# Draft Radio Spectrum Management Strategy 2016 to 2018 (Consultation 15/131)

## Submissions to Consultation 15/131

**Submissions Document**

**Reference:** ComReg 15/131s

**Date:** 20/04/2016

**An Coimisiún um Rialáil Cumarsáide**
**Commission for Communications Regulation**
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ÚDARÁS CRAOLACHÁIN NA hÉIREANN
BROADCASTING AUTHORITY OF IRELAND

1st February 2016.

Divisional Assistant to Market Framework,
Commission for Communications Regulation,
Irish Life Centre,
Abbey Street,
Dublin 1
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Dear Sir or Madam,

The BAI welcomes the opportunity to review and respond to ComReg's Consultation Document 15/131 – Draft Radio Spectrum Management Strategy 2016 to 2018. The draft document is timely given the recent outcomes of the WRC15 and European developments in relation to spectrum use and harmonisation.

The BAI broadly concurs with Sections 1 to 5 of the draft strategy document. It has noted the proposed work-plan for 2016 to 2018 and the topical spectrum management issues set out in section 7 of the document.

In relation to Section 7.6 & 7.70, the BAI agrees that social and other benefits of spectrum need to be taken into account when considering fees. In developing a strategy in relation to fees, a one fit or numeric based approach is not, in our view, appropriate. Broadcasting services, in particular, require a different consideration given their unique cultural relevance, the broader policy, legislative and regulatory environment in which they operate and the manner by which spectrum is planned and subsequently licensed. Clearly spectrum fees, if any, should consider the nature, scale and geographic reach of the service. This consideration is not just limited to the type of service (e.g. community or national) but to other factors including the transmission infrastructure[1] required to serve the entire area. The BAI would welcome the opportunity to further engage with ComReg in relation to this work area. Among the matters that could be considered are (i) the spectrum planning, co-ordination and WT licensing process that is currently used for analogue broadcasting, and (ii) fees including consideration of a review of SI 392 of 2003 - The Communications Regulation Act (2002) Section 30 Amendment - Levy Order. In its current form, it may act as a disincentive to providing coverage in low population areas and therefore may act against the wider public interest.

[1] In terms of FM radio coverage, Dublin city and county can be largely served using one transmitter station while Cork city and county requires a minimum of eleven. Also quasi-national services, such as Newstalk, require a larger number of transmitter stations due to power limitations related to its frequency range.

The BAI also notes that ComReg may commence consideration of the relicensing of the RTÉ radio and television digital multiplexes during the lifetime of the proposed draft strategy. As part of this process, the current spectrum fee may need to be re-considered. Section 135 of the Broadcasting Act 2009 permits spectrum fees to be set by ComReg for digital radio or television multiplexes. Such a fee structure should among other matters reflect the important cultural relevance of Irish broadcasting services, the broader national policy objectives and the mandatory legislative provisions that apply particularly in relation to the availability of free to air Irish broadcasting services via digital terrestrial multiplexes. In particular, in relation to DTT, the setting of any fees should also take cognisance of the significant resources that have been required to re-plan and re-engineer the DTT networks to allow for spectrum to be made available for other uses. The BAI believes that these public policy dimensions and cost contributions should be considered in determining the spectrum fees, if any, that may be proposed. The BAI also recognises the synergies that exist and the importance of a co-ordinated simultaneous migration of DTT services, north and south of the border, to new frequencies. Such transition plans will need further development during the lifetime of this proposed spectrum planning strategy.

The BAI has noted the relevant annexes to the document and in particular the various RTÉ licences that are due to expire in 2019. The sound broadcasting contracts, and associated wireless telegraphy licences, for a number of services including Newstalk, Today FM and various regional, local and community services will fall for consideration by the Contract Awards Committee of the BAI in the lifetime of both the current and new Comreg Radio Spectrum Management Strategy. Any ComReg decision in relation to fees will need to be reflected into the BAI contract award process. We would welcome clarity in relation to this matter at an early point.

Once again, thank you for the opportunity to respond to this consultation.

Yours faithfully,

Neil O'Brien

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# 2 BT Communications Ireland Ltd. (“BT”)

# BT Communications Ireland Ltd (BT) Comments to ComReg's:

# Draft Radio Spectrum Management Strategy 2016 to 2018

## Issue 1 – 1st February 2016

### 1.0 Introduction

Thank you for the opportunity to comment on this important subject area. Given the wide range of issues addressed in the consultation, we have limited our comments to issues of specific interest to BT Ireland and, so that we do not unwittingly distort the industry view, we are not providing comment to the other aspects of the document.

### 2.0 Detailed Comments

#### 2.1.1 The Internet of Things (IOTs) Reference ComReg Sub-sections 5.2.5 and 6.2.6

We agree with the view in clause 5.57 that the Internet of Things (IOTs) is a growth area which will have both an economic and social impact going forward and we consider focus must be maintained to facilitate increased investment both by vendors and users of this technology. We therefore support a progressive approach in 6.2 towards making appropriate and harmonised spectrum available in a timely way for SRDs and the IOT. Our preference is for the new bands identified for SRDs however we do recognise that SRDs and the IOT should also be able to operate within the WiFi bands. The reason for our preference is that some always-on or nearly-always-on SRDs could start to limit WiFi for Broadband access capacity.

Existing WiFi and future bands for Short Range Devices (SRDs).

- The 2.4 GHz licence-exempt band (2400 - 2483.5 MHz), e.g. using WiFi
- The 5 GHz licence exempt bands (5150 – 5350 MHz and 5470 – 5725 MHz), e.g. using WiFi
- We agree the bands 870 – 876 MHz and 915 – 921 MHz should be made available as identified in clause 6.2 (ii).
- 433 – 435 MHz and 863 – 870 MHz that are identified across Europe for “Non-specific Short Range Devices”.
- We also agree with the proposal to support Short Range Devices in the 76 to 79 GHz band.

#### 2.1.2 Smart Metering (Reference clause 5.16 and Annex 3 Table 3)

For deployment in Ireland we consider the lower the frequencies assigned or made available for Smart Metering the better.

The issue is not one of throughput for such systems, as by definition IoT is about small data transactions from vast numbers of devices; rather it is the propagation characteristics and range. The longer the range of a smart meter communications module the less the infrastructure required to support the connection. This is particularly applicable in a meshed radio infrastructure. In contrast the 5GHz band is fundamentally short range given the very low transmission power typical of an IoT end device.

### 2.2 The use of auctions for awarding spectrum rights of use for Electronic Communication Service ECS (Reference ComReg Sub-section 7.1)

In general we support the use of auctions for awarding licences in bands where demand is expected to exceed supply, as they are usually the best way to objectively identify the licence holder(s) who will make best use of the spectrum.

We agree that the best choice of auction design will depend on the individual circumstances, although we do not share ComReg's enthusiasm for the Combinational Clock Approach (CCA), because we believe that it can lead to excessive uncertainty (particularly in the supplementary bids round) and a lack of transparency.

### 2.3 Spectrum trading/transfers (Reference ComReg Sub-section 7.2)

We are strongly supportive of regulators permitting spectrum trading as this can lead to market based exchanges that increase the welfare not just of the parties to trade but society generally.

### 2.4 Appropriate duration for spectrum rights for ECS and timing of assignment processes (Reference ComReg Sub-section 7.3)

We agree that a licence should be (at the minimum) of sufficient duration to allow the necessary investment to be recovered on an economic basis. This should also recognise that there may be a delay between the issuing of the licence and the availability of suitable equipment for the band.

We continue to believe that there are advantages (in some circumstances) to indefinite licences, particularly in a fully liberalised market where spectrum trading provides an incentive to maximise return on spectrum which is not being used in an economically efficient manner.

### 2.5 The sharing of spectrum and collaboration between wireless operators (Reference ComReg Sub-section 7.4)

We are supportive of spectrum sharing where it can increase the use of the spectrum, without compromising the incumbent use.

Licensed Shared Access (LSA) is a promising approach, as well as advances in technology such as geolocation databases.

Collaboration between network operators to share elements of their network infrastructure provides a means to reduce costs, which can be passed onto customers, whilst maintaining a competitive marketplace.

### 2.6 Spectrum fees (Reference ComReg Sub-section 7.6)

We would agree that in an open and competitive market, spectrum fees are an important element to ensure that spectrum licences are held and used in the most economically viable manner. Fees should promote efficient use of the spectrum, and should not be seen simply as a revenue raising mechanism. Any ongoing fees should be transparent and predictable, to enable licence holders to factor these into their business plans.

### 2.7 Coverage/Rollout conditions (Reference ComReg Sub-section 7.7)

We recognise the value of applying coverage and rollout conditions in some circumstances, however we believe that in a fully competitive market they are of limited benefit (as confirmed by ComReg in §7.85).

Spectrum auctions do not necessarily coincide with the technology development cycles, and sometimes a licence might be obtained in preparation for the next generation of technology which might not yet be launched. Such strategic purchases could fall foul of a coverage/rollout condition which has been set on a "use it or lose it" basis; this could result in an operator having to deploy the current technology, rather than waiting and using the band for the next generation of technology.

Therefore we believe that coverage / rollout conditions are best suited to applications where there is little or no retail competition.

### 2.8 Technology and Service neutrality (Reference ComReg Sub-section 7.9)

We are supportive of the classification of service usage such as fixed, mobile, satellite, amateur radio, radio navigation (i.e. radars) etc. The choice of service(s) for the band will then set the constraints on regulations and/or licences. We agree that the principle of technology neutrality then acts as the incentive to make the most efficient use of the spectrum within the conditions set.

### *2.9 Transparency of radio spectrum information (Reference ComReg Sub-section 7.10)*

We would support radio spectrum information being made available on a transparent and open basis, providing this does not conflict with the need for commercial confidentiality, or matters of security.

End

*For enquires about our response please contact john.odwyer@bt.com*

# 3 Eircom Ltd. (“eir”) and Meteor Mobile Communications Ltd. (“MMC”) (“eir Group”)

**eir**

# Response to ComReg Consultation Paper:

# Draft Radio Spectrum Management Strategy 2016 to 2018

# Consultation on ComReg's radio spectrum management strategy

**ComReg Document 15/131**

**1st February 2016**

## DOCUMENT CONTROL

| | |
|---|---|
| **Document name** | eir response to ComReg Consultation Paper 15/131 |
| **Document Owner** | eir |
| **Last updated** | 1st February 2016 |
| **Status** | Non-Confidential |

The comments submitted in response to this consultation document are those of Eircom Limited (trading as 'eir' and 'open eir') and Meteor Mobile Communications Limited ('MMC'), collectively referred to as 'eir Group'.

## Response to consultation

eir welcomes the opportunity to comment on ComReg's proposed Radio Management Strategy for the period 2016 to 2018. The draft strategy document provides a broad and informative overview of the developments and challenges that inform the regulation of radio spectrum in Ireland. We are generally supportive of ComReg's analysis and proposed work-plan and would ask that our views on the following specific items be addressed in the forthcoming ComReg work programme.

## 3G Licence Liberalisation

We note it was ComReg's expectation to publish its response to Consultation 14/65 concerning the liberalisation of the paired terrestrial 2GHz spectrum band ('the 3G licences') in 2015[1]. It is a year and a half since Comreg sought views on the liberalisation of the 3G licences. ComReg proposes[2] to '*Continue ComReg's consultation process on liberalising the paired 2GHz band*". This suggests that ComReg does not intend to make a Decision on this matter in the work-plan period to 2018. Indeed ComReg states[3] the project's timing "*needs to be considered in light of other work programme priorities and the likely timing of the existing licensee's need for liberalisation in this band.*"

eir supports the move from ECC in 2012 to harmonise the use of the 3G bands and believes that liberalisation of the 3G band is a natural and timely step in the achieving this goal. The Czech Republic, Slovenia and Spain are examples of European countries that have already taken this step. There is no doubt that a significant part of future traffic will come from devices introduced as part of M2M, the super family Internet of Things (IoT) and e.g virtual reality. These services are currently entirely ignoring the 3G standard in the 3GPP roadmaps and 3G therefore has the potential to see a more rapid retirement than 2G. The ecosystem for IoT in 3GPP is evolving around LTE and it is therefore eir's view that liberalisation of the 3G spectrum should be accelerated to allow operators to leverage this relatively large spectrum block in a future proofed way. Significant innovation in both the RAN, device and service elements of the industry comes from Asia and 2100 MHz is currently being used for LTE in counties like Japan, Philippines and South Korea with more than 36% of all devices able to operate in the 2100 MHz band.

Liberalisation of the 3G licences creates opportunities for more innovative use of the radio spectrum. This is consistent with ComReg's objectives and the option to liberalise existing technology specific 2G licences was a feature of the MBSA. The work item should be amended to read: "*Conclude ComReg's consultation process on liberalising the paired 2GHz band before 30 June 2017*".

## Spectrum Leasing Framework

We note that ComReg seeks views on some matters relating to the development of spectrum policy, including preliminary views on high level issues regarding establishing a framework for the leasing of spectrum rights. eir does not believe that the draft spectrum strategy consultation is the appropriate vehicle to seek to progress spectrum policy issues particularly as the questions in relation to spectrum leasing are set out in a footnote which could be overlooked. This consultation is focussed on ComReg's work-plan and the relative prioritisation of the work items therein. Specific policy issues are better addressed through dedicated consultation papers that allow the issues to be considered in a coherent and comprehensive manner. With regard to spectrum leasing and a forthcoming consultation we believe that an over-arching objective should be to ensure that the leasing framework is established in accordance with the same principles and

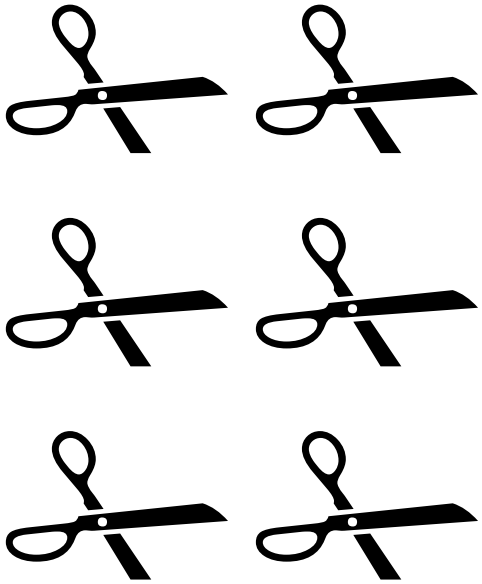
[1] See ComReg Information Notice 15/56
[2] Paragraph 6.14, ComReg 15/131
[3] Paragraph 6.15, ComReg 15/131

operates with the same checks and balances consistently with the already established trading framework. As ComReg notes in the footnote it will be important "*to ensure that potential transfer/leasing parties do not have incentives to "game" the respective review processes.*"

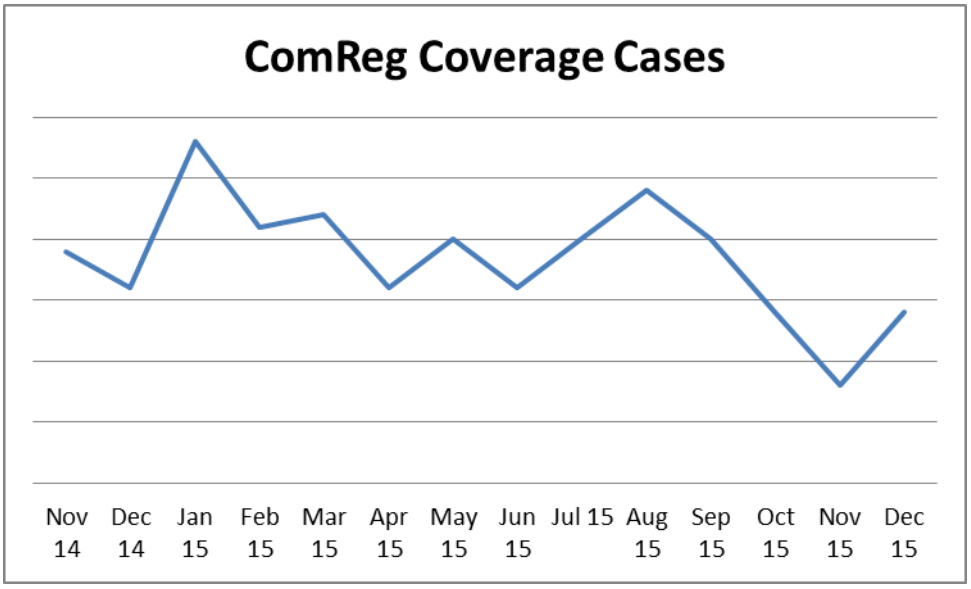
**Mobile retail consumer experience issues**

In the introduction to this topic ComReg "*notes some recently voiced views which suggest that the mobile consumer experience has deteriorated*" noting an Oireachtas Committee debate in November 2014 and ComReg's own publication (ComReg 15/122) of customer complaint statistics in November 2015 (although the compliant statistics are a snapshot in time and do not provide a trend). ComReg also notes that another source of information, its ICT consumer survey, shows that mobile phone users are more satisfied with the service in 2015 (90%) compared to 2013 (76%). This latter statistic is consistent with our own evidence that there has not been an appreciable decline in mobile customer satisfaction levels, at least in respect eir's mobile service.

We undertake regular consumer research and it can be observed from the below table that the perception of eir's mobile service is high and is consistently so. The performance of other mobile network operators may be influencing perceptions.



We have also considered the volume of complaints escalated by ComReg to our Customer Care function in respect of coverage issues. As can be seen from the following chart the monthly volumes over the last 14 months do not suggest a deterioration in customer perception.




We believe the persistent high levels of customer satisfaction reflect the fact we are continually improving our mobile network. In 2015 we added over 700 sites nationwide enabling:

- Extensive site coverage footprint expansion to improve voice capabilities and enhance customer experience
- Significant high speed data coverage improvements to improve data reach and speeds
- Addition of 4G data coverage capabilities to further improve data speeds in larger towns across the country

We also enabled High Definition (HD) Voice nationwide ensuring crystal clear calls

In 2016, we plan to continue our network investment to:

- Further enhance voice services through more site additions and our continuous improvement and optimisation programmes
- Add 4G data coverage capabilities to more larger towns across Ireland, adding further capacity to our high speed data layers
- Provide Converged Voice Services to ensure a seamless experience for our customers

In light of the above evidence it is not clear to us that a work package focussed on mobile retail consumer experience issues is necessarily the best use of ComReg's scarce resources. However there may be merit in such an exercise to the extent that it can bring an objective perspective to public debates. We would agree with ComReg that the six factors listed by ComReg on page 99 of the consultation paper are relevant for consideration if it is decided to proceed with this work item.

# 4 ESB Networks Ltd. (“ESBN”)

Energy for generations

Telecom Services, ESB Networks

# ESBN's response to ComReg's Draft Radio Spectrum Management Strategy (15/131)

01/02/2016

# Contents

# 1. INTRODUCTION

ESB Networks (ESBN) welcomes the opportunity to respond to the Commission for Communications Regulation (ComReg) consultation in relation to its Radio Spectrum Management Strategy 2016 to 2018[1].

Radio spectrum is a hugely important natural resource, enabling both critical and non-critical services to be deployed and made available for all citizens. It is a key enabler for the provision of wireless services which in turn generates significant economic, technological, social, environmental and safety benefits. In that regard, it is vital that appropriate radio spectrum is made available in a timely manner which brings the maximum benefit for the people of Ireland.

ESBN encourages ComReg to recognise the significant benefits that can be derived from Smart Grid, and ESBN believes that ComReg should consider making radio spectrum in an appropriate spectrum band available (e.g. 410 – 414 MHz paired with 420 – 424 MHz) for the utility sector. Harmonisation of spectrum is not a requirement for ESBN to deploy a network should relevant spectrum be made available.

# 2. INTRODUCTION TO ESB NETWORKS

ESB Networks Ltd. (ESBN), a regulated subsidiary within ESB Group, is the licensed operator of the electricity distribution system in the Republic of Ireland. ESBN is responsible for building, operating, maintaining and developing the electricity network and serving all electricity customers in the Republic of Ireland.

