its next strategic consultation on Ireland's potential digital dividend spectrum.

In particular, ComReg has obtained useful insight into respondents' views in relation to how other spectrum bands may be pertinent in the context of digital dividend spectrum.

Further, there appears to be strong evidence that Ireland's digital dividend spectrum will be greatly valued and could provide high levels of value for Ireland, from both a social and economic viewpoint. Respondents referred to a wide variety of sources of potential value likely to be associated with Ireland's potential digital dividend spectrum and provided views on how they believed this value could be extracted.

Respondents also provided views in relation to the issue of potentially reserving some digital dividend spectrum for the wireless research and development community. These views currently lead ComReg to believe that it would be unnecessary to create such a reserve. Indeed, there appears to be overwhelming support for the scheme currently employed by ComReg, *Test & Trial Ireland*, which exploits Ireland's strategic advantage of a relative abundance of unused spectrum for which access is available to the wireless research and development community.

The issue of the "mixed approach" of spectrum allocation in the UHF band, whereby spectrum in the UHF band would be assigned for both broadcasting and non-broadcasting services, rather than for one use only, was one of the most widely responded to consultation issues. In the main, the mixed approach received considerable support and this was buttressed by a variety of well reasoned arguments. The concept of a sub-band in the range 790 to 862 MHz (the 800 MHz band) was well supported. Strong views were provided by respondents, who stressed the advantage to Ireland of adopting an approach harmonised with other

larger markets in Europe. Many respondents alluded to benefits which would arise from economies of scale of radio equipment manufacture and from service roaming. ComReg considers that participation by Ireland in a harmonised 800 MHz band for non-broadcasting uses would be one of the critical success factors in relation to identifying and realising the benefits of Ireland's digital dividend spectrum.

There were, however, contrasting views in relation to the issue of additional digital dividend spectrum sub-band(s). While certain respondents considered that additional digital dividend spectrum would provide further benefits there were also some concerns raised. These concerns included the issue of fragmenting the existing 800 MHz band in order to realise additional digital dividend spectrum and the potential that the quality of broadcasting networks would be adversely affected.

The issue of accelerating access to a sub-band of digital dividend spectrum also received contrasting views. Certain respondents favoured the concept of having access as soon as possible, whereas others favoured the concept of obtaining access following analogue switch-off (ASO) completion.

Respondents were also generally positive towards the concept of service- and technology-neutrality in relation to the future potential award process for Ireland's digital dividend spectrum.

ComReg maintains, as with many of the issues discussed in this paper, that an appropriate balance will need to be struck between competing spectrum users, in order to ensure that Ireland best benefits from its digital dividend.

3 Introduction

3.1 Background

This document is ComReg's response to its consultation document entitled *"Digital Dividend in Ireland: A new approach to spectrum use in the UHF Band"* (the Consultation) which sought views on the following six high level issues:

1. Value and use of spectrum for non-broadcasting services;
2. Reservation of spectrum for experimental purposes;
3. A "mixed approach" to spectrum allocation in the UHF band;
4. Frequency harmonisation issues;
5. Accelerating access to a sub-band; and
6. Other issues including service- and technology-neutrality;

ComReg is now pleased to set out its response to the Consultation after having due regard to the views expressed by respondents as well as international developments which have taken place since the publication of the Consultation.

ComReg notes that upcoming national developments may need to be reflected in subsequent consultations on the digital dividend spectrum. In particular, developments are expected in relation to the provision of commercial digital terrestrial television (DTT) services in Ireland. ComReg understands that contract negotiations between the Broadcasting Authority of Ireland (BAI, formerly the Broadcasting Commission of Ireland (BCI)) and the current preferred bidder for the first three independent multiplex contracts for independent DTT services are progressing, with a potential launch of commercial DTT services in 2010. The advent of DTT services may serve to unlock the potential of the digital dividend.

3.2 List of Respondents

ComReg received fourteen responses to the Consultation and these respondents are listed below (in alphabetical order):

1. Broadcasting Authority of Ireland (BAI);
2. BT Ireland Limited;
3. Centre Telecommunications Value-Chain Research (CTVR);
4. Eircom Limited;
5. Ericsson (LM Ericsson);
6. GSM Association;
7. Ireland Offline Organisation;
8. Meteor Mobile Communications Limited (Meteor);
9. Nokia and Nokia Siemens Network;
10. O2 Ireland (Telefónica O2 Europe Plc);
11. Qualcomm Europe Incorporated;
12. Radio Telefís Éireann (RTÉ) and RTÉ Network Limited;
13. UPC Ireland Limited; and
14. Vodafone Plc.

ComReg is grateful to all respondents for their views.

3.3 The scope of the Consultation

ComReg set out that the scope and purpose of the Consultation was to advance the debate in relation to six high level issues which it identified as being central to gaining a deeper understanding of Ireland's potential digital dividend spectrum. The Consultation focused to a great extent on the 800 MHz band. ComReg believed this was a necessary starting point from which it could develop a roadmap for digital dividend in Ireland. As such, it is envisaged that the Consultation would form part of a series of consultations, each studying different aspects of digital dividend in Ireland and reflecting both national and international developments in this regard.

Although this was not raised as a consultation issue some respondents to the Consultation, in providing their views on the depth and scope of the Consultation, suggested that a wider or "holistic approach" should be taken with regard to developing Ireland's plans for the use of digital dividend spectrum, and this is addressed below.

3.4 A "holistic approach" to Ireland's potential dividend spectrum - respondents' views and ComReg's current position

Respondents' views

Six respondents suggested that ComReg should take "a holistic approach" in relation to its current study of Ireland's potential digital dividend spectrum and, in particular, in relation to the 800 MHz band.

Based on the views of these respondents, ComReg understands the "holistic approach" in the present context to generally mean a broad-based view in relation to the management and, in particular, the release of certain spectrum bands due to perceived substitutability, complementarity and/or other potential linkages between these spectrum bands. It was submitted, for example, that the 800 MHz and 900 MHz spectrum bands are substitutable from a spectrum user's perspective in terms of coverage and capacity, and also that the 800 MHz band would be complementary with the 1800 MHz and/or 2600 MHz bands, insofar as the former provides for wide area coverage and the latter band/s provide for high capacity. In addition, it was contended that digital dividend in the UHF band (470 to 862 MHz) should not be considered in isolation to potential digital dividend spectrum in the very high frequency (VHF) band (174 to 230 MHz), as the digital broadcasting services currently planned in the UHF band could be cleared and re-planned in the VHF band, thereby making additional spectrum available for non-broadcasting services in the UHF band.

The reasons provided by these respondents in support of such an approach can be broadly summarised as follows.

Firstly, it was submitted that such an approach would provide additional certainty in relation the quantity and availability of complementary and substitutable spectrum and that this would, in turn, influence overall strategic and investment decisions.

Secondly, such an approach would optimise the match of spectrum availability to demand as several services could have overlapping spectrum requirements, and several frequency bands could serve those demands. For example, it was stated that the capacity of the 900 MHz band would likely be insufficient for next generation mobile communications and, in this context, digital dividend spectrum, which is considered by these respondents to be substitutable spectrum, could meet this demand. Accordingly, these respondents stated that the availability of digital dividend spectrum should be made known as soon as possible.

Another reason cited in favour of the "holistic approach" was that it would ensure that decisions taken in one spectrum band did not conflict with those in other spectrum bands. In particular, two respondents provided views in relation to the use of the VHF band for digital broadcasting in place of the use of the UHF band and considered that the VHF band could potentially accommodate the digital broadcasting requirements currently planned under the Department of Communications Energy and Natural Resources (DCENR) broadcasting policy. This, they considered, could generate flexibility and more capacity for other non-broadcasting uses in the UHF band.

Finally, another respondent cited competition grounds for such an approach. It felt that some spectrum below 1 GHz should be reserved for "new entrants" in order to enable them to compete with existing providers in the 900 MHz band, on the basis that existing providers would have already recouped costs associated with network build.

ComReg's view

ComReg welcomes, and has carefully considered, the views expressed in relation to the "holistic approach".

ComReg recognises that, from certain radio spectrum users' perspective, there may be analogous transmission characteristics between some spectrum bands, such as those identified by respondents, that could be used, on a substitutable or complementary basis, to provide the same or similar electronic communications services to consumers. Indeed, the gradual move across Europe towards service- and technology-neutral spectrum usage conditions could create and strengthen any such equivalencies between spectrum bands.

In addition, ComReg recognises the potential benefits that may accrue to actual and potential spectrum users from adopting such an approach, in light of the equivalencies between spectrum bands referred to above, in relation to infrastructure investment and planning. Clearly, if ComReg and other national regulatory agencies (NRAs) were presented with a green-field environment with respect to these spectrum bands, and other potentially relevant spectrum bands, then a "holistic approach" could well be desirable.

ComReg acknowledges the strategic merit of the "holistic approach". It notes, however, that for the "holistic approach" to work in practice, it assumes a considerable degree of certainty regarding the nature, level and timing of digital

dividend spectrum supply. In this regard, it is worth reiterating that, at present, there remains considerable uncertainty, notwithstanding ComReg's consultation process in relation to these matters. This uncertainty reflects a number of factors. First, the timing of Ireland's digital dividend is dependent on ASO as well as any upgrading of DTT networks and clearing of existing or future planned DTT services from the digital dividend spectrum. Moreover, as detailed in section 3.5.2 below, European preparations for digital divided, which are likely to have considerable bearing on the nature and timing of Ireland's digital dividend, are not yet at a stage with which to provide such certainty. In particular, the harmonised approach to digital dividend in Europe is part of ongoing studies, both political and technical, and while momentum is building for a harmonised band in Europe, ComReg recognises that this is likely to be on a non-mandatory basis. It acknowledges, however, that more countries are likely to publicly declare the 800 MHz band as digital dividend spectrum in the next year.

Additionally, ComReg notes that there are existing spectrum users in the spectrum bands referred to by respondents and, moreover, there are specific and, quite often, different rights of use associated with these spectrum bands, particularly with respect to licence duration and expiry dates (as set out under the enabling Wireless Telegraphy Act licensing regulations). In addition, ComReg notes that in relation to some of these spectrum bands, the timing and processes are, to a large extent, outside of ComReg's control – particularly where such bands are the subject of mandatory European harmonisation directives and decisions. For example, ComReg notes its ongoing consultation on the liberalisation of the GSM 900 and 1800MHz bands (see, for example, ComReg documents 08/57 and 09/14) - a primary factor of which is the European Commission's legislation in relation to these bands (in addition to the expiry of existing GSM 900 MHz licences).