The electricity distribution network includes all distribution stations, overhead electricity lines, poles and underground cables used to bring power to more than 2 million domestic, commercial and industrial customers connected to the electricity network nationwide. ESBN also maintains the high voltage transmission network in Ireland on behalf of the Transmission System Operator (TSO) EirGrid.

Secure telecommunications is vital to the safe and efficient operation of the grid. The electricity network depends heavily on having high quality and high availability communications infrastructure (meeting specifications for back up; redundancy; resilience; low delay and jitter). ESBN deploys and operates extensive fixed and wireless telecommunications infrastructure to provide ESB and EirGrid with necessary real time information for operational purposes (i.e. to control and monitor the distribution and

[1] http://www.comreg.ie/_fileupload/publications/ComReg15131.pdf

transmission networks). Such critical communication cannot always be provided by public communications networks, as these networks do not satisfy the network requirements.

Services which ESBN deploy and manage include:

- Supervisory Control and Data Acquisition (SCADA)
- High Voltage protection circuits
- Disturbance recorders
- Energy metering
- Operational Telephony
- Private Mobile Radio (PMR)
- Corporate telecommunications

ESBN uses numerous media to deliver required telecommunications, namely:

- Microwave Radio
- Fibre network
- Satellite
- Polling Radio
- Power Line Carrier
- Copper/DSL

ESBN's telecommunications network requires connectivity in a significant number of locations within the country, often in remote areas and with inhospitable environment (e.g. within High Voltage substations). A significant proportion of ESBN's telecommunications network relies solely on wireless for several reasons, including situations where it is technically difficult to use cables to connect devices to the network, or where it is not economically feasible. Radio spectrum is an important enabler of ESBN's existing network.

Radio spectrum will be even more significant it the future. In order to meet Ireland's challenging 2020 renewables energy targets, the amount of wind power connected to Ireland's electricity grid must be greatly increased. Ireland has some of the most ambitious 2020 targets within Europe, with EirGrid stating[2] in its most recent Renewables Report that;

[2] Annual Renewables Report 2013, Eirgrid
http://www.eirgrid.com/media/EirGridAnnualRenewableReport2013.pdf

> "*No other synchronous system of scale manages the same levels of instantaneous wind penetration levels (50%) seen today, and no other synchronous power system is aiming to safely and securely manage real-time wind generation penetration levels of 75% by 2020.*"

EirGrid also state in its most recent Annual Report that;

> "*Government environment and energy policies coincide around the target of generating 40% of electricity from renewable sources by 2020. We are determined to play our part in achieving that objective.*"[3]

Generation of renewable (particularly wind) energy can be unpredictable, with quantum of energy generated and available at any time depending greatly on prevailing atmospheric conditions. Another unpredictable and increasing energy source is solar energy. There has been and continues to be significant investment in solar energy in Ireland[4], which is also a low-carbon energy source. Solar energy will contribute increasing amount of energy to the Grid in the future[5], and this can only be achieved with additional intelligence in the electrical network. Both of these energy sources creates the opportunity for 'prosumers'[6] to participate in the energy market. This hugely complicates the electrical network, as there will be significant variances and unpredictability in supply and demand of electricity to and from the network due to a multitude of factors. Decentralised intelligence and control is required to support such innovation[7].

Safe, efficient and reliable integration of this amount of wind and solar power on the electricity network requires much more sophisticated and real time telecommunications infrastructure. To meet these challenges ESBN needs to continue to be at the forefront of Smart Grid developments[8].

Another area of significant interest to ESBN is reducing carbon emissions in the provision of electricity. Reductions in CO2 would provide significant social, economic and environmental

[3] EirGrid Annual Report 2014, www.eirgridgroup.com/site-files/library/EirGrid/Annual-Report-2014.pdf

[4] http://www.irishbuildingmagazine.ie/2016/02/01/kingspan-completes-the-largest-solar-pv-project-in-ireland/

[5] http://www.irishtimes.com/business/energy-and-resources/future-looks-bright-for-irish-solar-power-1.2507134

[6] Large amount of small generating units feeding a smart grid that can both supply power to consumers and take it back from them.

[7] http://www.irishtimes.com/sponsored/future-shock-esb-powers-towards-transformation-1.2376405

[8] In December 2013 IBM Worldwide chose ESB Networks as the exemplar international utility for 2013 because of its work in the Smart Grid area, http://www.ibm.com/smarterplanet/uk/en/leadership/article/esb.html and http://www.ibm.com/smarterplanet/global/files/us__en__us__leadership__esb_case_study.pdf.

benefits. At the UN summit on Climate Change in Paris in 2015, Taoiseach Enda Kenny stated that Irish legislation will set out objectives under four headings dealing with carbon emissions generated from agriculture, energy, buildings and transport.[9] ESBN endeavours to minimise CO2 emissions, and a smarter electricity grid would facilitate such a reduction.

The Sustainable Energy Authority of Ireland (SEAI) has a deep understanding of the energy industry and issues that are important now and into the future. SEAI recognise that Smart Grid is an important lever to facilitate reductions in carbon in the energy sector;

> "*Ireland faces the same long term energy challenges as the rest of the world: a need to move towards competitively priced,* ***environmentally sustainable****,* ***low carbon energy sources****; and an insecure supply of conventional fossil fuels on which we are now dependent…****A smart grid can help us address these challenges by maximising our use of indigenous low carbon renewable energy resources****. A systems-based approach that optimises energy supply with demand for energy services and maximises our use of indigenous renewable electricity is central to ensuring Ireland meets its long term target of a secure and low carbon future.*"[10] [emphasis added].

## 3. SMART GRID

> "*A Smart Grid is an electricity network that can cost efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure an economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety. Though elements of smartness also exist in many parts of existing grids, the difference between a today's grid and a smart grid of the future is mainly the grid's capability to handle more complexity than today in an efficient and effective way.*"[11]

Smart Grid technology is being deployed worldwide (e.g. Alliander in the Netherlands[12], various utilities in Canada[13]). Both the Dutch and Canadian Smart Grid deployments have been hugely successful in operating an efficient and low carbon electricity network. These Smart Grid deployments have allowed increased control of the electricity network, but more importantly they have allowed optimisation of electricity generation (e.g. peak load management) and electricity consumption (e.g. balance of supply and demand to improve quality of power). Smart Grid also enables the integration of additional renewable energy

[9] http://www.rte.ie/news/2015/1130/750131-climate-change/

[10] SEAI's Smart Grid roadmap document, www.seai.ie/Publications/Statistics.../SEAI.../Smartgrid_Roadmap.pdf

[11] ETSI definition of Smart Grid, http://www.etsi.org/technologies-clusters/technologies/smart-grids

[12] Explanatory video on Alliander's network available here, https://www.youtube.com/watch?v=JIL0WDK8YKk

[13] http://www.nrcan.gc.ca/energy/electricity-infrastructure/smart-grid/4565

onto the electrical network by providing greater visibility of the network and energy generation.

Smart Grid's can provide significant socio-economic benefits. For example, some studies carried out in the United States conclude the following[14]:

- Smart Grids can reduce emissions by 60 to 211 million tonnes of CO2 per year by 2030. [Electric Power Research Institute 2011]
- Smart Grids are expected to achieve a 12% reduction in electricity consumption and CO2 emissions in 2030. [Pacific NorthWest National Laboratory]
- Smart Grid combined with changes in generation and end-use options could reduce by 2030 annual CO2 emissions from the electric sector by 58% relative to 2005. [Electric Power Research Institute 2011]

A recent report by the Irish Corporate Leaders on Climate Change[15] outlines the major benefits arising from deploying a Smart Grid in Ireland, stating;

> "*The roll out of the **Smart Grid is a critical lever for enabling and capturing green-growth possibilities across the economy**. It is **critical to managing variability of wind**. Low-carbon power in turn can be used to decarbonise end-use sectors (through the electrification of heat and transport, see below), and **allows for the more optimal use of generation assets through "demand response**" (for example, decreasing electricity tariffs to households when the wind is blowing). Deployment of the Smart Grid therefore joins together three of the most important pillars of Ireland's decarbonisation: integration of wind, smart zero energy buildings, and electrification of transport and heat…*
>
> *The optimal use of electricity in end-use sectors, and the optimisation of grid resources, will be facilitated by the deployment of a Smart Grid (see above), allowing the heat and transport sectors to play a role in managing variable electricity production. Electric vehicles and plug-in hybrids will be key technologies, and smart electrical heating technologies and heat pumps are very likely to also play a significant role…*

[14] Source: "The Socio-economic value of spectrum in providing utility services to support their operations": Report by The Joint Radio Company Ltd on behalf of the European Utilities Telecommunications Council: 20 January 2014

[15] http://www.foe.ie/download/pdf/unlocking_opportunity_the_business_case_for_climate_action_in_ireland.pdf

*SEAI estimate that more than **10,000 Irish jobs will be created** by the implementation of Smart Grid infrastructure and its associated technologies; up to **eight million tonnes of CO2 mitigation could be derived** directly from the implementation of Smart Grid; and a **net reduction in energy imports of over 4.3 Mtoe**, [equating to **savings of €2.4 - €5.2bn** in direct fuel offset by 2050] would also be delivered."* [emphasis added].

## 3.1 Technical Requirements of a Smart Grid

Smart Grid requires stringent technical performance of the underlying telecommunications network that is being utilised. Smart Grid requires almost instantaneous communications with certain applications, extremely high availability of telecommunications channel, coverage from designated base station and robust cybersecurity.

The European Utilities Telecom Council (EUTC) outlined the requirements of a mission critical network such as that required by Smart Grid;

"*Trust and control over these important mission-critical communications is of the utmost importance for utilities: the stability of the grid is dependent on these communications.*

*The communication systems needed by utilities can be characterised as follows:*

- *low to medium data rates;*
- *enhanced resilience*
- *longevity of products and support*
- *extensive geographic coverage (including less populated areas);*
- *stringent latency requirements;*
- *low jitter and synchronous requirements; and*
- *high levels of security.*

*The optimal combination of these different characteristics depends on the type of utility, the type of application or system, the environment in which the utility operates and the legacy systems already in place*."[16]

[16] http://eutc.org/system/files/UTC_private_file/EUTC%20Spectrum%20Position%20Paper-9April2013.pdf

The Radio Spectrum Policy Programme ('RSPP') was published in April 2012 on behalf of the European Parliament. Article 8 (2) of the RSPP states the following;

> "*2. The Commission shall, in cooperation with the Member States, conduct studies on saving energy in the use of spectrum in order to contribute to a low-carbon policy, and shall consider making spectrum available for wireless technologies with a potential for improving energy saving and efficiency of other distribution networks such as water supply, including smart energy grids and smart metering systems.*"

Article 8 (2) aims to reduce emission and improve energy savings with radio spectrum as the key enabler. The European Commission issued a report to the European Parliament and the Council on the implementation of the RSPP, published on 22 April 2014. Section 2.4 reviewed progress with respect to Article 8 (2) of the RSPP.

The EC is considering usage of commercial mobile networks to carry such mission critical communications. The European Commission appointed consultants (early 2014) to study the potential use of commercial mobile networks in "*mission-critical sectors*"[17]. The study is examining four critical sectors, utilities being one of these. Consultants SCF Associates Ltd published its final report in early 2015. The SCF report[18] stated that the only way in which critical applications like Smart Grid can rely on public mobile networks is if there is both massive investment in mobile network to deliver requirements of mission-critical network, and also unprecedented prescriptive and onerous regulatory intervention. In its conclusions on dedicated spectrum, SCF state "*Policy diversity among the MS makes the dedicated spectrum reservation and allocation choice an unavoidable option*".

It is unlikely that NRA's would intervene in the market place to the degree recommended by SCF. Also, it is unlikely that Mobile Network Operators (MNO's) will offer the required services on long term contracts as they are not guaranteed to have the supporting spectrum for the period suggested (up to 30 years). MNO's would find it extremely challenging to deliver the network characteristics and coverage required by utilities in addition to providing commercial wireless services to mobile users.

Robust cyber security is also imperative for critical infrastructure. Transmission System Operator's (TSO's) and Distribution System Operator's (DSO's) need to control their own networks to ensure the necessary level of protection. Recent cyber attack on the electricity

[17] https://ec.europa.eu/digital-agenda/en/news/study-use-commercial-mobile-networks-and-equipment-mission-critical-high-speed-broadband

[18] Presentation of report findings available here, https://circabc.europa.eu/d/a/workspace/.../AI-5-SCF_presentation.pdf

network in Ukraine[19] highlights the importance of secure telecommunications for electrical applications. Utilising MNO's services for mission-critical services creates significant vulnerabilities for utilities, as this would result in a mission-critical network sharing a telecommunications network with millions of unsecured and unencrypted public mobile devices.

The EUTC has correctly identified ESBN's technical performance requirements for a Smart Grid network, specifically resilient highly available communications, wide-scale (often in very remote areas) coverage, low latency, low jitter and high levels of security.

## 4. DEDICATED SPECTRUM

Public networks cannot provide ESBN with the requisite security, guaranteed Quality of Service, resilience, coverage as well as the other requirements noted by EUTC above. The following quote from ComReg in paragraph 5.43 of this Spectrum Management Strategy 2016 – 2018 recognises that public mobile networks are not the answer for critical services;

"*some critical services often require more resilient services with a higher quality of service than provided with public mobile networks*"

In reality this leaves the mission critical sectors (which includes ESB) with little choice but to deploy its own wireless services. However, supporting radio spectrum is required for this. In the event that ESBN did not have access to a sufficient amount of appropriate radio spectrum, this could create vulnerabilities through lack of resilience in key areas of the electricity network, with potentially significant impact on the Irish economy, environmental targets (e.g. integration of increasing renewable energy, reducing carbon emissions) and protecting safety of life. Access to appropriate spectrum and the timely introduction of appropriate licencing regimes has a vital influence for ESBN in permitting investment and innovation.

ESBN plays a key role in enabling spectrum to deliver benefits to end-users and industry nationwide. ComReg outlines in Chapter 3 of its spectrum strategy consultation document the fiscal contribution of spectrum to Irish GDP and social benefits (e.g. emergency services) generated, amongst other benefits. ESBN agrees that spectrum is a significant enabler to a modern society from an economic, social, technological and environmental perspective.

19 http://www.theregister.co.uk/2016/01/15/malware_clearly_behind_ukraine_power_outage_sans_utility_expert_says/

Spectrum is fundamental to a technologically advanced society. However, it is essential to have one additional enabler to allow spectrum make such contributions to society.

The advantages of spectrum are reduced (and perhaps redundant in some instances) without access to a highly reliable and available electricity network. Some key radio systems have limited back up power in Ireland, but in reality all radio systems in Ireland rely on the electricity network controlled by ESBN. Facilitating ESBN in acquiring dedicated spectrum would enable it to deliver a more secure, efficient, reliable electrical network which would only enhance the utility and availability of all radio spectrum users in Ireland.

The benefit to ESBN of deploying its own Smart Grid network includes:

- Real-time monitoring of grid state and automated analysis of grid data collected from Substations, Feeders, Meters, Reclosers and other Intelligent Electronic Devices (IEDs) will assist operations staff in the safe and efficient operation of the system. It will also enable more rapid and precise diagnosis of the root cause of power outages, resulting in faster restoration of supply as well as minimising the number of customers affected.
- Real-time communications among work crews, operations staff and operations systems will provide enhanced situational awareness, supporting automated switching systems to reduce the number of customers affected by grid faults. By reducing the reliance on slow manual electrical switching and instead using automated switching systems, the duration of customer outages will also reduce.
- Data mining of power quality and other grid performance data will assist operations staff proactively identify and replace faulty equipment before catastrophic failure, thus avoiding customer outage minutes.
- Post-incident fault analysis using data collected from a wide spectrum of IEDs deployed in substations and throughout the distribution grid can help utilities clearly determine the root cause of outages, helping improve their design practices.
- Collection of accurate, information-rich historical data can help utility staff improve their design, operation and maintenance processes.
- Improved situational awareness supports electronic completion of service orders, proactive outage notifications and avoids customer outage minutes.

This wireless network is fundamental to the secure deployment of the following ESBN electrical use cases and applications:

- Electrical continuity enhancement
- Peak load management
- Fault passage indication
- Field and substation asset management
- Condition monitoring
- Distribution automation
- Power quality monitoring and control
- EV charging control
- Electrical protection schemes

ESBN believes that ComReg should ensure that it plays it part in enabling the government's policy objective of facilitating "*world-class communications infrastructures, technologies and services for the express purpose of raising our competitiveness, contributing to our economic development and improving the quality of life of our citizens*"[20] by ensuring that appropriate radio spectrum is made available. This would be consistent with the third of DCENR's *Current Spectrum Policy Objectives*[16], *"Adequate spectrum will be made available for essential public services and for the fulfilment of social and cultural objectives using appropriate assignment mechanisms"*.

The *Current Spectrum Policy Objective* states that the Minister is committed to ensuring radio spectrum is "*managed and used effectively and efficiently*". ESBN considers that where there is demand for unused spectrum, efficient and effective management would require the rapid allocation and assignment of that spectrum.

There is precedent in other countries with respect to utilities getting access to licensed spectrum to build a smarter electricity grid as outlined below.

Alliander in the Netherlands were licensed in 2010 with spectrum in the 450 MHz range and use CDMA to deliver both Smart Grid and Smart Metering functionality. Alliander are the licensee and created a partnership with KPN to roll out the network on their behalf.

Spectrum was made available in Canada for all utilities to use as required. 20 MHz was designated for usage, with 5 MHz guard band either side of this 20 MHz (1800 – 1830 MHz). The spectrum was made available to any utility or service provider in 2008 on condition that it is used to meet electric utility operational requirements subject to approval by the regulator. In UTCC's submission to Industry Canada[21] it was noted that the licensing fees must be nominal in recognition of the vital role that power utilities play in the nation's economy and security. Existing users of the spectrum includes Hydro One, Manitoba Hydro and BC Hydro, amongst others.

Arqiva are assigned 412 – 414 MHz paired with 422 – 424 MHz to deliver Smart Metering to 10 million gas and electricity users in the UK. This solution is delivered in conjunction with equipment supplier Sensus.

[20] http://www.dcenr.gov.ie/NR/rdonlyres/83EB5634-66B9-45DE-9362-24414408E4AC/0/SpectrumPolicyStatement.pdf

[21] www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-008-08-utc-2.pdf/$FILE/smse-008-08-utc-2.pdf

Smart Grids and all the benefits it delivers, requires radio spectrum, without which Smart Grid technology is redundant. Without dedicated radio spectrum, citizens of the state will not reap the economic and social benefits of Smart Grids. Society and industry will not reap the economic benefits, and society as a whole will not reap the significant environmental benefits.

# 5. COMREG'S OBJECTIVES

ESBN considers that numerous ComReg objectives and obligations would point towards making the 410 – 414 MHz paired with 420 – 424 MHz (denoted '410 MHz spectrum' for the rest of this document) available in expedited manner.

*ComReg's primary objectives under the 2002 Act in carrying out its statutory functions in the context of electronic communications are to:*

- *promote competition;*
- *contribute to the development of the internal market;*
- *promote the interests of users within the Community;*
- *ensure the efficient management and use of the radio frequency spectrum in Ireland in accordance with a direction under Section 13 of the 2002 Act; and*
- *unless otherwise provided for in Regulation 17 of the Framework Regulations, take the utmost account of the desirability of technological neutrality in complying with the requirements of the Specific Regulations in particular those designed to ensure effective competition*

ESBN contends that release of the 410 MHz spectrum would promote competition and the interests of users in Ireland by facilitating deployment of an additional network. Releasing spectrum invariably contributes to efficient management and use of radio spectrum. Withholding available spectrum when a user wishes to utilise for wireless services is inefficient use of spectrum and management of spectrum, and not releasing the 410 MHz spectrum band would therefore be inefficient.

*Section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:*

- *ensuring that there is no distortion or restriction of competition in the electronic communications sector; and*
- *encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources.*

ESBN again contend that withholding spectrum which a user would like to utilise for wireless services is in conflict with ComReg's promotion of competition objective regarding efficient use and management of radio frequencies.

*In pursuit of its objectives under Regulation 16(1) of the Framework Regulations and Section 12 of the 2002 Act, ComReg must apply objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things…promoting efficient investment and innovation in new and enhanced infrastructures.*

ESBN believes that withholding 410 MHz spectrum eliminates the opportunity for ESBN (or another party) to utilise the spectrum. Releasing 410 MHz spectrum would be in line with ComReg's objective to promote "*efficient investment and innovation in new and enhanced infrastructures".*

*Section 12(4) of the 2002 Act provides that, in carrying out its functions, ComReg must have appropriate regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to the Commission, in relation to the economic and social development of the State.*

DCENR's response to its Spectrum Policy document[22] will be of interest in this regard.

*Policy Direction No.11 on the Management of the Radio Frequency Spectrum:*

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

ESBN argues that its interests have not been accounted for in ComReg's spectrum strategy document. ESBN has notified ComReg previously of the requirement for spectrum to be released (specifically 410 MHz spectrum band) for Smart Grid and this has not been addressed in ComReg's spectrum strategy document.

# 6. 410 MHZ SPECTRUM

ESBN has a requirement to deploy telecommunication services to both urban and rural areas, often with a relatively low data rate and low duty cycle. ESBN also has stringent requirements (listed previously in this document) which cannot be achieved by third party providers. ESBN therefore requires dedicated radio spectrum to meet this requirement.

[22] http://www.dcenr.gov.ie/communications/en-ie/Pages/Consultation/Spectrum-Policy-Consultation.aspx

The 410 MHz spectrum band is appropriate for wide scale deployment of remote devices in all economic manner. ESBN has no viable alternatives for deployment of Smart Grid technology as higher spectrum bands increase the Capex and Opex exponentially due to requirement of increased base stations to deliver same coverage as 410 MHz.

ComReg has omitted the existing 410 MHz spectrum band from its proposed spectrum strategy from 2016 - 2018. The spectrum licence for 410 MHz expired in 2015. ComReg has set a precedent that it consults on the future of spectrum bands in advance of licences expiring (e.g. 900 MHz and 1800 MHz spectrum bands, the 3.6 GHz spectrum band, the 2.6 GHz band). Indeed, ComReg outlines at various instances (e.g. paragraphs 6.4 and 7.40) in its draft spectrum policy 2016 – 2018 that it is common practice for it to consider the future use of spectrum bands expiring in the coming years well in advance of that licence expiring, e.g.;

"*where existing spectrum rights of use are set to expire within the near future (e.g. within the next 3 years), ComReg endeavours to set out its proposals on the future use such bands well in advance of expiry including, where appropriate, defining and carrying-out an assignment process for the radio spectrum*"

ComReg has not given the 410 MHz spectrum band due consideration in advance of the licence expiring in 2015. ESBN urges ComReg to consider the release of 410 MHz spectrum in a separate dedicated consultation process. This spectrum is currently fallow, and there are applications and services which could utilise this spectrum immediately.

ESBN also considers that the release of the 410 MHz spectrum band would have a low resource requirement from ComReg given the fact it is 'green-field' spectrum with no incumbency issues. Should ComReg fear that any licensee of this spectrum would again not utilise the spectrum (like the previous licensee), ComReg should include roll out conditions or SUF's to ensure that spectrum is used efficiently.

ComReg states that CEPT are considering spectrum in the 410 MHz range for BB-PPDR. ESBN notes the following outcome from WRC15;

- PPDR: All the 193 countries agreed on resolution 646 that recognises PPDR (Public Protection and Disaster Relief) as a party and the term "public protection radiocommunication". It encourages administrations to use harmonised frequency ranges for PPDR to the maximum extent possible in the frequency range 694-894 MHz. European user organisations and government operators supported the PPDR broadband work and the ECC report status. Three reports, (240, 239 and 218) have been approved assigning 700 MHz as the primary band for harmonisation measure.
- France did not support the European position on allocating the 700 MHz band to public safety, but identified spectrum in the 450-470 MHz band for PPDR.

ESBN does not believe that spectrum in the 410 – 430 MHz range will be affected by WRC15 outcome as BB-PPDR will likely be in the 700 MHz range. Failing that, there is already spectrum in the 380 – 400 MHz available in Ireland for such purposes, with this licence due to expire over the coming years.

# 7. HARMONISATION OF SPECTRUM

ComReg argues the benefits of harmonised spectrum usage at various points in its consultation document (e.g. Section 5.1.3, paragraphs 5.12, 5.22, 6.6). ComReg considers harmonised spectrum a key enabler "*in facilitating the delivery of services to end-users*". ComReg references previous unsuccessful releases of non-harmonised spectrum in the 400 MHz and 900 MHz spectrum bands as no commercial services deployed.

ESBN considers that ComReg has unfairly dismissed the benefits that can arise from non-harmonised spectrum, as ComReg has focused specifically on the delivery of commercial services to end-users as a measure of success. Spectrum in different bands creates different opportunities for different industries. It must be recognised that when the 410 MHz spectrum was acquired in 2005, the licensee envisaged an opportunity to provide broadband services to business and/or end-users. However, the prevailing nationwide deployments of 3G networks scuppered this business opportunity.

In reality, the delivery of commercial services to end-users was always going to be challenging in this spectrum band as the device requirements (e.g. antenna), frequency re-use distance and available bandwidth are not suitable for a user-intense high data rate network. Increasing amounts of broadband services are mobile, resulting in the 410 MHz spectrum having even less utility for deployment of commercial services. Commercial networks in the 400 MHz range (e.g. CDMA 450) are effectively obsolete on a global basis for this reason.

Private networks in contrast have successfully been deployed in spectrum around 400 MHz (380 – 470 MHz). For example, TETRA, telemetry, business radio, EPIRB and trunked radio systems/networks have been deployed in Ireland and globally in this spectrum. Generally these networks are private and do not provide services to end-users, they provide services directly to the licensed operator themselves.

Harmonisation can have significant benefits for consumer driven markets, e.g. economies of scale keeping costs of mobile handsets low. However, for the roll out of private networks (i.e. ESBN's proposed Smart Grid), the high number of devices being deployed by ESBN would enable it to negotiate favourable terms with a vendor.

Smart Grid and Smart Metering networks have been successfully deployed (or are in progress) in Canada, the UK and Netherlands as outlined above. These networks were successfully implemented without harmonised spectrum available. CDMA 450 is being used successfully by Alliander in the Netherlands to provide Smart Grid, whilst this technology is effectively obsolete from a consumer delivery perspective. This shows that commercial consumer driven networks and private utility networks have different requirements regarding harmonisation. Increasing numbers of countries are trialling or progressing with plans to deploy Smart Grid technology (e.g. France, Germany).

Technology and innovation cannot wait endlessly for the EU to harmonise and/or dedicate spectrum for Smart Grid. Vested interests can stymie progress at EU level. A wholly harmonised EU spectrum band for Smart Grid is unlikely to occur for the foreseeable future. The benefits of Smart Grid can be realised today, with affordable equipment available, including in the 410 – 414 MHz paired with 420 – 424 MHz range outlined below.

EU and Government commitments on carbon emissions and integration of additional renewable energy rely heavily on a smarter electricity network. This smarter electrical network requires dedicated spectrum.

# 8. TRIALS DRIVEN BY ESB NETWORKS

As ComReg will be aware, ESBN has a trial licence in the 410 MHz band for usage in Portlaoise. ESBN have completed the preparatory work for the trial which will be going live in February. ESBN will be demonstrating how different radio equipment operating in the 410 MHz range is capable of remotely communicating from electrical devices back to a base station.

ESBN would be happy to invite ComReg to Portlaoise to review the trial when it is live. ESBN believes that ComReg should be cognisant of developments (e.g. successful trials) when deciding the appropriate time to release spectrum.

# 9. OTHER ISSUES

## 9.1 870 – 876 MHz

ESBN welcomes ComReg's decision to designate and make available this spectrum soonest.

ESBN recommends that ComReg allow the unlicensed deployment of Network Relay Points (NRPs) as allowed for in ECC 70(03) to maximize the utility of the bands. Ofcom have permitted such usage of NRP's.

## 9.2 Digital trunking for PMR

There are no specific bands made available for PMR digital trunking, except the technology specific TETRA 385 – 400 MHz band. ComReg should make spectrum available in the 450 MHz range specifically for digital PMR trunking as this is the future of PMR.

## 9.3 13 & 15 GHz bands

Section 4.2.1 of ComReg's spectrum strategy consultation document discusses the closing of the 13 GHz and 15 GHz in Greater parts of Dublin. ComReg notes that a congestion charge may be charged in the future. ESBN recommends that ComReg only apply any such congestion charge to new radio link applications, and not to existing licensed radio links within these bands. ESBN recommends that any congestion charge is appropriately selected to encourage applicants to locate in other spectrum bands, but not to penalise applicants who may have no other option but to use these bands.

Section 5.2.3 of ComReg's spectrum strategy consultation document looks at drivers for demand of fixed links. ComReg states;

"*Furthermore, different kinds of licensing approaches might need to be considered, and the feasibility of sharing between mobile and fixed service networks in the same frequency band might need to be assessed*."

ESBN would like further clarification from ComReg on this statement and any implications it might have for existing and new licensees.

ESBN encourage ComReg to continue facilitating wider channels to increase data rates of existing fixed links i.e. 56MHz and 112 MHz channels.

Section 6.2.4 outlines ComReg's plans for fixed links over the coming years with ComReg stating that it may update licence fees to today's prices. ESBN would like some details on how ComReg proposes to calculate such updated prices.

## 9.4 Publication of licence details

ESBN recognises that there is an EU initiative towards publishing licence details for various radio users and services. ESBN welcomes such transparency regarding publication of information of interest to the public, where there are no apparent repercussions for doing so. However, radio users operating critical and emergency services require confidentiality to be maintained over their radio usage locations and frequencies. Publication of ESBN's radio spectrum licence details could facilitate a co-ordinated attack against targeted points in ESBN's telecommunications network.

There is precedent in this area, with cyber-attacks in Ukraine, US and the UK[23]. Publishing such licence gives potential attackers a means of attempting a coordinated attack on the network.

## 9.5 LORA spectrum requirements

LORA is an interesting evolving technology which requires spectrum in unlicensed bands. ESBN encourage ComReg to keep abreast of developments in this area and, if appropriate, increase available licence exempt bands for usage in ComReg document 02/71R.

## 9.6 Non-exclusive licences

ESBN is aware that certain licences are issued on a non-exclusive basis (paragraph 7.46 of ComReg's spectrum strategy statement), including MNO spectrum bands. ESBN commends ComReg on this method of increasing efficiency of spectrum use. ESBN would like ComReg to elaborate on how a third party could access and utilise spectrum licensed to another party but not currently used in a given location. Is a licence required and how would this be requested? Is there associated spectrum fees? How long could this spectrum be used for?

# 10. SUMMARY

Radio spectrum is a vital natural resource which must be managed efficiently to facilitate economic, social, technological and environmental advances within Ireland. ESBN commends ComReg on doing this difficult task professionally.

Smart Grid produces significant benefits for every electricity user in Ireland, specifically economically and environmentally. A fundamental requirement of Smart Grid is the

[23] http://www.bloomberg.com/news/articles/2015-01-09/power-grid-under-cyber-attack-every-minute-sees-u-k-up-defenses

availability of dedicated radio spectrum. A European harmonised band for this purpose is a long way off and may never come to fruition. Harmonisation is generally a requirement for consumer driven telecommunications technology, however is not as significant for private telecommunications networks. The benefits of Smart Grid can be availed of today, with networks successfully installed and examples of successful deployments around the world.

ESBN are investing in trials and are confident of a positive outcome. The 410 MHz spectrum band is fallow at this time and ComReg does not plan to do anything with it for the foreseeable future. ESBN encourages ComReg to facilitate innovation, investment, a low carbon electrical network and ensure efficient management of spectrum by consulting on, and releasing, the 410 MHz spectrum in an expedited manner.

**ENDS**

# 5 Inmarsat Ventures Ltd. (“Inmarsat”)

# Inmarsat Ventures Ltd.
# Response to Consultation
# Radio Spectrum Management Programme, 2016-2018

# ComReg 15/131

## Introduction

Inmarsat Ventures Ltd. (Inmarsat) welcomes the opportunity to respond to ComReg's Consultation on Radio Spectrum Management Strategy 2016 - 2018 (the Consultation).

We note that the Consultation aims to identify the appropriate prioritisation of spectrum activities for the years 2016-2018. As such, ComReg has highlighted a number of indicative work plan items that align with its key priorities for radio spectrum.

The main input Inmarsat wishes to make to the Consultation is an urgent request to finalise the element of Ireland's Mobile Satellite Service (MSS) 2GHz regulatory framework that remains outstanding, i.e.; the establishment of a regulatory framework for the authorisation of complementary ground components (CGC) in this band. Finalisation of which is not included in the plans presented to date.

The Consultation also makes an incorrect and ✂ that completion of the MSS CGC regulatory framework is contingent on successful satellite launch and roll-out and coverage obligations. Inmarsat disagrees with this statement and will present detailed arguments to support a request to ComReg to urgently provide legal certainty as soon as possible.

In responding to the Consultation Inmarsat addresses, in turn, the aforementioned concerns and indeed all relevant statements contained in the Consultation that have direct impact on Inmarsat's interests in the MSS 2GHz band.

In so doing Inmarsat sets out the background to the award of spectrum in the MSS 2GHz band, the legal obligations incumbent on ComReg to authorise the use of CGC within the hybrid MSS/ CGC network, and the commercial requirement for clarity on use and the establishment of appropriate national fees.

In addressing these issues in detail Inmarsat seeks to ensure that finalisation of the authorisation framework for use of CGC in the MSS 2GHz band is included in ComReg's work programme for 2016.

In conclusion we set out a number of key recommendations, action on which are crucial for the successful adoption of an appropriate MSS/ CGC authorisation framework in Ireland and the delivery of services to end users.

## Consultation 15/131

**Section 5** of the Consultation, Demand for Radio Spectrum, discusses the potential radio spectrum demand of specific radiocommunication service categories.

**Section 5.1.3.** International harmonisation of radio spectrum states:

> *"In ComReg's experience, the appropriate release of harmonised spectrum bands has proven to be generally very successful in facilitating the delivery of services. On the other hand, the release of non-harmonised spectrum bands has proven to be less successful".*

Inmarsat welcomes this statement as it publicly recognises the intrinsic benefit that harmonised spectrum bands have in the delivery of services to end users. It is, however, at odds with the omission, in the Consultation, of definitive plans for completion of the CGC regime for MSS 2GHz.

If ComReg is to truly realise the benefit of international spectrum band harmonisation, it must fulfill its legal obligation in respect to the completion of the national MSS/CGC framework. Realising the benefits of the international harmonization of radio spectrum relies equally on the availability of national authorisations. This will ensure that operators, awarded pan-European spectrum access rights (such as the harmonised 2GHz MSS band) can access an authorisation to use CGC and roll-out out a hybrid MSS and CGC network.

**Section 5.6.2 Satellite,** recognises the variety of networks provided for through satellite.

**Section 5.62** states:

> *"At a European level, ComReg notes that in May 2009 Inmarsat Ventures Limited and Solaris Mobile Limited were selected by the EC as the operators to provide a mobile satellite service (MSS) with complementary ground component (CGC) service on a pan-European level in the band 1980-2010/2170-2200 MHz. ComReg observes, however, more than 6 years later no services have been launched."*

Inmarsat would like to highlight that a new roadmap for the delivery of services to end users was put in place by all European authorities in 2014. In adherence to this roadmap, Inmarsat has actively engaged with the regulator over the course of the last

eighteen months outlining continued compliance of its planned network configuration, commercial strategy, satellite launch schedule, financial spend, commercial contracts, and network roll-out timetable.

✂ We would urge ComReg to recognize that all regulatory milestones incumbent on Inmarsat have been met and that Inmarsat is on-course to provide services to end users in compliance with its pan-European authorisation conditions.

The establishment of a CGC authorisation framework is also a key component upon which successful delivery of pan-European services will be achieved.

**Section 6.2.5 Satellite -** identifies the following work plan items concerning satellite networks and services for the period 2016 to 2018:

> "*Monitor developments in relation to MSS noting that the consideration of CGC issue is contingent upon successful satellite launch by operators and other matters including compliance with rollout and coverage obligations as determined by the EC award".*

Inmarsat is very concerned that the work plan merely references a commitment to *"monitor developments in relations to MSS"*.

Despite repeated assurance received from ComReg over the course of the last year that Inmarsat's European Aviation Network (EAN) is in compliance with the EU regulatory framework for MSS 2GHz and that the 2015/2016 work programme would include finalisation of the CGC framework, it is disappointing to note that the Consultation contains no timetable or practical provision to address the outstanding issue of the national use of CGC.

Not only does the Consultation omit definitive action on CGC, it also includes the incorrect assertion that consideration of CGC is contingent upon successful satellite launch and roll-out and coverage obligations.

Following is an analysis of Member States' legal obligations in respect to operators awarded spectrum access rights through Decision 449[1]. This analysis demonstrates that operators do have a legitimate expectation for Member States to provide full authorization for an integrated MSS/CGC system.

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[1] Commission Decision of 13 May 2009 on the selection of operators of pan-European systems providing mobile satellite services (MSS)

An approach whereby clarity on the CGC regime is only provided after satellite launch is at odds with the policy objectives at the heart of the MSS 2GHz project, i.e. to encourage a pan-European innovative network through hybrid MSS/CGC technology. ✂

***Legislative Framework***

On 14 May 2009 the European Commission announced the results of the EC administered selection and authorisation Decision[2] (the Selection Decision) provided for by Decision No. 626/2008/EC[3] (the Decision).

Inmarsat was selected under this process to use, in each Member State, in accordance with Title III of the Decision, from 1980 to 1995 MHz for earth to space communications and from 2170 to 2185 MHz for space to earth communications, for the provision of Mobile Satellite Services (MSS).

In respect to the award of national authorisations, the Selection Decision states that the right to use the specific radio frequencies should be granted to the selected applicants as soon as possible after their selection. It also requires Member States to grant the selected MSS operators an authorisation for CGC for their territory, with the terms and conditions of such authorisation to be determined by national and community law.

Article 8 of the Decision sets out Member States' obligations in respect to the authorisations necessary for the provision of CGC. It obliges competent authorities to grant the authorisations necessary for the provision of CGC of mobile satellite systems on their territories on the basis of the following common conditions:

> *(a) operators shall use the assigned radio spectrum for the provision of complementary ground components of mobile satellite systems;*
>
> *(b) complementary ground components shall constitute an integral part of a mobile satellite system and shall be controlled by the satellite resource and network management mechanism; they shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of the associated mobile satellite system;*

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[2] Ibid.

[3] Decision No 626/2008/EC of the European Parliament and the Council of 30 June 2008 on the selection and authorisation of systems providing mobile satellite services (MSS)

*(c) independent operation of complementary ground components in case of failure of the satellite component of the associated mobile satellite system shall not exceed 18 months;*

*(d) rights of use and authorisations shall be granted for a period of time ending no later than the expiry of the authorisation of the associated mobile satellite system.*

It should be noted that the above conditions of authorisation do not include successful satellite launch as a condition of the award of a CGC authorisation as suggested in the Consultation. In fact, the framework even foresees that in case of satellite launch failure, commercial service over the CGC network can continue for another 18 months, while a replacement satellite is sourced. This further demonstrates that the award of a CGC authorisation should not be made contingent upon MSS launch.

It is, therefore, a legitimate expectation for an operator to be provided with a CGC authorization in time to finalise the CGC roll out for simultaneous commercial availability of both elements of the integrated MSS/CGC network.

Section 6.2.5 of the Consultation also asserts that the authorisation of CGC is contingent upon "*compliance with rollout and coverage obligations".* Again, the common conditions do not include roll-out and coverage obligations as a requirement to be fulfilled in advance of the award of a CGC authorisation.