It is also worth noting that other spectrum bands are likely to become available for use before the digital dividend roadmap has been finalised across Europe and in Ireland. In the absence of a date for ASO in Ireland, there exists uncertainty surrounding the timing of the availability of the digital dividend spectrum. As such, a "holistic approach" could, in fact, result in delayed opportunities for investment, undermine spectrum efficiency by leaving valuable spectrum lying fallow until such time as the digital dividend spectrum became available, particularly where there would be demand for such spectrum from actual and potential spectrum users. Moreover, delaying access to these spectrum bands where there would be demand for such spectrum could also delay the benefits that more immediate use of this spectrum could provide to consumers and citizens in terms of the additional choice of, and potentially lower prices and increased quality associated with, electronic communications services.

In light of the above factors and considerations, and whilst a "holistic approach" may appear, ostensibly at least, to be an attractive proposition for certain spectrum users, ComReg considers that such an approach ought to be evaluated in light of existing rights of use of the spectrum bands identified, the potential for delayed investment opportunities in these bands, the risk that spectrum may not be most efficiently used and the consequences of these upon consumers. Nevertheless, ComReg will review

its thinking on the "holistic approach", if necessary and appropriate, in future consultations.

VHF and UHF spectrum

Whilst ComReg recognises potential for the VHF frequency band to be used for digital broadcasting services it also recognises that this band will not have sufficient capacity to meet all of ComReg's obligations to provide the spectrum for digital broadcasting under the Broadcasting Act 2009. In addition, the deployment of digital broadcasting in the VHF band in Ireland would create a unique requirement for television set top boxes (STBs), as STBs in most other European markets will be designed for the reception of UHF-only transmission signals, and this could be problematic given the size of the Irish market. Furthermore, ComReg notes that the Conference of Postal and Telecommunications Administrations (CEPT) has to date only dealt with the essential technical elements related to interference management from non-broadcasting services within the UHF band. Furthermore, DCENR developed a National Policy Framework[1] for identifying digital dividend spectrum based upon the core broadcasting requirements for DTT being concentrated in the UHF band from 470 – 790 MHz.

In relation to competition grounds for such an approach, ComReg considers that it is too early at this time to determine how best to provide access to the digital dividend to increase competition. Of course, ComReg will consider its objective of promoting competition in the provision of electronic communications networks (ECN) and electronic communications service (ECS), along with its other statutory objectives, in relation to the future release of any digital dividend spectrum.

3.5 Preparations in Europe for digital dividend

Since the publication of the Consultation the following four main developments have occurred:

1. The Radio Spectrum Policy Group (RSPG), which advises the European Commission (EC), published a Draft Opinion on the digital dividend;
2. Preparation by the EC of proposals in relation to the digital dividend;
3. On-going developments in individual European countries, particularly with regard to the 800 MHz band; and
4. On-going technical and other preparatory work by the CEPT in relation to the co-existence of broadcasting or high power transmission networks and bi–directional or low to medium power transmission networks in the UHF band.

[1] The DCENR National Policy Framework for digital dividend in Ireland is available at http://www.dcenr.gov.ie/Communications/Business+and+Technology/Spectrum+Policies+and+the+Digital+Dividend.htm

3.5.1 The RSPG Draft Opinion on Digital Dividend

The RSPG revised and updated its earlier Opinion[2] in relation to the digital dividend (Revised Opinion) and conducted a consultation in May/June 2009 on the Revised Opinion.[3] The key findings of the RSPG (ComReg chaired the working group which drafted the Revised Opinion) are summarised in a set of recommendations due to be published in Autumn 2009.

The Revised Opinion provides strategic policy advice to the EC and calls for swift action to be taken on its recommendations in order to minimise uncertainty in relation to the ability of Member States to make available the 800 MHz band.[4] It also sets out a number of principles which should be followed, the following two of which are of particular relevance in the context of this report:

- Service- and technology-neutrality; and
- Adherence to CEPT work in any EU harmonisation of technical elements.

ComReg has had regard to these matters in this report.

3.5.2 EC's proposed roadmap on digital dividend

The EC appointed Analysys Mason, DotEcon and Hogan & Hartson to identify and evaluate options for a co-ordinated EU approach to the digital dividend. The EC has used inputs from this study to prepare proposals, which include elements for a roadmap, for the EU approach.

Some of the elements of the EC's roadmap, which it consulted on (this consultation closed on 4 September 2009) include the following[5]:

- Increasing the size of the digital dividend through further spectrum efficiency gains;
- Following service- and technology-neutral principles;
- Accelerating ASO of terrestrial television in the UHF band; and
- Refraining from regulatory action in relation to the use of the 800 MHz band which would contradict or complicate the action of the technical harmonisation measures being planned at the EU level.

ComReg considers that the elements of the EC's roadmap are more likely to influence its views and actions in the future and are expected to feature in a further round of consultation. In particular, all but the element in relation to service- and

[2] RSPG Opinion on the EU Spectrum Policy Implications of the Digital Dividend. RSPG07-161. 14 February 2007.

[3] The consultation on the Draft Opinion and the responses can be found at http://rspg.ec.europa.eu/consultations/index_en.htm

[4] Recommendation No. 2 in Section 6 of the Draft RSPG Opinion calls for the Commission to act no later than 31 October 2009 on the RSPG's recommendations.

[5] Commission Consultation document *"Transforming the digital dividend opportunity into social benefits and economic growth in Europe"* 10 July 2009

technology-neutrality go beyond the six high-level issues in this Consultation and, for this reason, do not have direct implications on the reporting of the consultation issues at hand.

3.5.3 Situation in other European countries

Recently, there has been increased momentum in a number of European countries for the establishment of the 800 MHz band as digital dividend spectrum. This would increase the level of harmonisation of potential digital dividend frequencies between countries.

Currently, eight European countries have publicly identified the 800 MHz band as digital dividend spectrum which means the size of the potential market for ECN and ECS should lead to economies of scale for manufactures and operators.[6]

Many of the respondents' submissions to the Consultation urged ComReg to be circumspect in considering accelerating access to a sub-band of digital dividend spectrum, citing the risk of isolating Ireland from any harmonised approach, if it accelerated access to a band which later was not harmonised. Respondents considered that significantly more benefits would arise for Ireland by ensuring its digital dividend was harmonised with other large markets such as France, Germany, and the UK. ComReg sees merit in such an approach.

3.5.4 Technical and other preparatory work by the CEPT

The CEPT, under mandates from the EC's Radio Spectrum Committee, is studying a number of issues related to a harmonised approach to the digital dividend in the EU. The CEPT studies are divided between three CEPT groups, the Electronic Communications Committee (ECC) task group TG4 and project team PT1, and Spectrum Engineering Working Group (WGSE) project team SE42.

The ECC TG4 group is currently developing the following:

- Guidelines for border coordination of the mobile service in a country and the broadcasting service in another country;
- Recommendations aimed at ensuring the maintenance of Programme Making and Special Events (PMSE) equipment operating in the band 470 to 862 MHz, including the advantages of a strategy at the European level;
- Recommendations on the possible re-planning of the broadcasting service in order to release the 800 MHz band; and
- The definition of protection criteria to help establish compatibility between the mobile and broadcasting service.

The ECC PT1 group is currently developing channelling arrangements for the 800 MHz band for the International Mobile Telecommunications (IMT) systems as well as providing guidance on cross-border coordination. This work is intended to assist

[6] To date Denmark, Finland, France, Germany, Spain, Sweden, Switzerland and United Kingdom have publicly identified the 800 MHz band as a digital dividend spectrum. A summary of these developments is contained in Annex 1.0.

the implementation of IMT on a large scale in Europe while making it possible for countries to adapt the proposed channelling arrangements to their national situations and market needs.

The WGSE project team SE42 is currently defining the technical "rules" of the 800 MHz band and is considering least-restrictive technical conditions in the form of Block Edge Masks (BEMs), to optimise technical conditions by taking into account co-existence with current services.

During the ECC meeting in June 2009 the draft ECC Decision on the "Harmonised conditions for Mobile/Fixed Communications Networks operating in the band 790 to 862MHz" issued for public consultation, closing in September[7], which considers the all of above work in deciding:

- that the frequency band 790-862 MHz is designated for the provision of Mobile/Fixed Communications, while enabling administrations to continue to use all or portions of the frequency band 790-862 MHz for broadcasting and other services;
- that those administrations wishing to implement Mobile/Fixed Communications Networks based on frequency division duplex (FDD) in the entire frequency band 790-862 MHz should adhere to the preferred harmonised frequency arrangement given in Annex 1 of the Draft Decision;
- that those administrations wishing to implement Mobile/Fixed Communications networks in the frequency band 790-862 MHz with frequency arrangements other than the preferred harmonised arrangement in Annex 1of the Draft Decision should follow Annex 2 of the Draft Decision;
- that administrations should consider timely implementation of Mobile/Fixed Communications Networks when planning transition from analogue to digital broadcasting;
- that administrations implementing Mobile/Fixed Communications Networks, in accordance with Annex 1 or 2 of the Draft Decision, shall adopt the common and minimal (i.e. least restrictive) technical conditions specified in Annex 3 to the Draft Decision; and
- that administrations wishing to implement low power applications in the Mobile service such as programme making and special events (PMSE) in the centre gap of the FDD frequency arrangement given in Annex 1 of the Draft Decision or the guard block of the time division duplex (TDD) frequency arrangement given in Annex 2 of the Draft Decision shall adopt the common and minimal (i.e. least restrictive) technical conditions specified in Annex 3 to this Draft Decision.

This Draft Decision has been transmitted to the EC for consideration in its Radio Spectrum Committee.

[7] http://www.ero.dk/ Public consultations on ECC Decisions, Recommendations and Reports: ECC/DEC/(09)EE

4 Consultation Issue: Value and Use of spectrum for non-broadcasting services

4.1 Views in relation to the value to Irish society, consumers and Ireland's digital economy of non-broadcasting services

4.1.1 Consultation Questions

The following questions were posed in the Consultation:

Q. 1. What would you consider to be the levels of value and benefits, including any social value which may be produced for Irish consumers / citizens and Ireland's digital economy arising from non-broadcasting uses of the digital dividend?

Q. 2. How in your view could various industry sectors, for example transport, healthcare, education or other public sector industries, benefit from utilising digital dividend spectrum? Please include details of the potential spectrum requirements of the industry in your answer.

4.1.2 Views of Respondents

A majority of respondents considered that using digital dividend spectrum for non-broadcasting services would generate significant levels of value and benefits, including social value for Ireland and its citizens.

Propagation characteristics

These respondents generally cited the favourable propagation characteristics of the UHF band as one of the important sources of value associated with digital dividend spectrum. These characteristics include wide area coverage, reasonable building penetration and high capacity bandwidth. This, it was suggested, would reduce network rollout costs of national networks by cutting the number of required transmitter stations by 30 to 45%, whereas other higher frequency spectrum bands would require dense network topologies to provide the same level of coverage. It was also suggested that the favourable propagation characteristics of digital dividend spectrum could provide potential environmental benefits over similar dense network topologies operating in higher frequency bands.

Competition

It was also submitted that use of digital dividend spectrum for non-broadcasting services would lead to new ECN and ECS by providing an opportunity for new entrants to establish competing services. Some respondents submitted that the digital dividend spectrum, or part thereof, would likely need to be reserved for new entrants to this band, in order to facilitate competition with existing operators, which may have already recouped the costs of network build in other complementary frequency bands. This, they considered, would likely give rise to benefits to the consumer in terms of price, choice and range of services.

Innovation

Certain respondents argued that the use of digital dividend spectrum for non-broadcasting services would provide an opportunity to encourage the development of cutting edge technologies and networks such as; cognitive wireless networks, dynamic spectrum access networks, self-configuring and self-healing networks, all of which would lead to valuable intellectual property[8]. These respondents submitted that innovation is linked to access to spectrum and access to digital dividend spectrum would therefore foster innovative new companies. On the other hand, it was also suggested that access to spectrum alone would not encourage innovation and investment, and that the prevailing economic climate would also be important.

Research studies

In providing some quantifiable evidence for the potential level of value and benefits, which the digital dividend in Ireland could yield, certain respondents referred to a variety of thrid party studies[9]. Many of these studies were conducted to ascertain the economic and social benefits likely to be associated with the digital dividend spectrum, in the longer term, from a European prospective, and many used mobile broadband as a proxy for different types of non-broadcasting services. The results of most studies, such as the Europe Economics Research Limited (Europe Economics) study[10], which focused specifically on Ireland, show comparisons of the additional economic value which would be gained from using the digtial dividend spectrum for non-broadcasting services. ComReg notes that the conclusions from these studies are that additional value would be gained from non-broadcasting uses of digital dividend spectrum.[11]

Frequency harmonisation

A commonly held view of respondents on this issue was the importance of harmonising Ireland's digital dividend frequencies with larger markets to maximise the overall benefit. It was submitted that the harmonisation of frequencies between Ireland and other larger countries would effectively create a single but large

[8] Cognitive wireless networks, dynamic spectrum access networks, self-configuring and healing networks are based on radio frequency sensing techniques, which allow them to operate in the spectrum occupied by other types of networks without causing harmful interference.

[9] Five studies were referred to be respondents see for example: (1) The Ofcom digital dividend study http://www.ofcom.org.uk/radiocomms/ddr/. (2) Spectrum Value Partners, Getting the most out of the digital dividend, 2008.
(3) http://www.analysysmason.com/PageFiles/11730/GSMA.pdf (4) SCF Associates Ltd, The Mobile Provide: Economic Impacts of Alternative Uses of the Digital Dividend, 2007. http://www.digitaldividend.eu/files/digital_dividend_summary_report.pdf and (5) The Europe Economics report is available on the ComReg website (*ComReg Doc. No. CP50e)*

[10] "How Ireland can best benefit from its digital dividend", a consultancy report by Europe Economics.
http://www.comreg.ie/publications/how_ireland_can_best_benefit_from_its_digital_dividend_-_consultancy_report_by_europe_economics.473.103203.p.html

[11] Europe Economics concluded the additional value to be gained from assigning the digital dividend to non-broadcasting uses (NPV 2008 to 2027) would be between €1,241million for 40 MHz assigned, to €1,868million for 120MHz assigned to non-broadcasting services.

"market". This "market" would, as more countries adopted a similar harmonised frequency approach to the digital dividend spectrum, become sufficiently large to enable equipment manufacturers to mass produce equipment and exploit economies of scale. This, it was submitted, would benefit the Irish consumer through lower equipment prices and a wider choice of equipment. It was also claimed that frequency harmonisation would facilitate pan-European services and/or roaming of services, both of which were increasingly becoming important issues to consumers.

Uses: Internet services / mobile broadband

In the main, respondents contended that high levels of value would be obtained by using the digital dividend spectrum for internet services, particularly mobile broadband services. These views were based on the high levels of value which existing internet services currently provide. For example, it was submitted that internet telephony services (e.g. Skype, Google Talk, Blueface), video on demand services (e.g. RTÉ player, BBC iplayer, youtube), social networks (e.g. Facebook, LinkedIn, Twitter), radio streaming and e-books would lead to high levels of social value. The provision of ubiquitous internet access was viewed as being able to provide a platform for the development of many new systems and services for the benefit of every sector in society and industry. Significance, however, was placed on mobile broadband or other bi-directional networks.

Finally, there was a general consensus that Ireland's digital information economy, which would include sectors ranging from the healthcare to transport industries, would benefit from the digital dividend spectrum.

4.1.3 ComReg's position

Propagation characteristics

ComReg considers, even at this relatively early stage in Ireland's roadmap to digital dividend, that there is considerable value for Ireland in having non-broadcasting uses of the UHF band. The favourable propagation characteristics of the UHF band, such as wide area coverage, reasonable building penetration and high capacity bandwidth, mean that it would be suitable for a wide range of non-broadcasting services. It believes that this value is likely to be realised through the availability of consumer equipment aimed at receiving the new or enhanced ECN and ECS.

Competition

ComReg considers that high levels of economic and social benefits can arise through effective competition in the provision of ECS. It believes the digital dividend spectrum could potentially increase competition for these services, and increase economic and social benefits to Ireland. ComReg considers, however, that it is too early at this time to determine how best to provide access to the digital dividend to increase competition. Of course, ComReg will consider its objective of promoting competition in the provision of ECN and ECS, along with its other statutory objectives, in relation to the future release of any digital dividend spectrum.

Innovation

ComReg agrees that the use of digital dividend spectrum for non-broadcasting services will lead to innovations in the design and performance of consumer equipment, which currently are not designed to operate in the 800 MHz band. It considers, however, that the development of cutting edge technologies and the fostering of innovation in wireless technologies in Ireland would not be dependent solely on access to digital dividend spectrum, as such developments would be just as likely to be associated with access to other spectrum bands.

Research studies and frequency harmonisation

ComReg is cognisant of the prevailing view of the EC, that the EU dimension to digital dividend is likely to provide significant economic benefits to the Member States that adopt a harmonised band of digital dividend frequencies.

This view is founded on economic modelling of the added value of various possible types of coordinated action at EU-level. [12] For example, the economic modelling commissioned by the EC as part of a wide ranging study on digital dividend concluded that the option of reserving the 800 MHz band for non-broadcasting applications would increase the economic impact of the digital dividend by an additional €20 to €50 billion between now and 2015. Even though these results do not include, in the final aggregate analysis of costs and benefits, a breakout of the benefits for individual Member States, ComReg considers that it would be prudent for Ireland to avail of a harmonised band for digital dividend spectrum, particularly in light of the size of the Irish economy.

Ireland's economy is often characterised as being a small open economy on the edge of Europe. Ireland's economy, therefore, benefits from having close ties with the larger economies in Europe. For example, Ireland's Information, Communication & Technology (ICT) sector benefits from close ties with the ICT sectors in larger European countries because the manufacture of tuneable radio frequency equipment benefits from large economies of scale. ComReg considers that Ireland's digital dividend frequencies should be harmonised with large European markets if these benefits are to be realised here. In this regard, ComReg also recognises that eight Member States have identified the 800 MHz band as digital dividend spectrum and that additional Member States are likely to do so as the benefits of the European dimension to the digital dividend spectrum become clearer.

Uses: Internet services / mobile broadband

ComReg does not consider that it should suggest or nominate particular uses of the digital dividend spectrum. It considers that the market should have a leading role in determining the most appropriate use of the spectrum within the technical rules of the band (as may be determined by ComReg).

[12] See "Exploiting the digital dividend – a European approach" a study carried out by Analysys Mason, DotEcon and Hogan&Hartson for the EC, and Section 3.5.2.

On balance, and while recognising its legal obligations to accommodate national digital broadcasting services, ComReg is confident that a spectrum for a potential digital dividend can be identified while still catering for the requirements of digital broadcasting.

4.2 Views in relation to the applications and services likely to arise with non-broadcasting use of spectrum

4.2.1 Consultation Questions

Q. 3. Please outline your views regarding (i) the types of applications and services which you consider the digital dividend should be used for; (ii) possible spectrum requirements of those applications; (iii) timeframes for making available rights of use for digital dividend spectrum; and (iv) the potential levels of competition which may result in existing or new products and services markets.

Q. 4. Would you consider there to be other key issues which should be considered in terms of gaining a deeper understanding of the spectrum requirements of new applications and services? If so, what are they and please elaborate.

4.2.2 Views of Respondents

Respondents' views on the types of applications and services likely to arise with non-broadcasting use of the digital dividend spectrum were varied. While many respondents choose not to identify particular applications and services, a few respondents did provide high-level views on broadband, both fixed and mobile, backhaul and Public Protection and Disaster Relief (PPDR) services.

Fixed and mobile broadband

Views were given in relation to fixed broadband and mobile broadband, their associated wireless technologies[13], and how the digital dividend spectrum would be suitable for them.

In addition to referring to the favourable propagation characteristics of the digital dividend spectrum, (*see Section 4.1.2., Propagation characteristics)* respondents also contended that the spectrum characteristics were suited to mobile broadband. One particular feature highlighted by respondents was the ability of these frequencies to ensure good mobility of broadband services. These respondents submitted that the CEPT proposed band-plan for the digital dividend spectrum in the

[13] In relation to mobile broadband, respondents indicated that the following wireless technologies could be used in Ireland's digital dividend: High Speed Packet Access (HSPA), a variant of HSPA (HSPA+), Universal Mobile Respondents Telecommunication System (UMTS) and Long Term Evolution (LTE). In relation to fixed broadband the Worldwide Interoperability Microwave Access (WiMAX).

800 MHz band also provided for the mobility of services as it is based on bi-directional and frequency division duplex arrangements. Respondents also argued that the levels of broadband penetration in Ireland, in particular in relation to providing coverage levels to homes in remote locations, could be improved through mobile broadband services.

While there were less views given in relation to the use of the digital dividend spectrum for fixed broadband services, it was noted that this use was one of the proposals of the Worldwide Interoperability Microwave Access (WiMAX) Forum, and that the spectrum characteristics would be suitable for it. Respondents also asserted that fixed broadband services would also improve the levels of broadband coverage.

Backhaul

There was a view that the digital dividend spectrum could be used for backhaul services, in particular for fixed/mobile networks, and that these services are necessary elements of electronic communications networks, and have an increasing importance in ensuring connectivity in modern economies.

PPDR

Finally, there was a view that some digital dividend spectrum could be used for PPDR systems, which benefit communications to the public and between various agencies during a disaster or national emergency. It was stated that the value of such systems[14] may be hard to quantify and go beyond purely economic benefits.