Whilst Inmarsat acknowledges that satellite launch, coverage, and roll-out conditions are a fundamental obligation of its MSS 2GHz spectrum access award, they do not constitute measures upon which a regulator may determine whether or not an operator may be granted an authorisation to deploy CGC.

For these legal and commercial reasons, we request that ComReg should not link the finalisation of a national CGC authorisation framework to totally unrelated dependencies.

Over the course of the next 2 to 3 months we request that ComReg provides Inmarsat with an MSS 2GHz CGC authorisation so that Inmarsat's CGC network can be built in parallel with the satellite construction. As such, airlines can start planning the installation of MSS and CGC equipment in the immediate term.

***Engagement with ComReg***

Over the course of the last 18 months Inmarsat has pro-actively engaged with the regulator outlining:

- the hybrid nature of the planned EAN;
- progress in respect to satellite build;
- progress in respect to satellite user terminals;
- progress with the build of the satellite gateway;
- commercial strategy, ✂ ;
- the conclusion of all partnership agreements and, in particular, our commercial contract with Deutsche Telekom to roll-out and develop the ground network element of the hybrid MSS/ CGC network;
- the timetable for network roll-out; and,
- the nature of all regulatory discussions in EU Member States and with the European Commission

We have addressed all ComReg's regulatory and network questions in detailed written correspondence, and provided additional information on the technical specifications of our planned network. In addition we have provided tangible evidence of significant commercial contracts with a value of ✂.

In engaging with the regulator Inmarsat has sought and received assurance that the planned EAN and, importantly the ground network element, is in compliance with all conditions of the Decision, most notably the common conditions as outlined in Article 8(3). ✂ .

In return we seek clarity from ComReg on the regulatory framework for use of CGC in the 2GHz MSS band in Ireland and confirmation of ComReg's timeframe for its completion.  We would request ComReg to use the Consultation as the basis upon which completion of the framework for CGC can be achieved in 2016.

## Recommendations

1. Inclusion of an action to finalise Ireland's MSS 2GHz CGC authorisation framework in the Radio Spectrum Management Programme 2016-2018: seeking immediate regulatory action in 2016.

2. Introduction of a legal framework for the use of CGC based on service neutrality that can accommodate Inmarsat's European Aviation Network.

3. Introduction of a fee regime for use of CGC that is proportionate and consistent with service provision ✂ .

4. Introduction of a CGC fee structure ✂ consistent with the approach being negotiated with a number of Member States across the European Union.

5. Inmarsat requests ComReg to establish the CGC licensing framework and provide clarity on associated fees with urgency.

# 6 Irish Radio Transmitters Society (“IRTS”)

Irish Radio Transmitters Society

Established in 1932

amateur radio in ireland

Response to the

# Consultation on ComReg's Draft Radio Spectrum Management Strategy 2016 to 2018

Published by the

Commission for Communications Regulation

From the

## Irish Radio Transmitters Society (IRTS)

January 2016

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# PART 1

## Introduction

The Irish Radio Transmitters Society (IRTS) welcomes the opportunity provided by the Commission for Communications Regulation (ComReg) to comment on the Draft Radio Spectrum Management Strategy 2016 to 2018 published on 14 December 2015 in Document ComReg 15/131. Part 1 of this document is a scene setting section whilst Part 2 deals with specific suggestions concerning various issues which IRTS believe falls within the remit of a spectrum management strategy framework.

The IRTS was founded in 1932. It is a non profit organisation and is the Irish national society that represents licensed amateur radio operators in Ireland in respect of government and public relation matters. The IRTS is an active member of the International Amateur Radio Union (IARU), which is a sector member of the Radiocommunication (R) and Telecommunication Development (D) sectors of the International Telecommunication Union (ITU). The IARU also has observer status in the regional telecommunication organisation for Europe, the European Conference of Postal and Telecommunications administrations (CEPT), which addresses technical telecommunications regulatory matters, often under mandate from the European Commission. An IRTS Member sits on the Executive Committee of IARU Region 1 and represents IARU-R1 in the Frequency Management Working Group of CEPT and ITU-R Study Group 5 (terrestrial radiocommunications).

## Amateur Service

Amateur radio internationally is part of the leisure category of radiocommunications applications but has the distinction of being defined as a radiocommunications service in the ITU Radio Regulations[1], an international treaty instrument. In Article 5 of the Radio Regulations a number of frequency bands have been allocated to the amateur service and amateur-satellite service throughout the radio frequency spectrum.

Article 1.56 of the Radio Regulations describes the Amateur Service as," a radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest."

It is primarily a hobby in which participants use various types of radio communications equipment to communicate with other radio amateurs for public service, recreation and self-training and technical investigations. The term ‘amateur’ is not a reflection on the skills of the participants, which are often addressing state of the art techniques in radiocommunications; rather, the term ‘amateur’ indicates that amateur radio communications are not primarily involved in any commercial activities.

[1] Radio Regulations of the International Telecommunication Union, Geneva.

In Ireland radio amateurs, having passed an appropriate technical and regulatory examination, are licensed by the Commission for Communications Regulation (ComReg) under the Wireless Telegraphy (Amateur station Licence) Regulations, 2009 (S I No. 192 of 2009) Radio amateurs establish radiocommunications stations in order to conduct experiments with a view to the development of science or technique. Amateur stations utilise but are not limited to frequency bands allocated in Ireland to the amateur service. Irish radio amateurs are therefore involved in the recreational, public service, self training, technical investigations and experimentation aspects of the global amateur radio movement.

Amateur radio operators enjoy personal (and often worldwide) radio communications with each other and in many jurisdictions (including Ireland) are able to support their communities with emergency and disaster communications as appropriate, while increasing their personal knowledge of electronics and radio theory.

In furtherance of public service emergency activities a group of radio experimenters formed the Amateur Radio Emergency Network (AREN). This network operates under the umbrella of the IRTS and is essentially run by the AREN organisation in co-operation with ComReg. The Network was sanctioned following Ireland's adoption of Resolution 640 (1979) of the ITU Radio Regulations, which provides for the utilisation of amateur radio communications in emergency situations. Previously, Irish radio experimenters were licensed to communicate only with other radio amateurs nationally and internationally. ComReg, however, now extends the terms and conditions of the licences' of radio amateurs who are members of AREN to permit them to pass messages on behalf of a range of designated emergency services. It is worth mentioning that the contribution of amateur radio operators to providing communications in times of emergency or natural disasters throughout the world is well recognised and documented.

A side benefit of amateur and experimental radio is the fostering of an interest in STM subjects in children and young people, which in many instances will stimulate an educational and career path for the person involved. This is turn may create a greater pool of professionally qualified persons, which are available for employment in the Irish ICT sector.

There are approximately three million amateur stations in the world, a number that is increasing at the rate of 7% annually. The number and variety of modes of emission used by radio amateurs are also expanding, creating internal pressures within the amateur service for their accommodation at the expense of users of established modes such as single-sideband telephony and manual Morse code telegraphy operations. These new modes include digital voice, data and image. Their use improves the efficiency of amateur operations, but also increases the popularity of amateur radio and therefore the amount of frequency congestion.

Four years after the launch of the first man-made satellite (Sputnik) amateur radio enthusiasts launched OSCAR 1 (Orbital Satellite Carrying Amateur Radio) in 1961. Since then the amateur satellite programme has developed significantly and today ARISS (Amateur Radio on the International Space Station) allows school children throughout the world to speak with

the astronauts while the FunCube project allows schools to experience orbital physics and satellite telemetry experiments.

In addition amateur radio operators continue to investigate propagation effects and are contributing to a greater understanding of how radio waves propagate for small percentages of time. Such scientific and investigative work requires frequency allocations in key parts of the spectrum and an extensive beacon network in order to conduct measurements over long periods of time.

In the context of the self-training and technical investigation aspects of amateur radio, the IRTS has welcomed the Minister for Communications, Energy and Natural Resources' commitment in the Department's 2014 Consultation on Spectrum Policy Priorities, to ensure that an adequate amount of useful spectrum continues to be available for amateur radio and scientific applications. Spectrum for these applications is important from an educational, research and recreational perspective and is vital in helping to ensure our ongoing interest in technology and in furthering our understanding of radio propagation and communications.

# PART 2

## General

The Irish Radio Transmitters Society (IRTS) has studied the document 'Consultation on Radio Spectrum Management strategy 2016 – 2018 and wishes to submit the following observations.

IRTS in common with IARU and most IARU member societies around the World have three major concerns and objectives:

1. Ensure an adequate supply of suitable spectrum is allocated and is available to the amateur service and amateur-satellite service in the range 0 kHz to 3THz,
2. Ensure the overall noise floor in all current frequency bands does not increase to a level where small signal reception is not feasible in a typical domestic environment, which would make the hobby unattractive to many persons, and
3. Make every effort to encourage young people to take an interest in radiocommunications and other ICT subjects through amateur radio, thus facilitating a motivated and knowledgeable nucleus of people who are likely to be employed in the ICT sector in later years.

For Irish amateur radio licensees these three core issues are addressed directly or indirectly in Sections 6.2.9, 3.3.3 and 5.2.7 of document ComReg 15/131. IRTS would be grateful for any assistance ComReg and the Department of Communications, Energy and Natural Resources (DCENR) can provide to address these three issues to achieve the desired outcome. The IRTS response to this consultation is focussed on identifying ways to improve the situation within the spectrum strategy framework developed by ComReg.

IRTS fully appreciates the valuable nature of spectrum and of the need to ensure that a balance is struck between the competing demands across all spectrum users. As mentioned in Part 1 the Society very much welcomed the Minister for Communications, Energy and Natural Resources' commitment in the DCENR's 2014 Consultation on Spectrum Policy Priorities that an adequate amount of useful spectrum will continue to be available for amateur radio and scientific applications.

Spectrum for these applications is important from an educational, research and recreational perspective and is vital in helping to ensure our ongoing interest in technology and in furthering our understanding of radio propagation and communications. The Society is also pleased that in the Minister's statement amateur radio has been separated from general leisure use and placed side by side with scientific applications where it is more appropriate given that it is defined in the ITU Radio Regulations as a service ".... for the purpose of self-training intercommunication and technical investigations ....".

The respective roles of DCENR in the development of effective policies and an appropriate legislative framework on the one hand and the implementation of these national policies by ComReg , an independent statutory body, responsible for the efficient

use and management of spectrum has in the Society's opinion worked well. Although ComReg has major responsibilities with regard to implementing national spectrum policy and dealing with the many commercial users of the radio spectrum, nevertheless the Society has always found its interaction with ComReg to be very effective and productive. New frequency allocations granted at World Radiocommunication Conferences (WRCs) to the amateur service have always been released in Ireland in a timely manner. The Society enjoys a very good working relationship with ComReg and DCENR and would wish the dual complementary roles of ComReg and DCENR to continue.

IRTS takes the view that it will probably be increasingly the case that changes in spectrum usage will be processed initially at the level of the regional telecommunications organisations such as CEPT before more general changes are processed through WRCs of the ITU. Our experience of this process has been positive. On the initiative of ComReg in 2008 a new footnote EU9 was inserted in the European Common Allocations (ECA) table. This footnote enabled many telecommunications authorities to grant access to radio amateurs to frequencies in the region of 70 MHz. A further initiative by IARU-R1 together with a number of administrations (including Ireland) has resulted in the provision of an ECA secondary allocation in the band 69.9 – 70.5 MHz to the amateur service which can provide a regulatory basis for all or part of this band's release in the 48 member countries of CEPT.

## Frequency Management Issues – Section 6.2.9

IRTS is a member society of IARU and is actively involved through IARU at the international and regional level, firstly in the identification of spectrum requirements through the ITU process of WRCs and seeking appropriate WRC agenda items and secondly through the CEPT process by means of appropriate amendments to the European Common Allocation (ECA) table.

Once allocations to the amateur service are included in the Radio Regulations and/or ECA, IARU Region 1 has a tradition of developing band plans to cater for all interests. National IARU member societies then develop the IARU plan to take account of any unique national requirements. IRTS believes that the amateur service should continue to self-regulate how individual frequencies and sub-bands should be utilised.

However IRTS believes that the situation could be improved at the international level since most frequency allocations to the amateur service and amateur-satellite service have to be negotiated at some point in time in ITU and/or CEPT forums. In many countries a representative from the national society is encouraged to participate in the national delegation and IRTS continues to seek for such an opportunity also.

An important issue for the amateur service is the constant threat of eviction from frequency bands which become of interest to commercial or governmental sectors. IRTS recognises the burgeoning demand for spectrum to meet the needs of mobile-broadband; however in many cases it may be technically feasible to implement sharing arrangements which protect other primary or co-secondary users.

While sharing between services (including the amateur service) in some parts of the spectrum is a practical and workable solution for the improved utilisation of spectrum, sharing with the amateur service in some primary and exclusive frequency bands is limited by factors such as:

- The widespread geographic distribution of amateur stations,
- The number of stations operating at all times within the frequency bands allocated to the amateur service,
- The variety of transmission modes used by amateur stations and the relatively low power and signal levels that are involved in amateur communications.

However in many countries it has been clearly demonstrated that the amateur service is often able to share with a variety of occasional defence applications. Such sharing clearly adds to the efficiency of spectrum usage.

IRTS as a member society of IARU is actively involved with IARU Region 1 at the regional level, firstly in the identification of spectrum requirements through the ITU process of WRCs and seeking appropriate WRC agenda items and secondly through the CEPT process by means of appropriate amendments to the European Common Allocation (ECA) table. However in future IRTS would in addition seek to examine the possibility

of future allocations through experimentation and experience at the national level with appropriate amendments to the Irish Table of Frequency Allocations.

IRTS spectrum requirements at the national level are generally obtained through direct negotiations with ComReg officials responsible for frequency policy. In future IRTS would in addition seek the possibility of obtaining additional allocations through experimentation and experience at the national level with appropriate amendments to the Irish Table of Frequency Allocations.

Table 1 below provides a 'wish-list' of IRTS thinking with respect to current and future spectrum aspirations. Table 1 is based on a similar table included in the IRTS submission to DCENR's 2014 spectrum policy consultation reflecting IRTS views on its spectrum priorities for the next 3 to 5 years. Column 2 of Table 1 details frequency bands of interest, column 3 provides the reasons for proposed access or change in status, whilst column 4 provides IRTS views on the priority that should be given to the various items. Further explanation on some of the frequency bands is provided in the text following Table 1 below.

| Band | Frequency Range | Reason for Proposal | Priority High (H) Medium (M) Low (L) |
|---|---|---|---|
| **1** | 1 800 – 1 810 kHz | To align with ITU R2 | L |
| **2** | 3 800 – 3 850 kHz | To provide more overlap with R2 and R3 allocations | L |
| **3** | 5 250 – 5 351.5 kHz | Seek alignment with any UK allocation made to the amateur service in this range. This would provide more flexibility to avoid primary services. | M |
| **4** | 5 351.5 – 5 366.5 kHz | WRC-15's award of a new secondary allocation to the amateur service | H |
| **5** | 5 366.5 – 5 450 kHz | Seek alignment with any UK allocation made to the amateur service in this range. This would provide additional flexibility to avoid primary services. | M |
| **6** | 7 200 – 7 300 kHz | To align with R2 following the gradual decline in HF broadcasting. Could be a timed daylight only allocation initially, which would help alleviate congestion, especially at weekends in one of the most popular amateur allocations. | H |
| **7** | 10 100 – 10 200 kHz | Extending band by 50 kHz to provide additional capacity for intra Irish voice communications in this congested and popular band plus an increase of power. | M |
| **8** | 30 – 49 MHz | Sub-band allocation circa ISM band at 40.68 MHz and/or provision of assignments to propagation beacons to facilitate research as suggested by CEPT in the 1990s | M |
| **9** | 50 – 52 MHz | Upgrade status of amateur service to national primary in 50 – 51 MHz to align with UK. NOC to 51 – 52 MHz | H |
| **10** | 52 – 54 MHz | To harmonise 50 MHz allocation with Regions 2 and 3. See also Agenda Item 1.1 of WRC-19 | M |
| **11** | 54 – 69.9 MHz | Sub-band allocations or individual assignments to propagation beacons (suggested by CEPT) and digital amateur television repeater outputs (downlinks). | M |
| **12** | 69.9 – 70.125 MHz | To align with ECA lower 70 MHz band limit to facilitate the implementation of spectrum designated for propagation beacons in the IARU-R1 plan<br>* L for 69.9 – 70 MHz | H* |
| **13** | 70.45 – 70.50 MHz | To align with ECA upper 70 MHz band limit to facilitate the implementation of spectrum designated for FM voice communications in the IARU-R1 plan | H |
| **14** | 70.5 – 71.5 MHz | To align with UK NRA's offer to facilitate digital experimentation. Similar licensing conditions to UK are suggested, which may also ease UK access to the band in Northern Ireland. | L |
| **15** | 146 – 147 MHz | To align with UK NRA's offer to facilitate experimentation with wide-band digital modes (including television) and to partially align with R2 band limits. Similar licensing conditions to UK are suggested, which may also ease UK access to the band in Northern Ireland. | M |
| **`16** | 3 400 – 3 410 MHz | To align with EU17 of the ECA – use of guard-band to improve efficient and effective utilisation of spectrum. | M |

**Table 1 – IRTS Current and Future Spectrum Wish-List**

Electromagnetic waves do not respect national borders and it is usually good practise to implement the same or compatible spectrum usage on both sides of an international border. Ireland has a land and sea border with the United Kingdom. Several entries in Table 1 above seek to utilise spectrum in a similar manner to amateur service activity in the UK. This would not only be of interest to Irish radio amateurs but also radio amateurs in Northern Ireland who face somewhat difficult technical conditions in some frequency bands to protect current or future spectrum usage in Ireland. This comment applies to items 3, 5, 8, 9, 11, 12, 13, 14, 15 and 16.

## Additional Band Comments

**5 250 – 5 450 kHz (Specifically Mentioned in Section 6.2.9)**
The amateur service was successful in achieving a 15 kHz band (Item 4 in Table 1) in this frequency range at ITU WRC-15. IRTS is grateful that active consideration will be given by ComReg to the release of this 15 kHz band. The allocation also carries a power limit of 15W eirp. Therefore with minimal possibilities of harmful interference resulting and already a proposed entry in the 2016 ECA, IRTS believes that this 15 kHz band could be released without delay.

However as a result of the WRC-15 consensus on this agenda item, it seems likely that some administrations may retain their existing 5 MHz channel arrangements for the amateur service to meet disaster relief and general operational requirements. Prior to WRC-15 UK amateurs negotiated a considerable amount of additional spectrum over and above their original five assigned 3 kHz channels. IRTS would wish to secure facilities which are the same or similar to any solution eventually provided in the UK, in the range 5 250 – 5 450 kHz. The question of expanded 5 MHz facilities was raised by IRTS in response to the previous spectrum strategy consultation for the period 2011 – 2013.

**7 200 – 7 300 kHz**
The band 7 000 – 7 200 kHz is currently allocated in Region 1 to the amateur service on a primary and exclusive basis. It is one of the most popular allocations to the amateur service and is often extremely congested. Amateurs in Region 2 and 3 have access to an additional 100 kHz from 7 200 kHz to 7 300 kHz, which in Region 1 is allocated to the broadcasting service on a primary and exclusive basis. Monitoring and research has shown that the broadcasting service generally considers that the band is only suitable for night time operations where the transmitter and its service area are both in darkness. As a result there is little broadcasting activity during daylight hours. IRTS therefore seeks access to the band on a secondary non-interference basis for intra Ireland communications from 90 minutes after local sunrise to 90 minutes before local sunset.

**10 100 – 10 200 kHz**
An additional 50 kHz is requested in this popular part of the spectrum to experiment with voice communications, within Ireland. The current allocation of 10 100 – 10 150 kHz was considered by IARU and a number of administrations to be too narrow to support voice modes and Morse code and narrowband data communications are generally recommended.