Service- and technology-neutrality

Certain respondents suggested that while it would be possible to provide a non-exhaustive list of the applications and services which could use the digital dividend, such a list would likely change over time and potentially an application or service, not yet thought of could become the most appropriate service. On this basis, respondents considered that ComReg should follow a principle of service- and technology-neutrality and let market forces determine the uses in due course. Other respondents had similar views and considered that the digital dividend spectrum would foster many applications and services, all of which would improve the digital economy in a general fashion.[15]

[14] Current examples of PPDR services and systems include the Terrestrial Truncated Radio (TETRA) and Tetra Police (TetraPOL)

[15] These respondents considered that the market would determine the services which would improve the digital economy but that they might include video and audio streaming, blogging, gaming, location based services, mobile commerce, enterprise services, e-government services, e-healthcare services and mobile communications, to name but a few.

Potential spectrum requirements

Respondents who considered that all of the digital dividend spectrum should be used for mobile broadband services submitted that as much digital dividend spectrum as is possible should be made available for it. There was a further common view by these respondents that once the spectrum is harmonised with other larger markets, 72 MHz should be the minimum amount of spectrum made available to mobile broadband. This, they argued, would enable technologies such as Long Term Evolution (LTE) to use various duplex channelling arrangements and give rise to fast, high capacity bi-directional services.

Respondents that suggested fixed broadband services noted that the WiMAX Forum indicated a minimum of 60 MHz would be required for a WiMAX service.

No views were given in relation to the potential spectrum requirements of PPDR.

Other respondents argued that the widest potential variety of services for Ireland's digital dividend could be supported if a minimum of 72 MHz of digital dividend spectrum was made available by ComReg on a service- and technology-neutral basis, assuming that the frequencies were harmonised with the digital dividend frequencies in other European countries, particularly in the 800 MHz band.

Another respondent submitted that a minimum amount of 140 MHz of spectrum should be reserved for non-broadcasting uses as this would future proof the new systems being deployed in the spectrum given that potential future bandwidth requirements of services would increase.

Availability

There were three broad views in relation to the timing of making digital dividend spectrum available.

The first view was that the digital dividend spectrum should be made available as soon as possible to assist strategic planning and investment. These respondents considered that such an action would ensure that Ireland reaps the benefits associated with the digital dividend spectrum as soon as possible, maintains its competitiveness and fosters product development through early certainty on the frequencies for digital dividend.

The second view was that the digital dividend should be made available once the equipment necessary to use it became available. These respondents considered that there would be little gain in making the digital dividend spectrum available before the radio equipment would be ready, as this could lead to spectrum temporarily being unused. These respondents suggested that the certainty regarding the frequencies should be provided as soon as possible so as to encourage the development of the necessary equipment.

The third view was that the digital dividend spectrum should be made available sometime after ASO, with one suggestion given as three years after ASO. It was

submitted that access should not be made available before this as there would need to be a period allocated for infrastructural changes associated with clearing broadcasting from the digital dividend spectrum. These respondents also submitted that there should be an undisclosed period to enable broadcasters migrate and upgrade to more spectrally efficient transmission technologies.

Potential for competition arising from the digital dividend

In addition to referring to competition as one of the benefits arising from the digital dividend spectrum, (*see Section 4.1.2., Competition)* there was a view that it would be very difficult to consider detailed competition levels at this time given that digital dividend spectrum would not be fully accessible until sometime after ASO. There were other views that greater spectrum availability would generally lead to an increase in competition in wireless applications and services.

In addition to the views expressed in relation to the potential uses (*see Section 4.1.2., Uses: Internet services / mobile broadband)* respondents suggested that the CEPT proposed band-plan should be adopted in Ireland as it would allow for up to three different operators to provide a mobile broadband service using 2 blocks of 10MHz.

Other considerations

There were three other issues which respondents considered to be important to gaining a deeper understanding of new applications and services and their spectrum requirements.

International issues

Firstly, in addition to the views expressed in relation to frequency harmonisation (*see Section 4.1.2., Frequency harmonisation)*, it was submitted by certain respondents that ComReg should be cognisant of the development of international guidelines. For example, those set by standardisation bodies in relation to the standards for television receivers or those set by the CEPT in relation to the work on essential technical elements to ensure interference management issues can be properly dealt with. In addition to the views expressed by respondents on PPDR (*see Section 4.2.2., PPDR)*, it was suggested that cognisance should be taken of work in the EU to provide spectrum for PPDR.

National issues

Secondly, some respondents considered that there was a significant national dimension to the new applications and services and referred to many of the issues discussed in *Section 4.2* of this paper. These national dimensions included:

- increasing broadband coverage levels (*see Section 4.2.2., Fixed and mobile broadband);*
- adopting a "holistic approach" to digital dividend spectrum *(see Section 3.4., A "holistic approach" to Ireland's potential digital dividend spectrum respondents' views and ComReg's current position); and*

- making the digital dividend spectrum available in Ireland in a timely manner *(see Section 4.2.2., Availability).*

Technical issues

Lastly, respondents considered there to be a technical dimension comprising the following three elements.

1. *Using "interleaved spectrum"*

It was submitted that the potential use of "interleaved spectrum" needed to be studied in Ireland as this could further increase the amount of spectrum available for either further DTT services or new non-broadcasting services. In addition, some respondents considered that further study should be devoted to the spectrum requirements associated with moving existing services away from legacy technologies and/or to different frequency bands.

2. *Spectrum planning*

It was also submitted that Ireland could make more digital dividend spectrum available through the widespread use of national single frequency network (SFN) planning broadcasting multiplexes (where transmitter stations in a network would share the same frequency). These respondents considered that with widespread use of SFNs there would be no need for ComReg to reserve a large portion of the UHF band for national broadcasting.

3. *"Future proofing"*

Another technical element submitted related to "future proofing" the size of the digital dividend spectrum. It was stated that LTE could currently provide 100 Mbit/s capacity using 2 blocks of 20 MHz, but that this capacity could be different if more spectrum was made available or if the bandwidth made available was different (e.g. 2 blocks of 10 MHz or 2 blocks of 30 MHz). Another respondent suggested that ComReg would need to be cognisant of the different bandwidth capacity requirements of high definition television (HDTV) or three dimensional television (3D TV).

4.2.3 ComReg's position

ComReg's views in relation to the favourable spectrum propagation characteristics have been set out above (*see Section 4.1.3., Propagation characteristics).* It agrees that mobile and fixed broadband uses would enable a wide variety of services to be made available to consumers in particular in remote locations in Ireland.

ComReg also acknowledges that backhaul services are an important element of ECN and ECS. While ComReg believes that the market would be in a better position than it to determine the most appropriate uses of the spectrum it is not aware of any spectrum users which would in practice use spectrum with such favourable propagation characteristics for backhaul purposes.

ComReg notes that the propagation characteristics of digital dividend support PPDR uses, as these signals travel far across borders and could be important in regions where co-ordinated cross border emergency services would be required. In relation to Ireland, however, ComReg notes that PPDR narrow and wide band digital land mobile systems are already catered for in the 380-400 MHz band specifically, and in the 380-470 MHz band using tuning ranges where necessary[16].

ComReg also understands that the CEPT is considering future additional spectrum requirements for PPDR, and these considerations do not currently involve the use of digital dividend spectrum.

More generally, ComReg acknowledges the difficulties of identifying appropriate uses of digital dividend spectrum arising from ongoing technological developments. It therefore considers that service- and technology-neutral licensing principles should in general be applied to the potential digital dividend spectrum award(s), as this would enable the market to determine the uses of the spectrum. ComReg would however see merit in setting down technical conditions in order to aid compatibility between DTT services and non-broadcasting services.

Potential spectrum requirements

ComReg is grateful for the views in relation to the minimum amount of spectrum which particular services might need.

ComReg notes that a contiguous block of spectrum, such as the 800 MHz band (72 MHz in size), could meet most of the minimum spectrum requirements suggested. For example, LTE or bi-directional networks could be accommodated using paired spectrum in either 2 blocks of 10 MHz or 2 blocks of 30 MHz in the 800 MHz band. Alternatively, the 800 MHz band could meet the minimum spectrum requirements of 60 MHz suggested for a WiMAX service.

However, and with regard to the view of certain respondents that the minimum spectrum requirement be 140 MHz to "future proof" new systems, ComReg holds that this would seem to be inappropriate, in the context of the upper part of the UHF spectrum band, given no other European countries have proposed to reserve 140 MHz in the upper part *(see Section 4.1.3., Frequency harmonisation).* ComReg considers that currently that the upper part of the UHF band could yield a dividend of 72MHz but that potentially other digital dividend spectrum could available in other parts of the UHF band. Views and comments in relation to potential other additional digital dividend spectrum are provided later in this paper *(see Section 6.3., Potential additional sub-band).*

[16] See ECC Decision ECC/DEC/(08)05 of 27 June 2008 on the harmonisation of frequency bands for the implementation of digital Public Protection and Disaster Relief (PPDR) radio applications in bands within the 380-470 MHz range.

Further, ComReg notes that the DCENR National Policy Framework on digital dividend proposes that the 800 MHz band should, in so far as is possible, be released for use by ECS. This proposal is compatible with CEPT technical studies and ongoing international developments. ComReg is cognisant of its legal obligations to accommodate digital broadcasting and is confident of identifying spectrum for a digital dividend, while catering for the requirements of broadcasting.

Availability

ComReg recognises that, from certain radio spectrum users' perspectives, making the digital dividend spectrum available as soon as possible might assist strategic planning and investment. While early availability is a reasonable aspiration, there are a number of factors that need to be addressed in advance of a release of spectrum. For example, external factors such as the cost and time for infrastructural changes to occur influence the availability of spectrum as some current spectrum users would have to migrate to new frequencies in order for Ireland to have a digital dividend in 800 MHz band. Further, the time to communicate changes to television viewers, who may have to re-tune television sets or other ancillary equipment could also be a factor.

ComReg sees merit in making the digital dividend spectrum available when the equipment designed to use it comes to market. This would reduce the risk of spectrum being left unused temporarily due to lack of equipment availability. However, ComReg must also be cognisant of the needs of some users of the spectrum who will not be easily accommodated elsewhere in the UHF band in advance of ASO.

ComReg believes that the EC's roadmap on the EU approach to digital dividend will provide further clarity on the frequency harmonisation issue. ComReg understands that the EC intends to take urgent steps, including possible technical harmonisation measures to facilitate the process of making the 800 MHz band available as quickly as possible. ComReg also understands that the main elements of the EC's consultation will then be incorporated into the wider spectrum action programme to be submitted at the beginning of 2010 to the European Parliament and the Council for adoption.

ComReg intends to carry out further consultations which will revisit the timing issue associated with making the digital dividend spectrum available in light of the EC's actions and other developments.

Potential for competition

ComReg agrees that digital dividend spectrum availability should enable additional ECN and ECS to be established. It is currently too early, however, to determine how best to provide access to the digital dividend to increase competition *(see, Section 4.1.3., Competition).*

Other considerations - International issues

ComReg recognises that there is value to be gained by monitoring, understanding and inputting where necessary on international developments in relation to the digital dividend spectrum. It agrees that it would be beneficial to harmonise Ireland's digital dividend spectrum with other larger markets in order to minimise the risk of Ireland becoming isolated from larger European markets as discussed earlier (*see Section 4.1.3., Research studies and frequency harmonisation).*

National issues

ComReg considers that it would be premature to link the digital dividend spectrum and targets for national broadband penetration as indicated by certain respondents. At this time there are still many dynamic issues in relation to the supply and demand of digital dividend spectrum and likely outcomes that a harmonised EU approach to digital dividend might bring. It therefore considers that a service- and technology-neutral approach to licensing would likely offer the greatest flexibility for the market to determine the most appropriate use of the spectrum.

ComReg's views in relation to the "holistic approach" are set down in *Section 3.4*.

Technical issues – 1.Using "interleaved spectrum"

Based on the views of respondents, ComReg understands "interleaved spectrum" (or "white space" spectrum) in the present context to mean spectrum which would be left unused after licensing the core broadcasting DTT multiplexes and any ECN/ECS in the 800 MHz band.

ComReg agrees that there may be a case for studying interleaved spectrum for broadcasting and non-broadcasting uses or, as some respondents suggested, for PMSE use in Ireland *(see Section 6.2.2., Channel 69 and the 800 MHz band).* ComReg highlights that it has already identified some interleaved spectrum for a Mobile TV service *(see ComReg Doc. no. 08/44, 09/63).* The identification of any further significant amount of interleaved spectrum is currently not possible as the frequency planning for national multiplexes and the 800 MHz band curtails, to a large extent, any widespread use of interleaved spectrum, especially as analogue and DTT services will be in simultaneous operation up to ASO in Ireland.

2. Spectrum planning

ComReg does not consider that SFN planning could be deployed for all national multiplexes for DTT services in Ireland given the existing broadcasting topology and the technical limitations associated with synchronising transmitter stations in SFN network. Specifically, the deployment of national SFNs in Ireland would lead to significant losses of DTT coverage because the distance between the main transmitter stations in Ireland is too great. However, ComReg envisages planning regional SFNs as part of the overall national frequency plan for DTT services and obtaining further spectrum efficiency gains where appropriate.

3. Future proofing

In relation, however, to the view by certain respondents on "future proofing" the size of the digital dividend ComReg will consider in future consultations the potential spectrum requirements of different technologies in light of its obligations to promote the efficient use of spectrum.

5 Consultation Issue: Reservation of spectrum for experimental purposes

5.1.1 Consultation Questions

Q. 5. What are your views in relation to the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation? Please support your views with consideration to the availability of UHF spectrum.

5.1.2 Views of Respondents

There were contrasting views received in relation to the level of demand for Ireland to reserve UHF spectrum for innovation and experimentation.

One respondent considered that there would be high level of demand for Ireland to reserve UHF spectrum for innovation and experimentation. It noted that the Institute of Electrical and Electronic Engineers (IEEE) Dynamic Spectrum Access Networks Conference (DYSPAN), in 2007, demonstrated the potential level of demand for spectrum for research and development in Ireland. It submitted as a result of this demand, there would be benefits to Ireland in terms of the research it would encourage and the intellectual property and new innovative services that it would develop. It contended that expert researchers would be encouraged to come to Ireland to join existing research teams or carry out research in collaboration with Irish research centres and that this would benefit Ireland's knowledge economy.

Another respondent considered that how new services/technologies could be introduced and whether there would be any benefit in releasing digital dividend spectrum in stages would warrant further study. This, it was considered, could allow for the migration to more spectrum-efficient technologies and the migration of services to alternative frequencies within the digital dividend band if new products are identified at a pan-European level.

On the other hand, it was also submitted that there would be very little demand for Ireland to reserve UHF spectrum for innovation and reservation. Certain respondents claimed that *Test & Trial Ireland* (see www.testandtrial.ie) already supports the growing demand for spectrum access by the wireless research and development community, and that it would be unnecessary to reserve UHF spectrum for this purpose.

Other issues were submitted by these respondents as matters to which ComReg should consider in making a decision to reserve digital dividend spectrum for innovation. For example, certain respondents contended that reserving any spectrum for innovation and experimentation would risk fragmenting Ireland's digital dividend spectrum. This could, it was suggested, detract from the benefits which could be gained through harmonisation of Ireland's digital dividend frequencies with other markets (*see Section 4.1.2., Frequency harmonisation).*

It was also submitted that reserving spectrum may have the effect of making it difficult to accommodate test and trial projects outside of the reserved frequencies

and this would lessen the benefit of having an innovation and experimentation spectrum reserve in the first instance.

Other respondents submitted that the demand for spectrum for test and trial would not likely increase because of the availability of more spectrum, given that the needs of the wireless research and development community are currently focussed on specific geographic locations. It was submitted that reserving spectrum nationally would therefore risk leaving some spectrum unused for long periods.

It was also submitted that services which would use digital dividend spectrum would enable innovation and experimentation in any case. For example, it was contended that ubiquitous mobile broadband of itself would lead to innovation.

5.1.3 ComReg's Position

ComReg believes that the reservation of any potential digital dividend spectrum for innovation and experimentation would depend on a number of factors such as; the demand from the wireless research and development community, the availability of suitable spectrum, and the potential to enhance Ireland's international reputation as a centre of excellence in relation to access to spectrum for innovation and experimentation.

With only one neighbouring country with which it must co-ordinate frequencies, its low population density, and its geographic position on the western edge of Europe, Ireland has a key natural advantage, namely, a relative abundance of unused spectrum. ComReg has developed *Test & Trial Ireland*[17] to exploit this natural advantage. The programme currently allows researchers and developers to test or trial wireless technologies on a wide variety of frequency bands, including parts of the mobile and broadcasting bands.

Although the DYSPAN Conference in 2007 highlighted that there was a level of demand from the wireless research and development industry for access to spectrum, ComReg notes that this year there were 31 *Test & Trial Ireland* licences issued (e.g. to universities, research centres, telecommunication manufacturers and telecommunication service providers).

ComReg recognises the potential risk of fragmenting Ireland's digital dividend spectrum by having a spectrum reservation in part of it and agrees that, where this would reduced the overall benefits of digital dividend spectrum it should be avoided.

ComReg also acknowledges that having a spectrum reservation using particular frequencies may limit spectrum users' ability to test and innovate using spectrum outside of the reserved band. This could be an undesired affect and may undermine the *Test & Trial Ireland* by limiting innovation and experimentation to the reserved frequencies.

[17] http://www.testandtrial.ie/video.php

ComReg also recognises that making more spectrum available for test and trial licences would not necessarily lead to more spectrum being used by the wireless research and development community. In relation to the submission by certain respondents that there would be no need to reserve spectrum for innovation, as ubiquitous mobile broadband would lead to innovation, ComReg takes the view there could be other types of innovations, which the wireless research and development community could develop from the use of spectrum.

On balance, and when taking into account all of the above factors, ComReg considers that it would be unnecessary to reserve spectrum for innovation and experimentation. ComReg also believes that even increased demand for access to spectrum by the wireless research and development community can be accommodated by *Test and Trial Ireland*.

ComReg will to monitor developments in this area and will seek updated views from interested parties if demand for spectrum from the wireless research and development industry cannot effectively be accommodated in the current programme.

6 Consultation Issue: Mixed approach to spectrum allocation in the UHF band

6.1.1 Consultation Questions

Q. 6. In light of your views on non-broadcasting services, do you consider that a mixed approach to spectrum allocation in the UHF spectrum band should be adopted? Please provide reasons for your view.

Q. 7. Do you agree with ComReg's assessment regarding the initial mix between broadcasting and non-broadcasting services? Please answer in terms of your views regarding the initial mix between broadcasting and non-broadcasting services and any other considerations that you consider relevant.

Q. 8. Do you consider that, if the spectrum demand for the provision of DTT services does not meet the level envisaged by the 2007 Act, a review of the initial mix should be carried out following analogue switch-off of television services in the UHF spectrum band? If so, please provide reasons for your view and also indicate which stakeholder(s) should participate in such a review. If not, please provide reasons for your view.

For the purpose of the Consultation, ComReg defined the mixed approach to mean one that the spectrum in the UHF band would be assigned for both broadcasting and non-broadcasting services, rather than for one use only. ComReg considered, in light of the modelling of the estimated additional value[18] which the combination of broadcasting and non-broadcasting uses would bring, that a mixed approach would be central to Ireland's ability to derive maximum benefit from its digital dividend.

6.1.2 Views of Respondents

In the main, respondents considered the mixed approach would be a very prudent approach to managing Ireland's digital dividend spectrum.

Respondents supported their views based on a number of considerations some of which were discussed in *Section 4.1.2*. These include the following:

- increasing competition in ECN and ECS;
- favourable propagation characteristics;
- the findings of research studies; and
- the benefits associated with frequency harmonisation.

[18] Europe Economics report Tables 6.1 and 6.2, and Figure 6.1.

In addition, it was submitted that a mixed approach would give rise to flexible spectrum use which would, in turn, yield the most valuable and appropriate way to allocate digital dividend spectrum.

Another reason raised in support of the mixed approach was that it potentially reflected the best practice approach in relation to the allocation of digital dividend spectrum.

Mix between broadcasting and non-broadcasting services

In the Consultation, ComReg set out an assessment of the likely initial division of spectrum bandwidth between broadcasting and non-broadcasting services if a mixed approach were adopted in Ireland. It proposed that between 272 to 372 MHz (from a total allocated bandwidth of 392 MHz) would be required to cater for the spectrum requirements for national multiplexes for digital broadcasting services.

Respondents submitted varying views on this initial mix. Certain respondents questioned ComReg's assessment from a frequency planning perspective and reiterated their views in relation to SFNs (*see Section 4.2.2., Spectrum planning)*.

Other respondents considered that the initial division would be appropriate for up to six or more national multiplexes for DTT. It was stated that this would be appropriate given that the national multiplexes should, in so far as possible, be compatible with existing TV receiving aerials.

There were two other differing views in relation to the spectrum division. The first view was that national multiplexes for broadcasting using VHF spectrum, rather than UHF spectrum, could increase the spectrum bandwidth available to non-broadcasting services *(see Section 3.4, VHF and UHF spectrum)*.