In addition IRTS wishes to reiterate a request made in the previous spectrum strategy consultation concerning an increase in power for the band. "*Like other countries the amateur allocation is 10.100-10.150 MHz secondary. However, while the maximum power level allowed here is 20dBW (100 watts) it is 26dBW (400 watts) in other countries including Northern Ireland and the UK generally. So far as we are aware there have been no cases of interference to any other services by amateur stations operating in the 10 MHz band. Accordingly the Society would like to see the power increased to the standard 26dBW (400 watts) within the period of the strategy."*

**30 – 49 MHz and 52 – 70.5 MHz (Specifically Mentioned in Section 6.2.9)**
IRTS is grateful that the range 30 – 70.5 MHz already appears in the Radio Spectrum Work Plan for 2016 to 2018. Items 8, 10, 11, 12 and 13 in Table 1 are covered by this Work Plan item. Items 9 and 14 are also relevant. The IRTS response to the consultation for the 2011 – 2013 period, stated for the band mentioned in Table 1 item 9. *"The present allocation is 50.0-52.0 MHz on a secondary basis. The initial allocation was 50.0-50.2 MHz and in April 2000 the band was extended to its present limits on individual application. In 2004, the band was made generally available to licensed radio experimenters. The liberalisation of the licensing regime and the extension of the band reflect the fact that interference by experimenter/amateur stations has not taken place despite the fact that two cable television channels were on frequencies relatively near the 50 MHz band.*

*The segment 50.0-51.0 MHz in the UK is amateur primary and so far as we are aware there has been no interference by amateur stations in Northern Ireland with services south of the border. The Society would, accordingly, like to see this segment upgraded to amateur primary within the period of the proposed strategy."* IRTS maintains the view expressed in 2011 especially as we understand that frequencies in the band 47 – 68 MHz are no longer deployed for down-linking on cable telecommunications networks.

Concerning the possible extension of the 70 MHz band mentioned in Table 1 items 12 and 13, text submitted by the IRTS to the consultation for the 2011 – 2013 period is also relevant. "*ComReg, in Document 10/101 of 5 December 2010, announced its intention to reopen third Party business radio licensing. As there was no demand for the low-band VHF channels when these licences were last issued in 2005, it has been decided that licences will not be issued in the band 68.0-87.5 MHz.*

*In paragraph 6.9 (page 65) of the proposed Spectrum strategy document it is stated that there has been a decline of 35% in the number of business radio licences since 2007. The steep decline in the latter half of 2010 has been mainly due to the transfer of public services onto the Emergency Services Digital Radio (ESDR) network. This is expected to continue as other emergency services move onto the ESDR network and surrender their existing business radio licences.*

*In the light of the foregoing, IRTS propose that during the period of the proposed strategy the existing band be extended to 70.0-70.5 MHz, an increase of 175 kHz. This would*

*bring the band into line with that in use by licensed amateurs in Northern Ireland and the UK generally. There is increasing activity on the 70 MHz band particularly in Northern Ireland and in Dundalk/Drogheda which has the potential for interference by licensed amateur stations in Northern Ireland with any residual low-band business radio users. Alignment of the band here with the allocation in Northern Ireland and the reassignment of any remaining low-band business users to frequencies above 70.5 MHz would eliminate the difficulties that would be caused by such interference. Use of the 70 MHz band will increase as amateur allocations are granted by more European administrations."*

IRTS therefore requests an extension to the lower limit of the 70 MHz band to 69.9 or 70.0 MHz and an upper limit of 70 .5 MHz.

Item 14 in Table 1 represents a UK decision to allow amateur experimentation in the band 70.5 – 71.5 MHz. IRTS would be pleased if it proved to be possible to also permit such experimentation in Ireland.

**146 – 147 MHz**

This band is mentioned in Item 15 of Table 1 and represents another UK decision to allow amateur experimentation in this part of the spectrum. IRTS would be pleased if it proved to be possible to also allow such experimentation in Ireland.

**3 400 – 3 410 MHz**

As mentioned in its submission to ComReg on Document 11/28, IRTS *"in its response to the consultation on the release of spectrum in the 2300-2400 MHz Band in Document 09/76 of 6 October 2009 in paragraph 4.2.6.2 on page 17 ComReg indicate, that in relation to the amateur usage of spectrum in the 3.5 GHz band, ComReg may review this as part of any consultation which may take place in the future in relation to spectrum in that band. On the basis of the information included in the proposed strategy it seems that any such review will not take place for a number of years. In the meantime the Society requests that ECA Footnote EU17 be implemented and reflected in the Radio Frequency Plan for Ireland and that in addition the segment 3400-3410 MHz be allocated to the amateur service on a secondary basis."*

IRTS also responded to document ComReg 14/101- Consultation Paper entitled Spectrum award - 2.6 GHz band with possible inclusion of 700 MHz, 1.4, 2.3 and 3.6 GHz bands. In Document 15/70 ComReg stated *"ComReg notes the response to Document 14/101 from IRTS contending that the guard band 3 400-3 410 MHz could be used for the amateur service. ComReg notes that, subject to discussions on the future of 3 400-3 410 MHz as indicated above and in the interests of spectrum efficiency, ComReg may consider this matter further."*

In Document 15/140 ComReg has provisionally decided "*to implement a guard band between 3400 MHz and 3410 MHz to give appropriate protection to systems in adjoining bands, as provided for by Article 2(2) of the 3.6 GHz EC Decision."*

It would appear to be an opportune moment to reconsider the IRTS request for access to the band 3 400 – 3 410 MHz which provides a guard-band between the radiolocation service below 3 400 MHz and the fixed, mobile and fixed-satellite services above 3 410 MHz, on a secondary non-interference basis. The Society would like to draw ComReg's attention to the ECA footnote EU17 which states "In the sub-bands 3400-3410MHz, 5660-5670 MHz, 10.36-10.37 GHz, 10.45-10.46 GHz the amateur service operates on a secondary basis. In making assignments to other services, CEPT administrations are requested wherever possible to maintain these sub-bands in such a way as to facilitate the reception of amateur emissions with minimal flux densities." The Society would wish to see this footnote implemented by ComReg and reflected in the Radio Frequency Plan for Ireland. Amateur use of such spectrum in Ireland is never likely to be excessive or even significant and most amateur emissions are narrow-band in nature. This 10 MHz could therefore be utilised without too much difficulty.

**Other Guard Band Issues**

IRTS suggests that sharing studies should be conducted in the vicinity of band edge frequencies, where spectrum currently having an interest to the amateur service is likely to be transferred to other services e.g. 2 300 MHz and 2 400 MHz. The objective is to ascertain whether sharing is feasible under normal conditions.

**The Future**

The new Radio Equipment Directive, 2014/53/EU has included equipment operating below 9 kHz and ETSI has been requested to develop revisions of relevant harmonized standards. This may also result in a need to regulate the use of spectrum below 9 kHz. The ITU Regulations and ECA define spectrum usage down to 8.3 kHz and up to 275 GHz. Sub 9 kHz amateur radio experimentation is currently being undertaken in several countries on a licensed or unlicensed basis dependent on national law. Surprising results have been achieved with very modest equipment. It is also envisaged that the amateur service will seek sub 3 THz allocations in the coming years.

## Monitoring, Compliance and Enforcement – Section 3.3.3

Sub-section 3.3.3.2 deals with the R&TTE and EMC Directives. The terminology used by IRTS in this part of its response is that used in the EMC Directive. It is stated that ComReg is the responsible authority for the Electromagnetic Compatibility (EMC) and Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directives in Ireland. Presumably ComReg will also be responsible for the Radio Equipment Directive (RED) (Directive 2014/53/EU).

In this regard IRTS is pleased to note that there has been an increase in market surveillance of late, peaking in the period 2014 – 2015. However IRTS is concerned that ComReg subject to resources, will need to increase product testing in the coming years, based ONLY on the ever increasing number of radio related devices entering the marketplace. IRTS believes that Market Surveillance for EMC compliance should not be focussed only on radio related devices but on electrical and electronic equipment entering the marketplace which radiate (albeit unintentionally) electromagnetic emissions.

The amateur service continues to experience problems due to the general increase in electromagnetic noise. This is similar to light pollution where astronomers and those who appreciate spectacle in the night sky are thwarted by glare from street lights and other visual emissions. Amateur radio operators are interested in receiving small signals from amateur stations around the World and indeed from manned spacecraft. Increasing broadband noise levels resulting from a variety of domestic apparatus e.g. computers, microprocessors, plasma television receivers and in-home power line telecommunications' units continue to cause problems.

However it is not only apparatus which causes an increase in the overall levels of noise experienced by radio amateurs. Fixed installations are also an increasing problem in many jurisdictions. A fixed installation is a particular combination of several types of apparatus and, where applicable, other devices, which are assembled, installed and intended to be used permanently at a predefined location.

Examples of fixed installations cited in official documentation include industrial plants, power plants, power supply networks, telecommunication networks, cable television networks, computer networks, airport luggage handling installations, airport runway lighting installations, automatic warehouses, skating hall ice rink machinery installations, storm surge barrier installations (with the control room etc), wind turbine stations, car assembly plants, water pumping stations, water treatment plants, railway infrastructures, air conditioning installations. Therefore the smallest electrical systems as well as large scale energy and telephone networks for commercial and industrial applications fall under this term. Large machines can also be fixed installations.

However the classification of a particular fixed installation e.g. "assembled, installed and intended to be used permanently at a predefined location" has been challenged in some countries with respect to the permanency of some fixed installation examples.

In Europe fixed installations must be installed according to generally accepted rules of technology, and the specifications for the intended use of the installed components must be observed. The measures for compliance with the essential requirements of the EMC Directive must be documented. Furthermore, an accountable person must be appointed to hold the appropriate documents at the disposal of the relevant national authorities for inspection purposes for as long as the fixed installation is in operation.

Recent examples of interference from fixed installations caused to the amateur service from around Europe include:

- Lifts (elevators) and railway trains which use variable frequency drives which rectify the incoming AC to DC and then chop it into a new frequency to feed the motor.
- Some inverters and optimisers used with Solar PV panels. Quality of installation is important and compatibility tends to depend on how cables are routed and the quality of the DC-DC converters. Optimisers are DC-DC converters that are typically fitted at the back of each panel to maximise power transfer.
- Electronic ballasts using solid state electronic circuitry to provide the proper starting and operating electrical conditions to power discharge lamps. Electronic ballasts are often based on the SMPS topology, first rectifying the input power and then chopping it at a higher frequency.
- High levels of radiated noise directly radiated by the infrastructure within the immediate vicinity of some Wind Turbines probably created by water cooled electronic power converters that translate the variable voltage and frequency output from the generator to the fixed voltage and frequency of the national grid.
- Radiation from VDSL networks over unbalanced copper pairs

IRTS regularly meets with ComReg on a variety of spectrum management issues. Since harmful interference and disturbance is becoming an increasing problem, IRTS would wish to have a regular interface with ComReg staff who are responsible for resolving harmful interference affecting ComReg licensees, in order to resolve EMC issues in a timely manner. This can also be a forum for an exchange of information as IARU representatives are active in CISPR and European forums.

For some time IRTS has been concerned at the lack of consultation when Directives of the European Union are transposed into Irish Law, since it is important to ensure that the Essential Requirements of Directives designed to protect telecommunications are adequately reflected in national legislation which impacts our sector. It is hoped that this matter can be rectified prior to the laying of new Statutory Instruments (which at the time of writing do not appear to be on the Irish Statute Book) addressing the new EMC and RED Directives, 2014/30/EU and 2014/53/EU respectively before the Dail and Seanad.

## Radio Amateur Licensing Matters – Section 5.2.7

IRTS' third concern and objective after EMC and spectrum issues is to encourage young people to take an interest in radiocommunications and other ICT subjects through amateur radio, thus facilitating a motivated and knowledgeable nucleus of people who are likely to be employed in the ICT sector in later years.

The Society shares the concerns of many of its sister societies worldwide around the issues of the difficulty in (i) attracting and (ii) maintaining the interest of young persons who traditionally would become new participants in amateur radio activities. These difficulties are due, in some measure, to the extraordinary developments in recent years in the area of communications made possible generally by computer or other electronic communications technology. The Society feels it is incumbent on it to give serious consideration to the proposal of some innovative measures to ensure the amateur service continues to make its unique contribution to science and to the community.

**Novice Licence**

The society proposes that an additional category of amateur licensing be established in Ireland for radio amateurs. This category would be in the nature of a novice grade licence with conditions attaching to it which would make it more attractive to participants who have not yet achieved the technical standards demanded by the current licensing conditions. The conditions would also address issues around the facilities which would be afforded licensees in the new category.

As mentioned above participation levels in the amateur radio service are a cause of concern. An analysis from 2010 and subsequent years generally show, with the exception of 2015, a slow but steady decline in the number of Society members. Worldwide statistics in relation to licensed radio amateurs reflect a similar position.

With regard then to the proposal for a novice grade it is suggested that particular conditions would attach to the new category of licence. In the first instance an examination of a standard similar to that required for the CEPT novice licence would apply. ERC Report 32 sets out the syllabus for the CEPT Novice Licence whilst ECC Recommendation (05)06 relates to the licence itself. The Novice Licence has been implemented in 25 CEPT countries to date. In general terms a knowledge of the regulatory arrangements, to the standard required for the current category of licence, would be required. This would ensure familiarity and compliance with the provisions of the legislation and appropriate use of the facilities afforded to licensees, in particular the avoidance of interference with other users of the radio frequency spectrum.

The technical knowledge required would be at a lower level than is required for licensees in the current category. This would be complemented by a requirement for licensees in the new category to operate with equipment which would minimise the risk of interference to other users of the radio frequency spectrum. The use of CE marked products for the main station equipment, particularly transmission equipment, might be considered desirable. It is further proposed that frequency bands, output power and modes of operation be restricted. It is suggested that amateur bands at 7 MHz, 14 MHz

and 28 MHz, as well as the VHF and UHF bands should be available to novice licensees. It is believed that novice licensees should be permitted to use SSB, CW, FM and digital modes.

The overall thrust of this proposal is designed to broaden the appeal of interest in experimentation and use of amateur radio frequency allocations for the purposes already mentioned. It is hoped it will reverse the trends displayed in recent years of declining numbers. Furthermore it opens up the possibility to many more people, particularly young people, of participating in amateur radio and contributing to science and to the community.

It is worth noting that in the past certain developments in licensing conditions, in particular the introduction of the VHF only Class B licence and ultimately the removal of the requirement for proficiency in the use of Morse code led to an increase, albeit modest, in participation in amateur radio activity. This occurred without any perceptible diminution of standards.

IRTS therefore proposes that consideration be given to the introduction of a Novice Licence in Ireland. This licence would be granted following compliance with conditions as described in the foregoing paragraphs. The main condition to be met would be the successful completion of an examination along the lines described.

# Summary

The IRTS would like to extend its thanks to ComReg for the opportunity to respond to this consultation and hopes that the Irish telecommunications regulator will be favourably disposed to the suggestions and requests outlined in this document. These have been prepared in order to address the global concerns and objectives of the International Amateur Radio Union of which IRTS is the Irish member society:

1. Ensure an adequate supply of suitable spectrum is allocated and is available to the amateur service and amateur-satellite service in the range 0 kHz to 3THz,
2. Ensure the overall noise floor in all current frequency bands does not increase to a level where small signal reception is not feasible in a typical domestic environment, which would make the hobby unattractive to many persons, and
3. Make every effort to encourage young people to take an interest in radiocommunications and other ICT subjects through amateur radio, thus facilitating a motivated and knowledgeable nucleus of people who are likely to be employed in the ICT sector in later years.

During the period of the strategy the IRTS would like to see the following initiatives implemented:

- Release the new WRC-15 band at 5351.5 - 5366.5 kHz at as early a date as possible together with alignment with any other frequency allocations that may eventually made to the amateur service in the UK in the band 5250 - 5450 kHz,
- Initially allow daylight only operation in the band segment 7200 – 7300 kHz with the long term objective of alignment with ITU Region 2. This initiative would help alleviate congestion, especially at weekends, in one of the most popular amateur allocations,
- An increase in power to the standard 26 dBW (400 watts) in the band 10.100 – 10.150 MHz,
- Upgrade the status of the amateur service to national primary in 50 - 51 MHz to align with the UK,
- Extension of the 70 MHz band from 69.9 or 70.0 MHz to 70.5 MHz to align with the ECA table, and
- Initiate discussion at an early date on the introduction of a Novice Licence on the basis of the submission already made by the IRTS (see also Section 5.2.7 of this response).

The remaining items on the ‘Spectrum Wish-List’ at page 10 of this response could be progressed over time.

The IRTS remains at ComReg's disposal if further information or clarification is required. The IRTS would also like to state that nothing in this document needs to be considered as restricted or confidential.

# 7 Motorola Solutions Ireland Ltd. (“Motorola”)

January 29, 2016

**Submissions to ComReg 15/131:**
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**Source:** Motorola Solutions Ireland Limited

**Subject:** Response to Consultation on ComReg's radio spectrum management strategy 2016 – 2018

**Introduction**

Motorola Solutions Ireland Limited wish to thank the COMREG authority for the opportunity to express views and post comments to the plans and strategies under development in Ireland.

In general, the WRC15 just concluded a few months ago, leaving many new spectrum aspects for consideration by the Regions, regional and national authorities, including user communities and their service providers. We therefore appreciate this very timely launched national consultation.

For the purpose of this response, we shall stay much focused on a particular spectrum band and class of services and respectfully submit the following:

**The Band 410 – 430 MHz**

*As we observe that, this band is:*

- Not harmonised in CEPT
- A very busy platform across all CEPT member states for national licensed PMR-DMR narrow – and wide band systems
- Not identified for IMT at WRC15 and hence for broad band systems such as LTE and its evolutions
- Offering beneficial propagation characteristics in both urban and rural areas

*We further observe that:*

A growing demand for commercially viable narrow/wide-band data services (IoT/M2M as well traditional PMR) is currently developing in the market, such as:

  - Smart Metering (gas, water, electricity) for the mass market of private house holds
  - Smart Grid (On-Line Electrical Energy redirecting and switching to demand/supply situations)
  - Other professional voice-and data communication services to be most efficiently serviced by the TETRA, TETRA-TEDS and DMR standard platforms

**Referencing p. 45 (5.22) 1st bullet**

We take note, that ComReg's previous licensing of the 2 x 2 MHz allocation (410 – 414 MHz paired with 420 – 424 MHz) did not result in the launch of commercial services unfortunately.

Given however, the most recent developments in the demand for services as explained above we therefore strongly recommend,

**that ComReg should launch a formal allocation process for this spectrum, which now and in the future seem to be a promising slot of the 410 – 430 MHz PMR/DMR band for transition from the traditional analog to more spectrum efficient DMR and TETRA platforms as well as for the growing identification of new non-broadband technologies in service of the expanding IoT/M2M segment.**

We do acknowledge that some services may require broadband wireless networking. These are however already considered as part of the channeling arrangements of the 700 MHz band plan as elaborated in CEPT, post WRC15.

**Finally Referencing p 125 (2nd row of the table)**

The meeting Jan 13-14 of the WG FM PT49 on BB-PPDR spectrum issues, decided **not to consider** the band 410 – 430 MHz for BB-PPDR in contrast to the COMREG observation at the time of writing its plan.

**We therefore take the view, that this further amplifies the significance of the said 2 x 4 MHz allocation (410 – 414 MHz paired with 420 – 424 MHz) as subject for hosting future non-broadband type of services along with our further observed services requirements expressed herein.**

Yours sincerely,

Vincent Kennedy

Motorola Solutions Ireland Limited

# 8 Raidió Teilifís Éireann and 2rn (“RTÉ and 2rn”)

# RTÉ & 2RN RESPONSE TO

# COMREG CONSULTATION

# Draft Radio Spectrum Management Strategy 2016 to 2018

ComReg 15/131

1st February 2016

## 1. Introduction

RTÉ and 2RN welcome this opportunity to participate in the development of the ComReg Spectrum Management Strategy. We believe that this is an essential activity to set out and clarify the implementation of national spectrum policy. This is particularly important at this time where there is heightened pressure to reallocate spectrum from important services with high social value such as public service broadcasting, to meet increased demand from other potential users of spectrum. Ensuring the correct balance is maintained here requires insightful judgement and clear guidance.