The second view was that additional DTT multiplexes could be required in order to provide scope to migrate broadcasting services to more spectrum efficient technologies or to provide enhanced broadcasting services (e.g. HDTV or 3D TV), which may require additional spectrum bandwidth.

It was also noted by respondents that the division of spectrum bandwidth between broadcasting and non-broadcasting services was a dynamic issue and what might be an appropriate division of bandwidth initially might be inappropriate in the future, as technological or market developments take place. Respondents generally considered that there should be a mechanism to capture these developments.

Reasons provided as the basis for having a review process

Most respondents submitted that there would be merit in reviewing the division of spectrum bandwidth in light of market and technological changes. First, it was submitted that changing demographics and population density in parts of Ireland could alter the demand for UHF spectrum for either broadcasting or non-broadcasting services.

Moreover, respondents considered digital dividend spectrum was too valuable a natural resource to have some of it remain unused, especially if demand for national multiplexes for broadcasting was not met.

Furthermore, a review process might enable Ireland to act quickly in response to international developments, in relation to the harmonisation of additional spectrum in the UHF spectrum band, should they arise. Certain respondents considered that the UHF band should be open to a review in order to ensure a high degree of flexibility of use of UHF spectrum.

Finally, there was a view that periodic reviews of the use of spectrum would be a core principle of spectrum management.

Timing of a review

There were diverging views, however, on the timing of any such review. On the one hand, certain respondents considered that the review should not take place until sufficient time had elapsed for national multiplexes for broadcasting to develop. It was submitted that terrestrial television services have traditionally taken a long time to establish themselves, as programming rights and other copyright issues delay provision of some content on free-to-air networks. On this basis, it was submitted that that a review could, if conducted too early, overlook the likely needs of broadcasting spectrum users for UHF spectrum. It was also suggested any review should not limit the ability for indigenous Irish programming content to have access to an indigenous platform, as Ireland's national broadcasting policy objectives have a longer term horizon.

On the other hand, other respondents submitted that a review should not be postponed until after ASO, because a review would provide clarity to spectrum users, which could in turn provide benefits to them in relation to the timing of investments and the planning of future services (whether broadcasting or non-broadcasting services).

There was, however, a consensus view that the DCENR should be the main driver in reviewing broadcasting use of the UHF spectrum band, as it sets national broadcasting policy for Ireland.

While there were no other main considerations put forward by respondents in relation to a review, it was suggested that ComReg should not exclude any other particular course of action at this time because more certainty in relation to the bandwidth requirements of broadcasting and non-broadcasting services would develop in due course. For example, it was submitted that spectrum requirements would crystallise as applications and services are deployed in the US.

6.1.3 ComReg's Position

ComReg considers that the mixed approach achieves one of the main goals of the DCENR National Policy Framework on digital dividend, as it proposes that the 800 MHz band should, in so far as possible, be released for use by ECS.

As previously discussed in *Section 4.1.3*, ComReg considers the digital dividend spectrum offers scope to increase competition and has propagation characteristics, which would suit a wide range of applications. It also considers that a mixed approach would be central to Ireland's ability to derive maximum benefit from its digital dividend and there would be significant benefits to be derived from harmonising Ireland's digital dividend spectrum with larger European neighbours'.

Furthermore, flexible spectrum use has a high level of value associated with it, albeit this can be difficult to quantify. Therefore, ComReg agrees with respondents views that the mixed approach allows for flexibility in the use of the UHF spectrum band.

The mixed approach also reflects current best practice based on European and global trends. For example, the World Radio Conference (WRC) 2007 added the mobile service to the use of the UHF band in the 800 MHz band in Region 1, which includes but is not limited to the territory of Europe. The DCENR National Policy Framework on digital dividend proposes that at the next WRC in 2011 Ireland should enter the relevant Radio Regulations footnote to afford greater certainty to any mobile implementation in the 800 MHz band.

Mix between broadcasting and non-broadcasting services

In relation to the view that SFNs should be considered in planning broadcasting networks, ComReg considers that widespread use of SFNs is not currently feasible for technical reasons (*see Section 4.2.3., Spectrum planning).*

In relation to the view that the national broadcasting multiplexes should, in so far as possible, be compatible with existing TV receiving aerials, ComReg is of the view that this would assist the establishment of DTT services given it would minimise any necessity for re-tuning of television equipment.

In relation to the view that national multiplexes for broadcasting should be provided using VHF spectrum, rather than UHF spectrum, ComReg is of the view that this would be inappropriate, for the reasons previously given *(see Section 3.4, VHF and UHF spectrum).*

With regard to the view that additional spectrum for DTT may be required in the future, ComReg is of the view that it would be too early to provide an opinion on this matter. The reason for this is DTT services have yet to launch and future demand for spectrum broadcasting will depend on the success of DTT services. Furthermore, ComReg considers the identification of significant amounts of additional spectrum, over and above that required for six national multiplexes (the core requirements), cannot take place until after ASO, due to the need for simulcasting of analogue and digital broadcasting services.

Reasons provided as the basis for having a review process

ComReg sees considerable merit in a review process and considers that a review mechanism could assist it in managing the digital dividend spectrum effectively and

ensuring that it would be used efficiently. It also considers that a review would assist the flexible use of UHF spectrum.

Timing of a review

ComReg considers there to be some merit in the view that sufficient time for DTT services should be given before carrying out a review. In this regard, ComReg does not believe that an effective review could be carried out prior to ASO as the requirements of digital broadcasting services would not be known. For example, only following ASO could spectrum be made available to meet the core broadcasting requirements and the identification of the need for, and the potential availability of, additional spectrum could commence.

ComReg sees merit in a review taking a longer term view given that the migration of DTT services from the 800 MHz band would have to be managed. Furthermore, any compatibility issues between broadcasting and non-broadcasting services in the UHF band will have to be assessed and this could impact the timing of a review.

6.2 800 MHz sub-band proposal: UHF channels 61 to 69

6.2.1 Consultation Questions

Q. 9. Do you consider that the 800 MHz band should be reserved for services other than broadcasting? Please provide reasons for your view.

Q. 10. How do you consider that the current uses of channel 69 in Ireland, for example Programme Making and Special Events (PMSE) uses, would be impacted by reserving the 800 MHz band for non broadcasting services? Please provide your view on how PMSE uses could be accommodated if such uses were to be displaced from channel 69.

6.2.2 Views of Respondents

In the main, most respondents took the view that the 800 MHz band should be reserved in Ireland for services other than broadcasting for the reasons previously given (see *Sections 3.4 and 4.1*). These reasons include the following:

- increasing competition in ECN and ECS;
- favourable propagation characteristics;
- the findings of research studies;
- the benefits associated with frequency harmonisation; and
- adopting a "holistic approach" to digital dividend spectrum.

In addition, certain respondents submitted that the additional studies, which specifically address channelling arrangements in the 800 MHz band, give rise to

momentum for the adoption of this band of frequencies for non-broadcasting services.

Another reason raised in support of the reservation of the 800 MHz band was that it reflected best practice European and global trends as evidenced and the allocation of co-primary status to the mobile service in the 800 MHz band by the WRC 2007.

On the other hand, while not opposing the reservation of the 800 MHz band for non-broadcasting services, some respondents provided cautionary views on this issue. For example, certain respondents took the view that the quality of DTT services could suffer as there could be insufficient availability of spectrum below the 800 MHz band. The reason for this was that the core broadcasting requirements would, as a result of clearing the 800 MHz band, have to be compacted into the spectrum below the 800 MHz band. In addition, it was submitted, this could reduce the available spectrum for DTT services to migrate to more spectrum-efficient transmission technologies and to enable the newest DTT services to be broadcast (e.g. HDTV or 3D TV).

Another cautionary reason submitted was that cable systems, which currently use spectrum in the 800 MHz to carry information, could be susceptible to interference from non-broadcasting services in the 800 MHz band. It was submitted that before any decision would be made in relation to making the 800 MHz band available for non-broadcasting services further studies would be needed to ensure that cable systems, using 800 MHz band spectrum, would be protected from interference.

Channel 69 and the 800 MHz band

The channel 69, which has a bandwidth of 8 MHz extends from 854 to 862 MHz and therefore, is at the upper end of the 800 MHz band.

Certain respondents suggested that allowing PMSE to continue to use channel 69 would reduce the potential level of frequency harmonisation of Ireland's digital dividend spectrum. This, it was submitted, could have economic and social implications as the findings of the Europe Economics report supported the use of the entire 800 MHz band for non-broadcasting services. Moreover, these respondents submitted that the level of benefits which could be derived from using channel 69 exclusively for PMSE could not easily outweigh the level of benefits arising from using channel 69 as part of a digital dividend.

An alternative view raised by certain respondents was that PMSE was an important use of spectrum. For example, it was submitted that PMSE use tended to be localised and associated with particular events, for example in churches, halls and theatres, in connecting consumer premises equipment or in linking live events as part of outside broadcasts. It was submitted that such uses would be susceptible to interference if channel 69 was assigned to non-broadcasting services in the 800 MHz band. It was submitted that interference would be an issue because there would be a cost in fixing or preventing interference to PMSE. It was also submitted that PMSE users could not currently bear those costs.

Various views were provided in relation to potential solutions on how best PMSE spectrum uses could be accommodated in the future in Ireland.

The solutions proposed consisted of ComReg providing other suitable spectrum for PMSE. In particular, three specific solutions were proposed. The first was that interleaved spectrum should be used instead of channel 69 for PMSE uses in Ireland. The reason for this was that interleaved spectrum would be suitable for localised uses and there would be a relative abundance of interleaved spectrum.

The second was that PMSE should be reallocated another 8 MHz channel lower down in UHF band, specifically channel 38. The reason for this was that ComReg could follow Ofcom's lead in this matter as this issue had been extensively studied in the UK and channel 38 was found to be a suitable replacement channel. Alternatively, these respondents suggested that ComReg should wait and see what developments occur at the European level in relation to PMSE. The reason for this was that Ireland could benefit from implementing any European best practice on how to accommodate PMSE.

Another potential solution proposed by certain respondents was that PMSE should be allowed to operate in 800 MHz band, however, under specific restrictions for example, in the duplex gap of the CEPT proposed band-plan. No reasons were given for this solution.

Another view submitted was that there should be an appropriate plan developed by ComReg, which would include details of the timeframe and costs in relation to how Ireland would deal with the channel 69. The reason for this was to provide certainty and time to PMSE users to make any future changes. It was also suggested that the channel 69 issue could benefit from further study.

6.2.3 ComReg's Position

As previously stated, ComReg considers that reserving, in so far as possible, the entire 800 MHz band for services other than broadcasting services would achieve one of the key objectives set down in the DCENR National Policy Framework on digital dividend.