Without access to sufficient high quality spectrum, public service broadcasting is in danger of being unable to continue to develop world-class communications infrastructures such as the Saorview digital TV platform which continues to grow – in just over three years since analogue switch off Saorview is now received in 43% of Irish TV households and is the largest TV platform in Ireland.

Although broadcast spectrum policy is the responsibility of the DCENR, we would welcome greater regulatory certainty and reassurance from this ComReg spectrum strategy to support a long term future for public service broadcasting in Ireland, particularly in light of the recent WRC decisions relating to UHF spectrum.

RTÉ and/or 2RN would be happy to discuss any of the issues raised here with ComReg.

## 2 General Comments

UHF Spectrum

Continued access to high quality UHF spectrum is required to maintain a strong, appealing, relevant and competitive free-to-air (FTA) broadcasting platform in Ireland. Limiting access to spectrum will cause disruption and incur costs for users and broadcasters alike, which will ultimately devalue the Saorview platform as both the primary FTA TV delivery platform in Ireland and an important element in inter-platform competition.

The UHF band (470 to 694MHz – post 700MHz migration) is required for terrestrial TV until at least 2030 and most likely beyond. In the UK, where UHF spectrum use is closely linked with Ireland, Ofcom has stated that DTT is expected to require access to UHF spectrum until at least 2030[1]. Strong indications of regulatory certainty are needed to encourage continued investment and development of the Saorview platform within this remaining band when the 700MHz band is implemented for mobile broadband in Ireland.

We note that two critical issues relating to the implementation of the 700MHz band are not addressed in the draft spectrum management document:

- a timeframe for the 700MHz migration, and
- compensation for broadcasters and TV viewers

[1] Securing long term benefits from scarce low frequency spectrum, Ofcom, November 2012.

See further comments on section 6.15.

Other Issues:  Non-ionizing Radiation

We think that NIR requirements should be mentioned in this spectrum strategy, noting that although there should be relatively little practical impact, Ireland must transpose the new directive 2013/35/EU this year.  This is an important aspect of spectrum use and management in which ComReg has a role.

## 3 Specific Comments

3.5 – RTÉ are concerned with the omission of public service broadcasting in this section on the social benefits arising from the use of radio spectrum. We are concerned that recognition of the unique requirements and use of spectrum for public service broadcasting has diminished within ComReg. We note that the tone of the text in the 2008-2010 spectrum strategy[2] reflected a clearer understanding:

> *The value of broadcasting goes far beyond its economic contribution in terms of fostering civil society, its cultural significance, its role in media pluralism and hence its importance as a public policy objective.*

3.7 – RTÉ are pleased to see reference to the DCENR's responsibilities in developing national broadcasting policy and associated spectrum use, and we note that there has been no significant changes in DCENR policy with respect to spectrum use for broadcasting since the period covered by the ComReg 2008-2010 spectrum strategy.

3.13 – We agree that effective spectrum management requires flexibility and would argue that in certain circumstances (e.g. for services of significant social importance such as public service broadcasting) the effective management of spectrum represents more than technical efficiency alone. An example of this in practice is where national FM radio services must provide a degree of protected overlapping coverage between transmitter areas to ensure interference free reception of services with typical (un-sophisticated) in-vehicle FM radio receivers using standard RDS.

Further to our comments on section 3.5 and 3.7, we note the that 2008-2010 spectrum strategy was more appropriately explicit on this point with respect to public service broadcasting:

> *Public policy goals play a significant role in determining spectrum management priorities. Technical efficiencies may have to be compromised in order to safeguard the provision of certain public services such as safety, defence and public broadcasting services*

3.18 – RTÉ and 2RN are grateful for ComReg's participation in WRC15, where along with DCENR, the Irish delegation was able to contribute to help support the future of UHF broadcasting under agenda item 1.1 (in-line with the recommendations from the DCENR's UHF spectrum policy review group[3]) – thus ensuring a greater level of global regulatory certainty on the continued use of UHF spectrum for terrestrial broadcasting towards 2030.

4.22 – For perspective when considering the relative utility of UHF spectrum it is worth noting that data currently consumed in Irish households using the Saorview network in comparison to the mobile data demand reported in Figure 6. ComReg 15/131 Figure 6 is

[2] *Spectrum Management Strategy Statement 2008-2010* (ComReg 08/50)

[3] Report on the future use of UHF spectrum for broadcasting in Ireland, DCENR, May 2014

adapted below to illustrate this point. Calculations are conservatively based on 676k Saorview households viewing on average 3.5 hours of standard definition TV per day, or 3.5 hours of high definition TV per day[4].

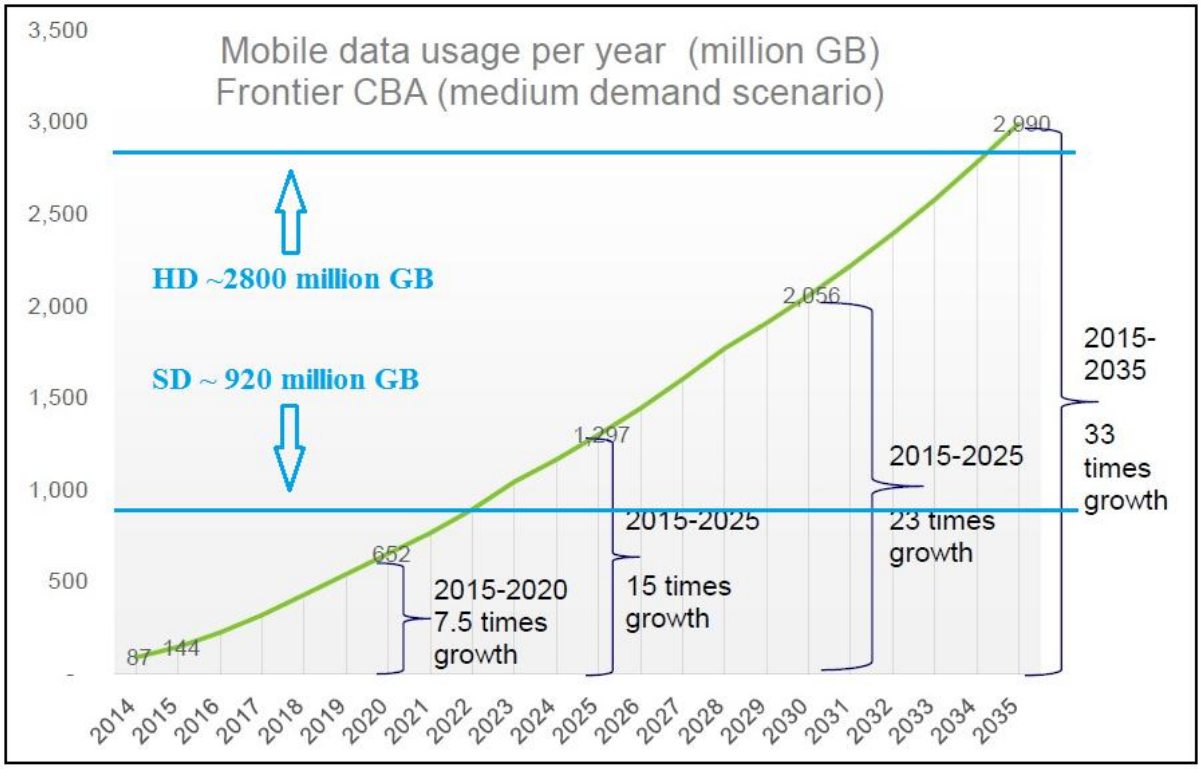


Figure 1 – Adaptation of ComReg 15/131 Figure 6, showing estimates of current Saorview data usage (RTÉ/2RN additions in blue).

It is worth noting that currently with 2 DTT multiplexes on-air (with a total of 48Mbit/s), over 18,000 million GB of data per year is currently delivered to Saorview households during their 3.5 hours viewing per day.

4.56 – RTÉ welcomes the ComReg 700MHz Cost Benefit Anaysis (CBA). However, we do not agree with some of the assumptions and conclusions of the analysis; in particular we believe that the potential costs to TV viewers have been underestimated and that the assumptions based on UK research/experience may not be directly applicable to local conditions in Ireland.

Other comments in relation to the 700MHz CBA, which are relevant to the spectrum management strategy are outlined below. RTÉ and 2RN would be happy to discuss any of these points with ComReg:

<u>CBA Mobile Analysis</u>

- We do not fully agree with the assumptions on the coverage range and utility of low

[4] Recent research (Jan 2016) on TV viewing from TAM Ireland: http://www.tamireland.ie/node/472

vs high frequency spectrum for mobile use and believe that spectrum above 1GHz is ultimately most suited to very high capacity mobile data applications (e.g. 5G). It is possible that these assumptions, along with assumptions on the demand spread, has led to an underestimation of the increased capacity that can be obtained by adding more base stations alone. We believe that it would be more spectrum efficient and more effective to pursue a strategy of increased mobile network density (e.g. 5G mobile) than to continue with adding more and more spectrum.

- Assumptions on demand growth: While we appreciate the difficulties associated with long term forecasting, and further to the referenced research, we believe that a sanity check is required on the assumption of continuing mobile data growth to 250 million Gbytes per month (medium demand scenario) with respect to other fixed, portable and broadcast access technologies.
- Assumptions on the level Wi-Fi off-load are underestimated when considering (a) the type of applications requiring the very high data rates implied in the growth scenarios; i.e. high resolution video which will mostly be consumed in fixed/portable environments, and (b) that possibly over 80% of data from mobile devices is already off-loaded[5] to Wi-Fi.
- Using the 700MHz band for increased cell performance – instead of increased capacity – seems to give very limited benefit (~3%).
- ComReg could insist on more efficient spectrum use from existing mobile spectrum users including more efficient traffic management (i.e. ensuring that more voice traffic is moved to VoLTE), prior to the release of further spectrum.

<u>CBA Broadcasting Analysis</u>

- We believe that the analysis may have underestimated the cost of 700MHz migration to the network – noting that there are still significant uncertainties around the cost of a 700MHz migration, in particular the timeframe over which the migration will be required.
- Underestimated cost to TV viewers:
    - UK estimates of the number of households requiring a retune should not be applied in Ireland, where typical reception conditions can be very different given the development of terrestrial reception predominantly based on longer range reception, often including multiple sources (e.g. Irish and UK TV).
    - Note that the 15% figure quoted in the information provided by 2RN to Frontier Economics was not an estimate of “interference” (as listed in Table 12 Annex 1 of the CBA). It was an estimate of households that could experience reduced signal level (at their receiver) to such an extent that they would notice reduced quality in their TV reception. The implications of increased interference have yet to be fully considered.
    - The cost of a retune/rescan is underestimated, noting that retunes are not common in Ireland and many viewers will require assistance with this task.
    - Implications of the delayed manifestation of 700MHz migration effects on viewers need to be considered, given that reduced signal level or increased

[5] “The value of Digital Terrestrial Television in an era of increasing demand for spectrum”, Rob Kenny, Robin Foster & Tim Suter, Communications Chambers, UK, January 2014.

interference may only become noticeable up to a year or more after the migration (e.g. after a major seasonal enhanced propagation event or following seasonal growth in nearby foliage). These effects can be very subtle or intermittent, therefore any information campaign should inform viewers of this so that these effects are not dismissed as being indicative of a poor quality platform, but are in fact a direct result of the 700MHz migration and they should be due compensation to restore reception.

- The statement that DTT can be accommodated at lower UHF spectrum without loss of service is not correct (CBA section 7.7). Migrating from the 700MHz band will result in more densely occupied spectrum both in Ireland and the UK with an inevitable increase in interference between DTT services and a consequential loss of coverage – which with careful planning can be minimised, but not eliminated.

4.58 – We would like to add that a 700MHz migration is a more challenging proposition than the 800MHz clearance as there is not likely to be any benefit to TV viewers (unlike at ASO); this will only cause disruption. It is therefore essential that all efforts are made to minimise damage to the Saorview platform during this transition, and we suggest that additional effort be given to the preparations and support of the migration.

5.2 – An additional factor in spectrum demand/supply relationship is economic/commercial decisions related to implementation – or alternatively "spectrum efficiency". When considering any apparent inherent limitations of spectrum usage, or when evaluating potential spectrum shortages (e.g. as currently perceived with respect to future mobile broadband services) it is important to recognise that by far the most effective way to increase spectrum efficiency is for greater frequency reuse (i.e. smaller cell sizes)[6]. With modern wireless systems the ability to reuse spectrum in this way is primarily limited by economics. The benefits of feeding such problems with more spectrum are temporary - the displacement of an existing system is permanent.

5.7 – It is important not to underestimate the impact of Wi-Fi off-load, the increased availability of fixed broadband access technologies, and the superior efficiency of broadcast technology for delivering high quality video content. Furthermore, technical advances in each of these other technologies must also be considered alongside future mobile development.

5.29 – Note that while eMBMS may be more efficient than previous/other LTE technologies for providing broadcast mobile TV, it is not more efficient than digital broadcasting technologies (e.g. DVB-T2) at delivering high quality mobile video.

5.34, footnote 91 – DVB-T2 has been mandatory in the Saorview receiver specification since January 2013: http://www.2rn.ie/wp-content/uploads/2015/11/Irish-DTT-receiver-spec-V6.pdf

[6] See the following articles for an interesting alternative perspective on the utility of spectrum: "The Myth of Spectrum Scarcity", Martin Cooper, 2010, & http://www.arraycomm.com/technology/coopers-law/

5.49 – Note that RTÉ has recently invested in migrating PMSE from the 800MHz band. At the time of migration there was no reasonable prospect of the 700MHz band also migrating within the lifetime of the equipment.

When considering new, alternative PMSE bands, ComReg should expect a lengthy lead time before new equipment designed for the new bands are sufficiently mature for critical live PMSE use.

5.51 - Note that more dense broadcast and PMSE use in sub-700MHz spectrum will leave less opportunity for new innovative white space applications to operate without causing disruption, and ComReg should be aware of this when considering future white space policy/initiatives.

## 4 Comment on Chapter 6: Radio Spectrum Work Plan for 2016 to 2018

6.12 - RTÉ and 2RN believe that it would be appropriate to reference the protection of existing users of spectrum, when considering any actions to encourage and ensure the efficient use of spectrum.

6.13 – Should the reference to WRC15 be WRC18 which will occur during the timeframe of the strategy?

6.15 – In relation to preparations for repurposing the 700MHz band, a key issue which should be referenced is the issue of compensation for viewers and existing operators of this spectrum given that they are likely to experience no benefit from this costly and disruptive repurposing of spectrum.

In relation to the timing of the spectrum release it is important to realise that a significant period of time will be required to allow for the planning, raising of capital, procurement and rollout of infrastructure to enable a 700MHz migration. Footnote 119 refers to an announcement of ASO in 2010 prior to a 2012 completion date, when in fact the planning and roll-out of the DTT network began with the publication of the Broadcasting Amendment Act, 2007. A two-year period from announcement to migration is not realistic for infrastructure projects of this scale.

6.16iii – Note that ComReg should continue to take guidance from DCENR policy where public service broadcasting is concerned.

6.2.8ii - ComReg should consider more interactive and ongoing input from the Irish PMSE industry when developing PMSE solutions, in addition to technical studies.

7.84 – We would argue that there is sufficient evidence that coverage and roll-out requirements are not required for public service broadcasting in Ireland given the recent experience during ASO. The Broadcasting Act 2009 does not require RTÉ to cover 98% of the population (as stated in bullet 3); it required RTÉ to replicate analogue TV coverage at

the time of switch-over. The 98% population coverage provided by Saorview actually exceeds the coverage of analogue TV coverage in Ireland at the time of ASO substantially (assuming standard receiving equipment without mast-head amplifiers), particularly for TG4 which did not benefit from VHF transmission. The increased coverage was undertaken voluntarily by RTÉ to help ensure the success of the platform, furthermore RTÉ voluntarily undertook to provide infill coverage to the remaining <2% of the population via a FTA satellite solution (SAORSAT) – all in the absence of prescriptive coverage obligations, or retail pressure.

This is an important point as it shows that traditional economic analysis and regulatory measures for commercial/competitive use of spectrum do not apply where services with important social value such as public service broadcasting are concerned. It is important that there is clear delineation within ComReg with respect to how spectrum is managed for these different types of uses. This distinction should be more apparent in the draft spectrum strategy statement.

7.103 – Further to the aim of providing transparency it would be very helpful if the data already available on the ComReg siteviewer was also available in a list format. Similarly, this data should be made available for microwave fixed links and any other licensed services.

# 9 Sensus UK Systems Ltd. (“Sensus”)

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29 January 2016

Dear Sirs,

**Re: Response to Consultation on ComReg's Draft Radio Spectrum Management Strategy 2016 to 2018. ComReg 15/131**

Sensus is a global leader of clean technology solutions and are a provider of Long Range Radio (LRR) communications technology specifically designed for smart metering and smart grid. Sensus FlexNet technology has been selected for the GB smart metering programme.

Sensus has pleasure in enclosing the following commentary in relation to the above mentioned consultation ref: ComReg 15/131.

**Page 43, footnote 75**

Sensus understands and respects ComReg's view of spectrum harmonization where possible, and the fact that no commercial services have been deployed in the 400 MHz and 900 MHz WDMDS licenses in Ireland. However, as pointed out in the table on page 125 the 400 MHz band is being used by Arqiva in UK to operate a smart metering network on behalf of DCC for over 10 million homes. This network operates to high coverage and connectivity service levels in excess of 99%, which are made achievable largely through the propagation characteristics of this band. Sensus would draw attention to the fact that there are many topographical similarities between the northern regions of UK and regions within Ireland. This is true for both urbanised areas as well as more rural locations where a single 400MHz solution can provide excellent coverage and connectivity to all consumers economically regardless of where they live. It is the radio propagation to the meter point, wherever it is situated, that delivers significant financial savings in the deployment of a project such as the National Smart Metering Programme.

**Page 65 – 6.15**

Sensus believe that in line with other uses for Advanced Metering Infrastructure networks, ComReg should reconsider the statement regarding taking no specific action in relation to the 400 MHz spectrum that is now out of license. Depending on the actual need being created, there may be sufficient spectrum available to satisfy multiple projects in Ireland, and deliver greater economic benefits through innovation.

**1.9 Promoting Test and Trial Ireland**

Sensus agrees with ComReg that Ireland is an excellent location for testing and trailing radio solutions. It offers both the geographical and morphology environments and local expertise to thoroughly evaluate and prove out new solutions such as smart metering and smart grid. Sensus has

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already participated in several technology trials in Ireland, and is monitoring further opportunities to support Ireland's move into a digital utility future through membership of organisations such as Smart Grid Ireland.

**5.58 Internet of Things**

ComReg correctly states that the spectrum requirements for IoT remain unpredictable. Sensus therefore believes that for Critical National Infrastructure such as smart grids and smart metering, consideration should be given to spectrum allocation that ensures continuity of service as IoT expands. Sensus again notes that the 410-414, 420-424MHz band is currently unallocated and that this band has been successfully used to provide solutions for Critical National Infrastructure. In addition to the previous example of the Arqiva smart metering network in UK, networks operating critical communications, such as Tetra Ireland, on adjacent spectrum bands deliver extremely high levels of service and coverage. Due to the physical attributes of such bands Sensus would argue that costs are minimised for the deployment of technology.

**6.4 The Expiry of Existing Licenses**

Sensus notes ComReg endeavours to set out its proposal on expiring licenses in good time. Sensus notes the 400MHz licenses have expired without following such a process and encourage ComReg to start such a process as a matter of urgency as there are known commercial opportunities for this frequency. Sensus would propose that the 400MHz available spectrum is broken into smaller allocations based on 12.5KHz pairs. Such pairs can then be offered to encourage a range of users into the band.

**Annex 3. Table 3, 400MHz (WDMDS)**

Sensus agrees with ComReg that the 410-414, 420-424MHz band has a wide range of users within Europe including various land mobile, smart metering and smart grid solutions. As ComReg notes the band offers favourable propagation characteristics. In particular the use of 400MHz ensures high levels of availability to end-points that are in fixed locations and often located deep inside buildings. Smart meter deployments are most successful and realise the most beneficial economic benefit when connectivity rates are very high. Many utilities are driving for connectivity rates of greater than 99% in order to deliver granular "real time" consumer data, and reduce OPEX costs by mitigating installation revisits. The required data for such devices is small in comparison to many applications and as such a good compromise is achieved between coverage and capacity in the 400MHz band even with partial band allocations.

In addition, Sensus' global utility experience suggests that critical infrastructure such as SCADA networks, where data delivery, control and resilience are essential, benefit tremendously from the use of dedicated spectrum, where the network is not contended by other data traffic.

**Conclusion**

Sensus would urge ComReg to consult as a matter of priority on the allocation of the 400MHz bands, now they are out of license and remain unused. Sensus believes there are defined commercial opportunities for this spectrum, and would suggest that a suitable model could be to sub-divide and offer the bands in smaller paired allocations to ensure spectrum is available for a range of differing projects. Sensus believes this will stimulate a high demand for the band and lead to the deployment of new and innovative solutions, creating economic benefits for Ireland. Sensus encourages ComReg to make an initial 1Mhz allocation immediately available to address current needs.

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Yours sincerely,

**Neil Adams**
**Director, Strategic Customer Team, EMEA and Asia Pacific**
**For and on behalf of Sensus UK Systems Ltd**

# 10 Sigma Wireless Communications Ltd. (“Sigma”)

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29th January 2016

**Reference: Response to Consultation on ComReg's Draft Radio Spectrum Management Strategy 2016 to 2018. ComReg Document 15/131**

Dear Sir / Madam

Sigma Wireless welcome the opportunity to respond to this consultation. Sigma Wireless is a leading supplier of advanced radio communications solutions to professional and public safety users in Ireland since 1991. Our customers include An Garda Síochána, The National Fire Service, The Health Service Executive, Irish Coast Guard, Irish Aviation Authority, ESB, Dublin Airport Authority, many Local Authorities and Multinationals, such as Intel, Pfizer, Microsoft, Eli Lilly and Novartis. We have designed, built and currently maintain Tetra, PMR and DMR radio networks in the frequency bands up to 500 MHz for all of these customers. Sigma Wireless are also a shareholder in Tetra Ireland the national operator of the National Digital Radio Service (NDRS) network.

Our interest in responding to this consultation is around the 400 MHz band and specifically;
Point 5.12 page 43, point 6.15 page 65 and point 6.2.8 page 68.

**Point 5.12 – Page 43, Note 75**

We acknowledge ComReg's experience that harmonised spectrum bands has proven to be generally very successful in facilitating the delivery of services to end-users.
However ComReg would seem to suggest that non harmonised spectrum bands run the risk of being underutilised, as is what has happened in the past 10 years for the 400 MHz and 900 MHz bands licensed using the Wideband Digital Mobile Data Services (WDMDS) licences. We would be of the opinion that in order to avoid having unused spectrum in the future, that ComReg monitor the use of awarded spectrum (specifically long term licences) and if possible, seek alternative uses of this spectrum. We would also propose that a process be put in place for strict "use or lose" penalties to ensure that valuable spectrum is fully utilised to the economic benefit of the consumer. Furthermore we understand that the 410-430 MHz band is not currently harmonised within CEPT but is widely used across Europe, for service such as:

- PMR Radio
- DMR Radio and Trunked DMR radio
- Smart Metering (Specifically Arqiva in the UK, for the north of England and Scotland)



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- Smart Grid
- Tetra TEDS

**Point 6.15 – Page 65**

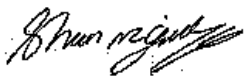
We strongly ask ComReg to reconsider their view that it should take no specific action(s) following the expiry the WDMDS licence using 400 MHz radio spectrum in 2015. We believe that this spectrum is an ideal spectrum for services such as those outlined above and to further leave this spectrum unused in the future, as it has been for over 10 years would be a great shame, given its favourable propagation characteristics as acknowledged by ComReg in the table on page 125. We have also found this with our experience, specifically in the RF design which has been proven by nationwide drive testing of the entire Tetra Ireland network, this system delivers high levels of coverage (Over 99% nationwide mobile coverage) in an adjacent frequency band (380 – 385 MHz / 390 – 395 MHz). As a result of the excellent propagation characteristics of the 410 - 430 MHz band we believe this should be viewed as a priority and that a consultation process should be carried out for this spectrum to assess the potential interest immediately.

**Point 6.2.8 - 6.1 ii. – Page 68**

We welcome and look forward to ComReg consulting on the business radio licensing regime to permit the use of national channels on a technology and service neutral basis. We also ask that the Mobile Radio System Licence (Trunked Radio) licencing 07/57 be consulted on. With the emergence of Digital Mobile Radio (DMR) over the last number of years we would like to see a situation where all DMR technologies, specifically Tier II and Tier III trunking can be deployed across the 410 - 470 MHz bands and not be limited to specific technologies per frequency band i.e. *385.0000 to 389.9875 MHz (Mobile transmit) paired with 395.0000 to 399.9875 MHz (Base transmit) for Digital Mobile Radio (Trunked) systems**

We see no reason technically why this cannot be achieved and understand that this is not the case in other markets across Europe.

Yours Sincerely,



Shaun McGinley
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Sigma Wireless Communications Ltd,
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Email: smcginley@sigma.ie

*(*ComReg document 07/57 General Information Point 5)*

Directors: J.A Boyle; M.McGinley; A.C Maguire; J.Reilly; N.Robinson;
Registered in Ireland No.174542 at McKee Avenue, Finglas, Dublin 11.

# 11 Silver Springs Networks (“SSN”)

**Silver Spring Networks' response to the Consultation on ComReg's Draft Strategy 2016 to 2018 radio spectrum management strategy**

Silver Spring Networks (SSN) has significant experience in the M2M market having connected in excess of 24 million end nodes. It has operations across five continents and operates the current largest IPv6 network in the world. SSN floated on the New York stock exchange in 2013 and is currently capitalized at close on $500 million US.

SSN welcomes the opportunity to respond to ComReg's strategy and plans for the coming period, and broadly agrees with the principles on which the strategy and plan is based.

SSN agrees that the release of harmonized spectrum (5.1.3) is of particular importance to any national regulator increasing the likely benefits and usage of the spectrum as manufacturers are able to take advantage of economies of scale and develop products that can operate and, if necessary, interoperate across borders.

SSN also agrees that exploiting sharing opportunities (7.4) is an important way to maximize the benefit of spectrum. In particular, Short Range Device (SRD) spectrum is an excellent way to allow a multitude of applications and service providers to access spectrum as necessary in geographic locations around the country. Regulators can be assured that compatibility work carried out in CEPT and ETSI will ensure that different applications can happily coexist (although we are of the opinion that the danger of band saturation is often overstated).

SSN agrees that enablers should be put in place to encourage the development of IoT technologies (5.2.5), a potentially vitally important technology and industry.

SSN, specifically, strongly welcomes the proposals to release of the bands 870-876MHz and 915-921MHz according to the conditions within CEPT Rec 70-03. The SRD community has invested much time and resources into careful studies to determine the best way in which devices and services should operate in these bands, and it is welcome that more and more countries are releasing this valuable sub-GHz spectrum.

The benefits of releasing License Exempt spectrum is well documented, equating to double that of mobile spectrum according to a study carried out on behalf of the UK's Ofcom in 2006. To this end, the UK was the first country to release the spectrum in Europe and it is heartening to see other countries now following suit.

These bands are particularly important - the sub-GHz frequency being in the sweet spot of range and re-use – and overlap the important quasi-global 902-928MHz ISM band which is currently under consideration by the ITU for global harmonization. The bands will offer consumers a host of new services including high-performance RFID, sensor networks, IoT connectivity and high performance alarms. IoT technologies that are likely to be deployed in the band include IEEE802.11ah and ETSI technologies for Short-Range SRDs (EN 303 204) and a new group technologies known as Low-Throughput Networks (LTNs). In many European countries they have

lain fallow for almost 15 years, and this arguably so in the Republic, too. Nine CEPT countries have already released this spectrum in the 12-months since Rec 70-03 was updated and, although unlikely to be recommended for full harmonization in the current round of updates to the EC's standing SRD mandate, it is likely that the 'soft harmonisation' process will continue over the next two years leading to likely full-harmonisation in the next iteration.

Rec 70-03 leaves regulators a choice as to whether to allow the operation of Network Relay Points (NRPs). NRPs are incorporated into several of the IoT technologies set out above, and studies carried out within CEPT were unambiguous: the benefits of such devices are clear and they have negligible impact on other users of the band, especially as the safe harbor bands exist at ends of the bands. We would encourage ComReg to follow Ofcom's steps and allow the unlicensed deployment of such devices to release the potential of the types of networks that can benefit therefrom. Not having this allowance would simply encourage the roll out of a greater number of NRPs, which would have the same operational effect but cost service end users proportionately more money.

In summary, Silver Spring is very supportive of ComReg's intention to designate and make available the use of the bands 870-876 / 915 - 921 MHz for SRDs. We believe that ComReg should allow the operation of NRPs to maximize the utility of the bands. In our opinion this decision will significantly benefit the development of IoT technologies in the Irish market.

# 12 Smart Connect (partnership Sigma, Tetra Ireland and Sensus) (“Smart Connect”)

Divisional Assistant to Market Framework
Commission for Communications Regulation
Irish Life Centre
Lower Abbey Street
Dublin 1
Ireland
**D01 W2 H4**
Email: marketframeworkconsult@comreg.ie

29th January 2016

**Reference: Response to Consultation on ComReg's Draft Radio Spectrum Management Strategy 2016 to 2018.ComReg Document 15/131**

Dear Sir / Madam

SmartConnect has been formed with a view to bidding for the upcoming ESBN Smart Meter Communications Network and is a Partnership between Sigma Wireless, Tetra Ireland and Sensus. Sigma Wireless is a leading radio integration expert with over 20 years proven experience in providing world class mission critical communications solutions including system design, installation, implementation and support. Tetra Ireland is the national operator of the National Digital Radio System (NDRS) critical national communications infrastructure network, and currently operates the service in radio bands adjacent to the 400 MHz band mentioned below. Sensus is a global leader of clean technology solutions and are a provider of Long Range Radio (LRR) communications technology specifically designed for smart metering and smart grid which has also been selected for the Great Britain smart metering programme.

SmartConnect are delighted to respond to the above mentioned consultation. Our area of interest is around the availability of spectrum for the upcoming ESBN Smart Metering communications programme.

**Point 5.12 – Page 43, Note 75 and Page 125**

As ComReg point out in footnote 75 on page 43, "*no commercial services have been deployed in 400 MHz and 900 MHz bands licensed using the Wideband Digital Mobile Data Services (WDMDS) licences which were issued 10 years ago in 2005"* and on Page 125 also state that 400 MHz band is being used in the UK by Arqiva for Smart Metering. In the UK the specific areas covered are the North of England and the whole of Scotland and the technology used is the Sensus Long Range Radio operating in the 400 MHz band connecting over 10 Million homes. We believe the 400 MHz is an ideal spectrum for the upcoming ESBN Smart Metering communications project, and believe that this will deliver true economic advantages in terms of technology deployment costs. The geographical area covered in the UK project is very similar to that of Ireland and given the

favourable propagation characteristics of the 400 MHz frequency spectrum, high levels of nationwide coverage, in excess of 99% is very achievable. We believe this spectrum is critical to deliver leading technologies like smart metering uniformly for both urban and rural communities, while meeting the twin objectives of spectral efficiency and value for money.

**Point 6.15 – Page 65**

We ask that ComReg reconsider their statement that they are *"of the view that it should take no specific action(s) following the expiry the WDMDS licence using 400 MHz radio spectrum in 2015"* and prioritise a consultation on this spectrum. As this particular spectrum has not been in commercial use for the last 10 years and ComReg don't have any particular plan for its use we believe it is ideal for Smart Metering Communications, given the 400 MHz propagation characteristics as stated above and furthermore a long term licence could be issued on this available spectrum for 15 years plus, in order to future proof the availability of suitable spectrum for the Smart metering programme.

In conclusion we believe that ComReg has sufficient interest to justify an immediate consultation and the release of a proportion, or all of the available of spectrum in the 400 MHz band in order to deliver known commercial benefits for Ireland.

Yours Sincerely,

Tony Boyle,
SmartConnect,
C/O Sigma Wireless Communications Ltd,
McKee Avenue,
Finglas,
Dublin 11.
PH: +353 (0) 87 2552016
Email: tboyle@sigma.ie

# 13 Vodafone Ireland Ltd. (“Vodafone”)

30 November 2015

Mr George Merrigan
Commission for Communication Regulation
Abbey Court
Irish Life Centre
Lower Abbey St
Dublin 1

**RE: Vodafone views on spectrum strategy**

Dear George,

Vodafone are writing to confirm our consultation responses to recent consultations on spectrum strategy. Vodafone are concerned that our views are being misinterpreted to support a view that Vodafone's first preference in terms of spectrum priorities is an assignment of 2.6GHz and 700MHz in one award and a support for the view that 3.6GHz spectrum is the first priority.

It should be noted that Vodafone was led to believe that ComReg had prioritised 2.6GHz as a spectrum band for earlier release given the availability of the spectrum from April 2016 which was a year before licenses expired on 3.6GHz spectrum. ComReg's consultation was '2.6GHz auction with possible inclusion of 700MHz and other bands'. Document 14/102 would also suggest that it was ComReg's view that 2.6GHz should be prioritised. In fact ComReg's advisors , DotEcon, confirmed in their report supporting the consultation that they had already started the process:

'Existing licences for radio spectrum in the 2.6GHz band expire in April 2016 and ComReg has commenced the process for awarding rights of use for frequencies in this band after this date. ComReg has engaged DotEcon to provide support in the design and implementation of the award process. In this report we discuss a number of key issues for the design of an award process for assigning rights of use for frequencies in the 2.6GHz band, and possibly of additional bands that could be offered in the same award'

Vodafone responded to the consultation on the basis of the strategy being put forward by ComReg. Vodafone argued for a lower number of bands in any auction process and although we expressed an interest in the use of the 700MHz band we pointed out the likely delay in getting this spectrum freed. We identified that we did not want 2.6GHz auction delayed significantly by this move. This is what appears to be the case. Our clear ask was to reduce the number of bands and simplify any future auctions.

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ComReg's decision to prioritise 3.6GHz band was therefore not based on the assumptions in document 14/102. For the avoidance of doubt in its response to document 14/10, Vodafone stated:

**'Vodafone would favour an auction design with a lower number of bands being simultaneously auctioned. An additional auction, or auctions, at a planned later date could award the other bands. The extra overhead imposed on Comreg and Operators by holding additional award processes would be compensated for by having significantly more simple auctions at more predictable times. We would ask that Comreg publish a work programme for future auctions setting out a quarter by quarter program over the next number of years. This would help operators plan resources and approvals and give more regulatory certainty to the market.'**

**'The early release of this spectrum from DTT to mobile applications is certainly of interest and we continue to support the process underway with the Cost-benefit analysis referred to in p3.44....While these processes are useful the timing of completion of a possible reallocation of spectrum from DTT to mobiles remains uncertain. The conclusion and implementation of an agreement with broadcasters on a move of DTT spectrum allocation in Ireland may take considerable time'.**

**'The long term attractiveness of the 700MHz for nationwide coverage is agreed...The key issues will be around the timing of availably of the spectrum and whether the uncertainty in the timescales required to agree a required move of DTT services could delay a 2.6GHz award process...The benefit of adding this band to the award process needs to be balanced with the possible delays to an auction'.**

Vodafone would ask that any auction in 2016 would take the opportunity to auction a number of bands not just 3.6GHz. Vodafone would argue it is inefficient use of spectrum if the 2.6GHz spectrum band remains unassigned when there is clear demand and to await the release of 700MHz could result in no assignment of 2.6GHz until 2017, at the earliest. The spectrum imbalance which exists at the moment creates a competitive disadvantage for Vodafone and the longer the imbalance exists the more potential damage exists for Vodafone. It is Vodafone's view that there is no impediment to ComReg conducting an award process for 2.6GHz spectrum in 2016.

We would welcome your views on the comments above.

Sincerely,

_____

**Gary Healy**

**Head of Regulation & External Affairs**
**Vodafone Ireland Limited**

Commission for
**Communications Regulation**
Coimisiún Um
**Rialáil Cumarsáide**

**4 December 2015**

Mr Gary Healy
Head of Regulation & External Affairs
Vodafone Ireland Limited
MountainView,
Leopardstown Dublin 18

**Re: Vodafone views on spectrum strategy**

Dear Gary,

I refer to your letter of 30 November 2015 to George Merrigan, in which Vodafone sets out its views on spectrum strategy.

I firstly note Vodafone's concern that its "*views are being misinterpreted to support a view that Vodafone's first preference in terms of spectrum priorities is an assignment of 2.6GHz and 700MHz in one award and a support for the view that 3.6GHz spectrum is the first priority*", and its reference to its submission to ComReg Document 14/101 in this connection.

Having considered the relevant documents issued by ComReg subsequent to the publication of Document 14/101 (namely, Information Notice 15/14 and Consultation 15/70), I am unaware of any circumstance in which Vodafone's submission to Document 14/101 was considered in said documents in such a manner so as to support Vodafone's concern as expressed in your letter. See, for example, paragraph 6 of Information Notice 15/14 and section 3.2.1 of Consultation 15/70.

I also note Vodafone's request that "*any auction in 2016 would take the opportunity to auction a number of bands and not just the 3.6 GHz band*" and its view that *"there is no impediment to ComReg conducting an award process for 2.6GHz spectrum in 2016*." I observe that such matters are relevant to ComReg's spectrum management strategy consultation, which is intended to be issued shortly. ComReg is therefore treating your letter as an input to this forthcoming consultation, and Vodafone's views (including any subsequent views Vodafone may wish to submit) will be considered alongside submissions received from other interested parties on same.

As with other submissions received in connection to ComReg consultations, we intend to publish a non-confidential version of your letter on ComReg's website in

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due course. In that regard, I note that your letter is not marked as confidential. However, should Vodafone consider any material to be genuinely confidential, then I would request that any representations to that effect be provided in accordance with the procedures set out in ComReg Document 05/24 and by 1pm on Friday 11 December 2015. ComReg also intends to publish this response in due course.

Yours sincerely,

Kevin Kennedy

Kevin Kennedy
Senior Manager Spectrum Policy and Development

# Vodafone Response to ComReg document :

# Draft Radio Spectrum Management Strategy 2016 to 2018

## Consultation on ComReg's radio spectrum management strategy

## Reference: ComReg 15/131

# Executive Summary

Vodafone welcome the opportunity to respond to ComReg's Draft Spectrum Management strategy 2106 to 2018.

Vodafone agree that spectrum play a vital role in the communications value chain and the efficient allocation and assignment of spectrum and efficient processes for the awards of mobile spectrum are a key support to the Irish economy and should be a key policy priority for ComReg.

Vodafone :

- Strongly support the anticipated customer demand for mobile services
- Believe that Ireland must ensure we have spectrum assignments in line with other European countries.
- Believes that a digital single market for European customers will bring benefits for Irish customers - this requires moving towards a **consistent policy environment** for spectrum across EC countries.
- supports the view that **open, simultaneous, multi-round auctions** (whether SMRA or CCA) are the most efficient way to assign new spectrum
- agrees **auction objectives** should include efficient use of spectrum and increasing access to mobile broadband services, but believes that positive discrimination towards possible new entrants should be avoided
- believes that governments should consider the longer-term impact on the economy (and associated treasury receipts) of raising excess revenue from licence fees
- insists that greater alignment on **timing of licences** across the EU is necessary to facilitate the Digital Single Market and achieve economies of scale
- encourages ComReg to adopt conservative **reserve prices** – supporting investment in infrastructure.
- supports the RSPG view that **licences terms** should be lengthened and consideration given to creating **perpetual licences**, in order to promote ongoing investment and upgrades in mobile broadband networks
- ask ComReg to consider the consistent **market pricing of spectrum across all users,** this would address under-utilisation of spectrum and incentivise rebalancing, causing inefficient users to release spectrum for more efficient purposes
- supports the use of **technology neutrality**
- supports the applications of reasonable **caps**, but cautions against spectrum **set-asides** for possible new entrants, which may be discriminatory and inefficient
- supports reasonable **coverage obligations**, which should not be changed unilaterally a licence has been issued
- supports **spectrum trading, leasing and sharing**

**Action for ComReg to support the development of Mobile services in Ireland :**

- **accelerate the auctioning of 2.6GHz spectrum** - It would be feasible and efficient to run this auction this year, in parallel with 3.6GHz as independent lots.