In relation to the cautionary view that there could be insufficient spectrum availability below the 800 MHz for broadcasting, ComReg takes the view that a frequency plan to accommodate the core broadcasting requirements, in so far as possible, below the 800 MHz band has already been developed. This plan has been developed in conjunction with the BAI and RTÉ.

In relation to the cautionary view that interference to cable systems could be an issue, ComReg is of the view that this is not a spectrum management issue but a matter for equipment standardisation bodies to address. The reason for this is that a cable system uses spectrum in a closed system under electromagnetic compatibility rules not spectrum management ones. Furthermore, ComReg understands that the RSPG has adopted a similar approach.

Channel 69 and the 800 MHz band

In light of the various views that the use of channel 69 would fragment the 800 MHz band and that a solution for PMSE should be found, ComReg considers that there would be considerable merit in accommodating the spectrum needs of PMSE outside channel 69.

ComReg believes that such work would be best carried out at a European level and notes the studies in progress by CEPT on this matter.[19] PMSE often uses different frequencies in different countries and European harmonisation of the relevant standards could ensure that economies of scale develop for PMSE equipment. ComReg also considers that cognitive technologies could become the de facto way forward for all PMSE.

At this stage, ComReg considers that it would be too early to consider whether a replacement channel would be required for channel 69 in Ireland, however, it is cognisant of the work undertaken by Ofcom in the UK in relation to a replacement channel for PMSE uses. It also considers that it would be too early to consider whether or not, in practice, PMSE could use the duplex gap in the CEPT proposed band-plan.

ComReg will provide further information on the future spectrum availability for PMSE uses in Ireland in further consultations.

[19] The ECC TG4 project group is studying issues related to PMSE uses in the UHF band.

6.3 Potential additional sub-band

6.3.1 Consultation Questions

Q. 11. **Do you consider there to be merits in the identification of additional sub-band(s)? If so, please provide details in terms of timing and any other details which you consider relevant and reasons for your view. If not, please provide details and reasons for your view.**

Q. 12. **What type of channel configurations would you consider would deliver most economies of scale in terms of availability of equipment and tuning / roaming of equipment? Please explain in terms of an indicative channel plan of frequencies, see for example Figure 2.0, and if you propose a channel configuration please give details of how this might impact broadcasting use of the band?**

6.3.2 Views of Respondents

There were mixed views in relation to whether there would be merits in the identification of additional digital dividend spectrum sub-bands.

On the one hand, certain respondents contended that there could be significant merits associated with the identification of additional digital dividend spectrum for reasons previously given (*see Section 4 and Section 6*). These reasons include:

- increasing competition in ECN and ECS;
- favourable propagation characteristics;
- the findings of research studies; and
- the benefits associated with frequency harmonisation.

In addition it was submitted by some respondents that the level of demand for spectrum for broadcasting services may not materialise, and if additional digital dividend spectrum bands were not identified at this stage valuable UHF spectrum could lie fallow.

On the other hand, other respondents did not see merits in the identification of additional digital dividend spectrum sub-bands at this time. These respondents submitted that to identify and realise other sub-bands would reduce the quality of terrestrial broadcast networks and increase the number of transmitter sites required to meet national coverage targets.

Other respondents submitted that there would be no merit in identifying more digital dividend spectrum if it were to be at the expense of any spectrum bandwidth already identified in the 800 MHz band.

Other relevant reasons and considerations

Certain respondents submitted that ComReg should assess the degree of harmonisation of potential additional digital dividend spectrum sub-bands. The reason for this was that countries which would deviate from a harmonised approach would likely limit the potential benefits.

It was also submitted by certain respondents that the current frequency plan would have to be recast, which could be a time consuming process. It was suggested that it would be helpful for ComReg to therefore, identify frequency planning scenarios and options in order to help Ireland quickly adapt to other spectrum sub-bands as it would ensure flexibility in spectrum planning and minimise the risk of isolating Ireland.

Another consideration, which certain respondents submitted, was that a full cost-benefit analysis should be carried out by ComReg on potential additional digital dividend spectrum as such an analysis could help strengthen the case for identifying additional digital dividend spectrum.

Channelling arrangements for additional digital dividend spectrum

In the main, respondents did not provide indicative channel plans for additional digital dividend spectrum as most considered that it was too early to begin to identify additional digital dividend spectrum.

Certain respondents, however, provided high-level views on the potential channelling arrangements. These respondents submitted that the 700 MHz band, which was made available for non-broadcasting services in the US, should be considered by ComReg given it might offer immediate economies of scale for equipment tuning and roaming of services. Certain respondents also considered that ComReg should study the lower sub-band being proposed by Ofcom[20], the 600 MHz band (channels 31 to 37), and monitor the ongoing work in the Asian and Pacific region in relation to digital dividend spectrum.

Many respondents advocated that the most valuable channelling configurations would be the ones which formed contiguous frequency blocks of spectrum as this would increase the bandwidth for applications.

6.3.3 ComReg's Position

ComReg is of the view that the possibility of identifying additional digital dividend spectrum should be investigated as there are likely to be considerable benefits for Ireland. The reason for this is that additional digital dividend spectrum could enhance the levels of competition in the ECN and ECS for the benefit of consumers.

[20] Digital Dividend: clearing the 800 MHz band. 30 June 2009. http://www.ofcom.org.uk/consult/condocs/800mhz/statement/

ComReg notes that any additional spectrum identified would have to be compatible with the DCENR National Policy Framework on digital dividend so that spectrum requirements for core broadcasting are met. ComReg also considers that the quality of broadcast network coverage should be a factor in identifying additional digital dividend spectrum.

ComReg sees little merit in identifying more digital dividend spectrum if this was at the expense of spectrum already identified, e.g. the 800 MHz band. The reason for this is that the 800 MHz band has potential considerable benefits in its own right *(see Section 4.1.3)*.

Other relevant details

ComReg sees much value in the harmonisation of frequencies with other larger markets.

In this regard, ComReg would see value in developing a series of options and scenarios in relation to other possible sub-band(s). This, it considers, would allow Ireland to react swiftly to potential international developments. Furthermore, adopting such an approach would ensure that ComReg could be flexible in relation to international developments.

ComReg does not consider that a full-cost benefit analysis should be carried out on identifying additional digital dividend spectrum at this time, as it would unlikely provide any additional useful information particularly as there is considerable uncertainty in relation to possible additional sub-bands. Notwithstanding the above, it may be worthwhile revisiting this issue in due course.

While certain respondents emphasised the CEPT proposed band-plan[21] as a potential band-plan for Ireland, ComReg considers that other band-plans may develop and ComReg should not limit Ireland's potential band-plan. There may be a greater potential for innovation and investment by selecting other band-plans by the time Ireland is ready to award digital dividend spectrum. ComReg, therefore, considers that in the future the CEPT proposed band-plan may be just one of several potential band-plans.

Channelling arrangements for additional digital dividend spectrum

ComReg's current view in relation to potential channelling configurations is that the market, as a whole, should logically have more information regarding potential channel configurations than ComReg and that it is too early to reliably indicate detailed channelling arrangements for additional digital dividend spectrum. ComReg is satisfied that it would be more appropriate to return to this issue in later consultations as required.

[21] The CEPT proposed band-plan includes both frequency division duplex and time division duplex channelling arrangements.

In relation to the indicative band-plan proposals from certain respondents, ComReg sees some merit in closely following international developments, particularly in relation to the applications and services, and their associated spectrum requirements, which may be deployed in the 700 MHz band in the US, or the 600 MHz band in the UK.

In general, ComReg's initial views in relation to channelling arrangements are that it would be desirable for it to allow the market to select the most appropriate configurations bearing in mind any conditions of the band, which ComReg may have to set in order to aid compatibility between existing or future planned DTT services and non-broadcasting services.

ComReg agrees with respondents that additional digital dividend spectrum would most likely be more valuable to the market if it consisted of contiguous spectrum blocks.

ComReg considers that it would be prudent to prioritise its work in relation to realising a digital dividend in the 800 MHz band, while at the same time tracking international developments in relation to other potential digital dividend spectrum bands so as to ensure that Ireland maximises its benefits from the digital dividend.

7 Consultation Issue: Accelerating access to a sub-band

7.1.1 Consultation Questions

Q. 13. Do you consider there to be merits in accelerating access to a digital dividend sub-band in Ireland? If so, what considerations do you believe would need to be taken into account and how would they impact accelerating access to the digital dividend, for example (i) possible opportunity costs of delayed access; (ii) time-table for analogue television switch-off; (iii) geographic location of potential cleared spectrum bands; (iv) risk of fragmentation of digital dividend; and (v) any other risk/benefits which would need to be considered.

Q. 14. What would you consider to be an optimal time for holding awards for digital dividend spectrum? Please refer to the considerations outlined in question 13 above.

Q. 15. Please qualify your answers to questions 13 and 14 in terms of what benefits might accrue to Irish consumers and citizens and Ireland's digital economy if access to a sub-band could be made available as soon as possible.

Q. 16. Please also provide views on the opportunity cost of delayed access to cleared spectrum and the possibility of negotiating early access directly with broadcasting spectrum users.

7.1.2 Views of Respondents

There were mixed views in relation to the merits of accelerating access to digital dividend spectrum in Ireland.

On the one hand, certain respondents submitted that competition in ECN and ECS could be realised sooner if access was accelerated. There were, however, no detailed views given in relation to the nature and level of competition, which would result.

In addition, it was also submitted by certain respondents that accelerating access to the digital dividend spectrum would accelerate access to digital services in Ireland. These respondents submitted that Ireland was lagging its European counterparts in relation to the availability of digital services and that digital dividend spectrum provided a once in a lifetime opportunity to regain lost ground.

Some respondents contended that the merits of accelerating access to digital dividend spectrum were reflected in terms of the opportunity cost of delayed access. For example, it was submitted that one high level analysis suggested the cost to Europe of a three year delay in making available the 800 MHz band could be of the order of €20bn.[22] Therefore, in the opinion of some of these respondents, Ireland should try to minimise the opportunity cost of delayed access to digital dividend spectrum because it was likely there would be large opportunity costs.

Other, respondents provided cautionary views in relation to the merits of accelerating access to digital dividend spectrum in Ireland. These respondents submitted that there would be little merit in accelerating the access to the digital dividend spectrum without the necessary equipment being available to use the spectrum. These respondents stated that this would give rise to spectrum being temporarily unused and this should be avoided as it would not be an efficient use of spectrum.

Further, it was submitted that it would be difficult to see how the opportunities presented by accelerating access to the digital dividend spectrum could be obtained in practice given that broadcasting spectrum users would be required to temporarily use some spectrum in the 800 MHz band. For instance, broadcasters would have to move out of the 800 MHz band sooner than planned and would not be in a position to bear the migration costs. Furthermore, time would be needed to address potential impact to television viewers' services as there may be a need to communicate new tuning information.

Even though there were mixed views there was a collective view that this issue was very complex and likely to change as the European political and technical studies concluded.

Timing

There were equally mixed views in relation to an optimal timing for holding award(s) for digital dividend spectrum.

Certain respondents submitted that the award(s) should take place before 2012. Two main reasons for this were given. Firstly, if the awards took place before 2012 they would likely coincide with the timing of awards taking place in other European countries. This, it was submitted, would assist investors make more informed planning and investment decisions. Secondly, it was submitted that equipment manufacture would be fostered, as the award of digital dividend spectrum across Europe would give confidence to service providers to make investments. One respondent submitted that holding the awards prior to 2012 would force Ireland to take a decision on an ASO date as it considered Ireland was lagging its European partners and the absence of a firm ASO date was creating uncertainty for market players.

In contrast, other respondents submitted that an optimal timeframe for holding award(s) for the digital dividend would be after an ASO date was set. These

[22] Spectrum Value Partners, Getting the most out of the digital dividend, 2008.

respondents submitted that this would allow award proceeds to fund the broadcasting migration process and speed it up.

Certain respondents submitted that the award(s) should take place once there is sufficient surety in relation to the harmonisation of digital dividend spectrum across Europe. These respondents considered that this would minimise the risk of Ireland becoming isolated.

Other risk/benefits which would need to be considered

In relation to the process of accelerating access to a digital dividend spectrum, certain respondents considered that earlier access would increase the potential to create jobs in the ICT sector and to develop key skills and expertise in digital dividend, which would ensure Ireland's future competitiveness.

In general, respondents submitted that the harmonisation of frequencies would be a critical success factor in Ireland benefiting from its digital dividend spectrum and that this factor could strengthen the case for accelerating access.

Opportunity cost of delayed access

Few respondents commented in detail in relation to the opportunity cost of delayed access, although it was submitted that the cost to Europe of a three year delay in making available the 800 MHz band could be of the order of €20bn.[23]

Some respondents provided general views on this issue and submitted that mobile broadband could suffer from delayed access, resulting in higher prices and restricted choice for the consumer. Other respondents considered that a cost and benefit analysis needed to be conducted, which would focus exactly on this issue in relation to Ireland.

Negotiating early access directly with broadcasting spectrum users

Few views were received in relation to negotiating early access directly with broadcasting spectrum users. One respondent submitted that there would need to be an acceleration in the take-up of DTT services, which could be achieved with a subsidy on STBs for consumers. The reason for this was that ASO could not be achieved until DTT was in place and digital dividend spectrum could not be accessed unless ASO was achieved. Another respondent held the view was that there was a need for DCENR, ComReg and BAI to collectively ensure access to Ireland's digital dividend spectrum and, in so doing, balance the needs of competing spectrum users.

7.1.3 ComReg's Position

ComReg acknowledges that accelerating access to a digital dividend sub-band could provide scope for increased competition.

[23] Ibid.

ComReg considers that Ireland has a high level of penetration of digital services, and that the launch of Ireland's digital terrestrial platform, while delayed in comparison to the launch of DTT services elsewhere in Europe, should enable further competition in the provision of multi-channel TV for consumers.

ComReg agrees with the cautionary views provided by certain respondents in relation to accelerating access to a sub-band of digital dividend spectrum. In particular, it considers that there would be little merit to accelerate access to a sub-band if there was no equipment available to use it as this could lead to spectrum being left unused.

ComReg also agrees with the view held by some respondents that the benefits of accelerated access could be affected by broadcasting transmitter stations using part of the 800 MHz band spectrum before re-farming. The date for ASO is important in this regard as it would provide some further certainty.

Cognisant, however, of the estimates of the opportunity costs of delayed access and in light of the cautionary views provided by certain respondents, ComReg will keep the issue of accelerating access to the digital dividend under review.

Timing

ComReg has considered the comments received in relation to the optimal timing for holding awards for a harmonised sub-band of digital dividend spectrum.

ComReg acknowledges that, from certain spectrum users' perspectives, there could be a benefit if award(s) for Ireland's digital dividend sub-bands were held prior to 2012 as this might coincide with awards in other European countries thereby facilitating investment and planning.

ComReg also acknowledges that the optimal timing could well be after the date for ASO has been set as this would provide more time for broadcasting spectrum users to migrate out of the 800 MHz band and more certainty to potential bidders for digital dividend spectrum with regard to its availability.

On balance, ComReg believes that the optimal timing of any potential award of digital dividend spectrum would depend on a number of factors such as widespread adoption of a harmonised sub-band, availability of equipment, the potential to follow best practice in other Member States and confirmation of the date of ASO in Ireland. ComReg therefore intends to keep this issue under review.

Other risk/benefits which would need to be considered

ComReg sees merit in factoring the potential to create jobs in the ICT sector and to develop key skills and expertise in digital dividend, which would ensure Ireland's future competitiveness, into its analysis of digital dividend spectrum.

In general, respondents submitted that the harmonisation of frequencies would be a critical success factor in Ireland benefiting from its digital dividend spectrum and that this factor could strengthen the case for accelerating access.

ComReg also agrees with respondents' submissions in relation to the merits of harmonisation of digital dividend frequencies and will continue to monitor this issue.

Opportunity cost of delayed access & Negotiating early access with directly with broadcasting spectrum users

ComReg has considered the comments received in relation to the opportunity cost of delayed access to digital dividend spectrum for consumers and the possibility of negotiating early access with broadcasting spectrum users, and believes at this stage it would be premature to form any final views in relation to these matters. It will, however, keep these issues under review and may return to them in the course of additional consultations on this matter.

8 Consultation Issue: Other consultation issues

8.1.1 Consultation Questions

Q. 17. Do you consider that service and technology neutrality should generally be a key principle for spectrum rights of use arising from the digital dividend? Please provide reasons for your view.

Q. 18. Do you consider that spectrum rights of use arising from the digital dividend should exclude the ability to provide DTT services? Please provide reasons for your view.

8.1.2 Views of Respondents

Respondents generally favoured the principle of service- and technology-neutrality for the following reasons:

- It provides flexibility for spectrum users to deploy technologies and services using the spectrum;
- Changes in technology occur quicker than the establishment of policies;
- It lowers barriers to entry for market participants and encourages innovation; and
- It can bring value through interoperability.

However, one respondent submitted that a totally flexible approach to digital dividend spectrum may not ensure that the spectrum becomes available in a form suitable for enhanced mobile broadband services, as this respondent considered the CEPT proposed band-plan as the only suitable plan for mobile broadband services.

Notwithstanding the above, the majority of respondents were in support of commercial DTT services being excluded from potential digital dividend spectrum awards. Respondents viewed these services as content services and agreed that they should therefore be licensed and regulated by the appropriate agency (the BAI) under multiplex licences issued to the BAI by ComReg.

8.1.3 ComReg's Position

ComReg supports the principle of service- and technology-neutrality. It considers that it would be premature for ComReg to fix technical conditions as this might limit innovation and would reduce flexibility for users. It considers that it would be necessary for potential technologies to satisfy the technical conditions of the band, which ComReg may have to set to assist compatibility between non-broadcasting and DTT services.

ComReg also considers that the market may be in better positioned than it to decide the appropriate technologies, which use digital dividend spectrum. ComReg notes that there may be the possibility of commonalities in the activities undertaken by Member States in making the 800 MHz band available for new uses on a service- and technology-neutral basis and this could be important in fostering innovation in the use of the digital dividend spectrum.

9 Next Steps

ComReg intends to consult in the first half of 2010 on another set of high-level issues having regard to national and international developments in this area, which could include publication of the Revised RSPG Opinion and the EC's spectrum action programme. By so doing ComReg considers it may move Ireland closer to realising its digital dividend.

10 Annex 1.0 Summary of European situation

Denmark
On 22 June 2009 it was decided that the frequency band 790-862 MHz should in the future be used for purposes other than TV e.g. mobile broadband. A decision is to be taken by the Danish Minister of Science, Technology and Innovation on how the frequencies will be awarded.

Finland
ASO was achieved in Finland in 2007 and the 800 MHz has been available for broadband mobile systems since 2008.

France
The date for ASO in France is 30th November 2011. The final plan for Digital TV, currently under definition, will be progressively put in place during the switch over process. This Plan is expected not to include any entry in the frequency band 790-862 MHz. The 800 MHz band will be available for mobile communication as from 30th November 2011.

Germany
The analogue switch off had been finalised by the end of 2008. On 12 June 2009 it was decided to use the 790 to 862 MHz band for mobile broadband as soon as possible, by giving preferential consideration to rural areas in order to close-down coverage gaps. The reconfiguration of the broadcasting networks is being subject to the current bi- and multilateral coordination process. Germany intends to award the spectrum in 2010. The Key Elements of this proposal are outlined in the Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway for the award of frequencies in the band 790 to 862MHz for realising electronic communications services document.

Spain
Analogue switch-off is scheduled on 3rd April 2010. On the 2nd of June 2009, the Spanish government announced the objective of clearing the 790-862 MHz sub-band. A royal decree is in process, establishing that starting in 2015 this sub-band will be available for electronic communication services other than broadcasting, e.g. mobile broadband. The 800 MHz band will be available in Spain as a digital dividend for new applications as of 1st January 2015.

Sweden
There is some need for reconfiguration of Swedish plans and networks for digital terrestrial television in order to make the 800 MHz-band available for new uses. International co-ordination was initiated in 2008 and further progress is expected during 2009. There is no final date for co-ordination. It is foreseen that the current TV-transmissions in the 800 MHz-band can be relocated to the 470-790 MHz band during 2009. Existing licenses in 790-862 MHz for applications of PMSE (program making and special events) are granted until the end of 2009. The 800 MHz-band is therefore expected to be available for new uses in the time frame 2009-2010.

Switzerland

Switzerland decided to release its GE06-allocations in the band 790-862 MHz in favour of mobile services. In most parts of Switzerland this process has already been finalised. As far as possible new allocations for broadcasting in the band 470-790 MHz are identified and coordinated with neighbouring administrations.

UK

The UK intends to clear the 800 MHz band – 790-862 MHz, channels 61 to 69 in UHF Bands IV and V – of existing and previously planned users in a statement published on 30 June 2009. Following the decision to clear the 800 MHz band, a decision to migrate DTT to channels 39 and 40 (614-630 MHz) using a two-step hybrid approach is proposed. Under the current plans, migration will be completed by the end of 2013. Programme-making and special events (PMSE) currently uses channel 69 (854-862 MHz). The UK have decided to move this to channel 38 (606-614 MHz). Under current plans, the 800 MHz band is to be available for new uses in 2014.