- continue to work to reallocate the 700MHz band but **do not wait** for completion of this band to release other bands.

- Ensure the re-licencing of 26GHz radio-link band is carried out in good time to ensure continuity of service.

# Introduction

Vodafone welcome ComReg's document 15/131 "Draft Radio spectrum Management Strategy 2016 to 2018.

We agree strongly with the text that identifies the value of Radio Spectrum to the Economy, the industry value of the Telecommunications Industry is clearly calculated but the total contribution should also factor telecommunications as a facilitator of the wider economy. This together with the social benefits arising from better communications systems must drive us to have the best possible mobile networks in Ireland.

ComReg's document also identifies the importance of following European standards in the allocation of spectrum. This is key to having effective networks in Ireland - the scale of our customer base cannot drive technology development of base-station or terminal equipment so we must make maximum use of international standards to benefit from the rapid developments that are being made in new technologies.

To maximise the benefits of this standardisation we must consider the alignment of our frequency assignments as well as allocation. To have truly competitive networks in Ireland we should have at least as much spectrum available as other European countries. This is not the case at present.

The following diagram illustrates the disparity in assignments .

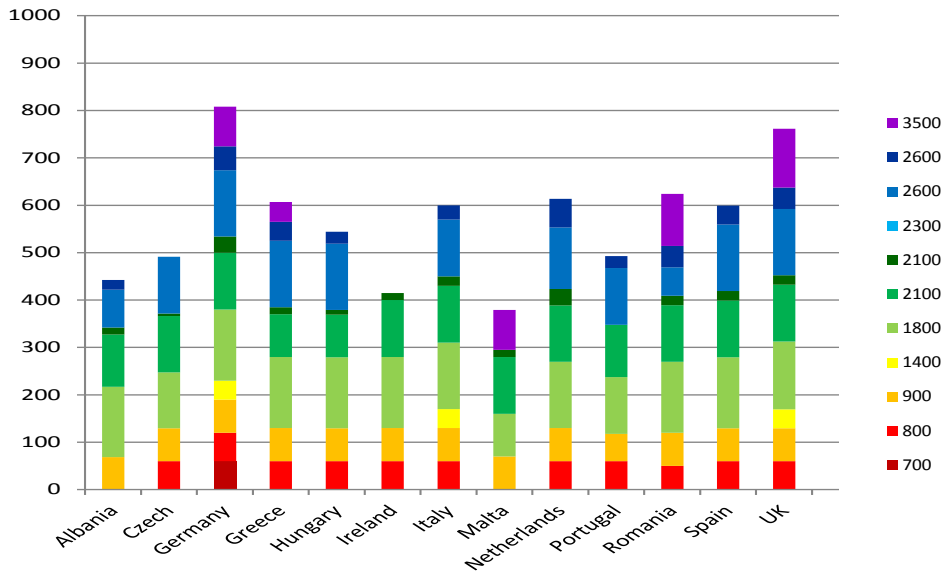



Fig 1 Current Spectrum Assignments in EU markets where Vodafone operate

This disparity in allocation drives additional cost in network build. Extra costs, particularly in site build, can result in long-term increased costs of network and inevitably leading to higher costs for customers. Lower spectrum allocation will also result in lower quality services for our customers

Although ComReg's document clearly identifies that customers have every increasing demand for mobile data it does not adequately link this to a drive for timely allocation and assignment of mobile spectrum. Mobile operators cannot wait for spectrum allocations before meeting these demands and hence if a lower set of spectrum allocations is available it will drive mobile operators to invest inefficiently in implementing solutions for customers that are sub-optimal.

The lag between assignments in other European countries and Ireland is now evident in the delays to allocation and assignment of the 2.6GHz band. These assignments have been completed in every major European market that Vodafone operates in except Ireland. We see no reason for continued delay in assignment of this spectrum We are also concerned that the assignment of 700MHz is proceeding in other European countries while the timescale for this step in Ireland remain vague. There is further risk here that Ireland will fall behind in delivery of service to customers.

The current consultation discusses the 2012 MBSA ( multiband spectrum auction ) at length. We agree that this demonstrated that auctions are an effective way of assigning spectrum . Many principles were established through the long consultation process that took place before that auction and we agree that the use of a well-defined and relative standard auction is clearly the way to assign future spectrum. The use of auctions has become relatively standard across Europe.

While the MBSA was effective it was not timely and it was more complex than the auctions held in other European countries. The long-time take to design and agree the auction delayed the assignment of 800MHz spectrum and liberalisation of 900MHz band as well as delaying the delivery of new services in these bands to customers. The rapid roll-out and take-up of new services in these bands post-auction illustrate that there was pent-up demand for these services.

The delays to the MBSA auction process also contribute significantly to the complexity of the final auction as the final auction format had an unusually complex set of time-specific lots and a very complex set of bidding caps. Comparing the auction in Ireland to other auctions Vodafone participated in we would observe that the mechanisms of "relaxed" and "chain" bids, and "relative" caps and "final round" caps were the most complex seen in any European auction.

Future auctions should be simpler and consistent in design – this will enable the consultation process to more straightforward and enable the auctions to be held in a timely manner.

Given the importance of this spectrum to the provision of services to customers a lack of resources in ComReg should not be a factor in deciding the timing of auctions.

Specifically in Ireland an auction for 2.6 GHz spectrum should take place this year. The arguments we made in our letter of Nov 2015 ( included in the consultation document ) still stand. Customers' terminal equipment is now capable of using this band, and as customer data demand increases investment should not be diverted into less efficient network solutions.

Further auctions for the other bands discussed in 14/101 ( 700MHz, 1.4GHz, 2.3GHz ) can then take place at a later date.

## Cost of Network Roll-out

The Customer demand for additional services is well identified in the document, but there is no discussion of the dramatic downward trends in price /Mbit that customers are enjoying. This can only be sustained by continually reducing all elements of the cost to deliver these services to customers. In the context of this document the cost of additional spectrum for mobile services ( and to a lesser extent for radio links) must reduce to enable this trend to continue.

ComReg have tended to follow an unfortunate practice in Europe of setting auction reserve prices based on the results of auctions in other countries. This can result in a ratcheting up of prices over time, and is a departure from efficient pricing. A well-designed and well-run auction will reveal the market value of the spectrum.

ComReg should demonstrate their commitment to genuinely market-based awards and corresponding consumer benefits.

# Response to specific Sections of ComReg Document 15/131:

## 1 Executive Summary

1.1 Radio spectrum is a valuable national resource underpinning important economic, social and communications activities. These include widely used services, such as mobile/fixed wireless communications and broadband, radio and TV broadcasting, and the safe operation of air and maritime transport. In addition, radio spectrum is fundamental in the day-to-day operation of the emergency services and defence forces and is a vital input to many other services including important scientific applications, such as weather forecasting and monitoring the Earth's environment.

**Vodafone agree that Radio spectrum is a valuable national resource underpinning important economic, social and communications activities. Mobile and fixed telecommunications contribute . . .**

Chapter 3

## 3 Spectrum management in Ireland

3.3 Figure 1 below illustrates the relationship between Ireland's GDP in years 2009 to 2013 with the aggregate economic contribution from the use of radio spectrum over the same period. This graph highlights that the direct contribution of radio spectrum increased from €3.9bn in 2009 to €4.2bn in 2013, when modest multiplier effects are taken into account.

**We note and agree with the figures used to illustrate the value that efficient use of the radio spectrum brings to the economy. This serves to support the need for the most efficient management of the entire radio spectrum.**

3.13 Effective spectrum management also requires flexibility and responsiveness so as to adapt to changes in, among other things, technologies, demand from spectrum users and end-users, market developments and public policy.

We agree with this statement. The previous MBSA process of multi-round consultation leading to an IM was too slow to have been effective on these terms. The design complexity inherent in trying to solve issues in multiple bands process was a significant process in slowing this down.

**3.3.1 Spectrum management processes**

3.3.1.1 International aspects to spectrum management

Referring to sections 3.15 / 3.16 we strongly agree that we must align with European norms both on the allocation and importantly on the assignment of spectrum.

# Chapter 4

## 4.1 Spectrum for mobile wireless broadband

### 4.1.1 The 2012 Multi-Band Spectrum Award

4.3 The MBSA process was the subject of an extensive consultation process with a detailed consideration of many factors informing the final award design. A number of high level observations on the MBSA design and the post-award events are outlined below.

MBSA design

4.4 A primary matter for consideration in the MBSA process was the bands for inclusion in the award process. While ComReg initially proposed an award process for a single band (the 900 MHz band), following consultation and an assessment of the other relevant spectrum bands available, ComReg modified its award design to cater for a multi-band approach.

The pre-auction consultation process extended over a long time period. Changes in design of auction process caused considerable delay. The design process led to a very complex auction.

4.5 In assessing the other bands for inclusion in the award process, it was notable that each of the spectrum bands was either substitutable and/or complementary, and that each band was available in a similar timeframe. Further, each of these bands benefited from technical harmonisation measures which promoted the wide availability of relevant consumer equipment (e.g. handsets) for mobile wireless broadband. Further, having a multi-band award process provided benefits to bidders

as, during the auction, bidders were able to shift demand for spectrum rights between the bands in line with their preferences and in response to price changes between bands.

The bands in this auction were not directly substitutable as they have very different coverage capabilities. In practice the sub 1GHz coverage could not be replicated by bands over 1GHz bands. So although there was an overlap of capabilities of the bands they were not directly substitutable. This is important in consideration of caps.

• Facilitating market-based determination of award outcomes can be particularly beneficial by reducing the need for administrative decisions and lessening the potential for subsequent disputes or litigation.

We agree that an Auction process was best way of assigning spectrum in the MBSA.

We have the following observations on the MBSA process:

- The pre-auction Consultation process was long - circumstances changed during this consultation auction process making the consultation process complex and adding significantly to the complexity of the final auction design.

- The Auction included bands necessary for business continuity of the existing operators – so not all lessons are relevant to future auctions of additional spectrum.

- The Timing was of the auction was wrong , extensions to existing licences were needed to continue service to customers. The auction should have happened in advance of old licence expiry

- The Auction design was too complex. Too many possible packages - operators need to speculate too much on values of different packages.

Although the auction was successful in that it did result in the assignment of almost all the spectrum an alternative simpler auction could have achieved the aims more early.

Comparing the MBSA with other auctions Vodafone participated in there were several factors contributed to this being the most complex auction :

- The use of two time-slots
- The bidder-specific "liberalized" lots
- The mechanisms of "relaxed" bids and "chain" bids
- The intersection of "relative" caps and "final round" caps, leading to cycles of caps in some cases…
- The unduly complex assignment stage (owing to the two slots)

If ComReg are minded to do another CCA, we ask that they keep to a more standard Design.

4.15 ComReg observes the adoption of technology and service neutral licence conditions facilitated this innovation, as this provided flexibility to the licensees in deploying the appropriate technology to best meet their end-user demands.

**Agreed - Technology and Service neutrality have enable operators to rapid follow customer demands for additional services. These demands and the technical capability of terminal devices are continually changing - technology and service neutrality is the only effective way of licencing these services.**

4.18 ComReg also observes that 4G coverage in Ireland has been rolled out rapidly (noting that some MNO's 4G coverage has been rolled out faster than others) and, compared to other EU countries, Ireland's 4G coverage of 87% population in December 2014 is above the EU average of 79% population coverage.

**This demonstrates both effective use of spectrum by mobile operators and also that there was a latent demand from customers. We would suggest that if the MBSSA had happened earlier this roll-out would have happened more quickly.**

4.22 User demand for mobile data is expected to further increase as the penetration of devices (particularly 4G smartphones) increases and the capabilities of these devices increase. A recent report for ComReg by Frontier Economics has conservatively estimated that, between 2015 and 2035, user demand for mobile data will increase 33 times as illustrated in Figure 6 below.

**We strongly agree with this view and that this will drive the need for the assignment of more spectrum. ComReg should plan for spectrum assignments to meet this demand. It should also be noted that while user demand, traffic and resultant costs are growing revenues and margins are in real terms declining resulting in an increasingly challenging business environment**

4.1.3 Collaboration agreements between MNOs

**We agree that this should be a purely commercial matter between networks. Different models of site and equipment sharing are being tried by operators to try and improve service to customers and reduce costs. No input from ComReg is required.**

Post-acquisition developments

4.26 ComReg observes that it remains premature to draw any conclusions on the outcome of the above acquisition in relation to competition in the relevant mobile markets because, among other things, Three's integration of the former separate businesses is still ongoing and the two mobile virtual network operators (MVNOs) envisaged under the Final Commitments have only recently entered[55], the impact of which remains to be seen.

[56] In particular, ComReg assessed the Merger from a spectrum management perspective and continues to monitor spectrum use in Ireland (including as it may be affected by the acquisition) in accordance with its relevant statutory functions, duties and obligations. In summary:

- *ComReg has put in place a regulatory regime to ensure and incentivise efficient spectrum use. In particular ComReg, via the spectrum licensing regime, put in place various specific ex- ante measures to ensure on-going efficient use of spectrum in the relevant bands and in particular coverage and roll-out obligations and the payment of upfront spectrum access fees and ongoing spectrum usage fees;*
- *ComReg continues to monitor and supervise compliance by all of the MNOs with the conditions attached to their respective licences, including those identified above;*
- *ComReg continues to monitor and supervise compliance by all of the MNOs with the provisions of the Regulatory Framework; and ComReg regularly meets with the MNOs to discuss relevant matters such as market trends, deployment of new technologies, coverage levels etc.*

**Vodafone notes that the merger commitments included discussion of possible future use of spectrum by the new MVNOs. Comreg have not made clear what mechanisms may be used to implement these possible changes. Although footnote 56 mentions that specific ex-ante measures have been put in place to ensure on-going efficient use of spectrum we do not know what actions Comreg intend to take to monitor and review the effects of the merger and future change arising from the Commitments made in the merger process.**

**Vodafone remain concerned that there is significant imbalance in spectrum assignments and no planned round of assignments that could address this.**

## 4.1.6 The introduction of a spectrum transfer framework

4.37 In 2014 ComReg finalised its framework (procedures and guidelines) concerning the transfer of rights of use to spectrum in the bands set out in the Radio Spectrum Policy Programme (RSPP) Decision (Document 14/11). In addition, spectrum transfer regulations were adopted into law.

4.40 ComReg observes that the leasing of rights of use to radio spectrum used for the provision of ECS is provided for as part of the RSPP Decision and the Common Regulatory Framework. ComReg is presently considering the setting out of a spectrum leasing framework for the RSPP bands within the 2016 to 2018 timeframe (see chapter 5).

We agree with market based spectrum trading framework - but note that this trading does not happen often in practice. It is unlikely that this can provide a remedy for unbalanced spectrum assignments.

## 4.1.7 Potential for further spectrum releases

4.41 In line with ComReg's key priorities on radio spectrum use as set out in its strategy statement on Electronic Communications (Document 14/75), and given factors such as the increasing demand for mobile services, the ongoing harmonisation activities in the spectrum bands for (mobile) wireless broadband, and the availability of these bands, ComReg has progressed a number of items with a view to the further release of relevant spectrum rights.

4.42 These items projects include:

- Consultation 14/101 on the potential spectrum award of the 2.6 GHz band with the possible inclusion of 700 MHz, 1.4 GHz, 2.3 GHz and 3.6 GHz bands;

ComReg have not followed up in this consultation. See Vodafone's letter to ComReg of 30November 2015.

- Information Notice 15/62 in which ComReg sets out its view that the 700 MHz band can and should be repurposed for other services in line with relevant international harmonisation measures, as this would represent its most efficient use; and

Vodafone Agree

- Consultation 15/70 on the potential award of the 3.6 GHz band where ComReg indicated its intention to issue a response to this consultation by the end of 2015.

We welcome the progress made on advancing an auction on 3.6 GHz, this should not prevent progress on other bands..

## 4.2 Spectrum for other radio services

4.44 Radio links are commonly used for providing a high bandwidth connection between two fixed points and, in some circumstances, for providing an alternative to optical fibre connections. In Ireland, a large number of radio spectrum bands are allocated to and used for fixed radio links. ComReg has an established process for considering applications for radio links in a variety of key bands (see Document 98/14R).

We agree that a large quantity of links will be required. Radio links are a key enabler of business expansion. Our view is that proportionally more radio links will be required in Ireland due to the low availability of fibre.

4.45 In April 2014, ComReg closed the 13 GHz and 15 GHz spectrum bands to new radio link applications in the congestion area covering certain parts of Greater Dublin because of the exhaustion of all available channels within the congested area (see Information notice 14/32).

4.46 Further, ComReg observes that as of January 2015:

- in the urban areas, particularly in the defined congested area in the Greater Dublin region, demand for new radio links appears to have shifted towards higher frequency bands. This may be due to an exhaustion of the existing channels in the lower frequency bands or the ability for the higher frequency bands to meet the users' demands. Outside of Dublin demand is spread across all frequency bands; and

Due to the high usage it is now impractical to plan new radio links in the lower bands in the Dublin area.

4.47 No congestion charge currently applies to the 13 GHz and 15 GHz frequency bands, but ComReg notes that such a measure could be explored as a means of appropriately managing congestion issues.

We believe that congestion charges can only be a useful tool of managing these bands if other frequency bands are available. It is important that this process does not add to the overall cost of radio links.

The allocation and assignment of additional frequencies is required.

4.58 With regards to any future actions, ComReg observes that a migration of DTT services from the 700 MHz band is likely to require similar preparations to those used in the 2012 switchover process from analogue television to the DTT service as discussed above. ComReg will continue to engage with relevant stakeholders with a view to making further progress on this important spectrum band.

We welcome this activity. This band is important for wide area coverage of data services. Because of our lower population density use of this band will be more important for mobile services in Ireland than in other European countries.. It is important that we match the assignments of spectrum in other European countries in order to offer competitive services.

We do observe that the timing of this change will be dependent on other factors over which ComReg will not have control. Hence a plan for future assignments of other bands that is dependent on this change carries significant risk.

# Chapter 5

## 5 Demand for radio spectrum

5.6 With increased penetration and use of smartphones, it appears that end-users increasingly expect to access mobile internet/video services at any time and place similar to the service enjoyed with voice calls in terms of nationwide access. In addition it appears that smartphone users increasingly expect to access mobile internet/video services with service levels similar to those enjoyed in the home / Wi-Fi hotspot in terms of data speeds and reliability.

5.7 To meet these expectations, the delivered speeds and capacity of dedicated mobile networks will need to continue to evolve over time, and the deployment of technology advances, such as carrier aggregation, will increasingly be required.

Vodafone strongly agree that these factors will drive the demand for higher speed mobile services in all areas of the country. As the speeds available in fixed home broadband increase standard applications used by customers will tend to increase in their bandwidth demands. .

### 5.1.2 Technology changes and advancements

We agree that continued technology change will be implemented in networks in order to provide the best possible service to customers. The most effective way to administer spectrum is through the use of technology and service Neutral licences.

### 5.1.3 International harmonisation of radio spectrum

5.10 The international harmonisation process plays a key role in determining the demand for and the supply of radio spectrum, given its benefits in terms of facilitating economies of scale in the manufacture of radio equipment (which lowers both the cost of deploying wireless networks and the cost of wireless devices for consumers), and the minimisation of interference between users.

5.11 International harmonisation, and benefits provided from same, is particularly important for countries with a small population, such as Ireland, and, therefore, limited ability to affect the technology roadmaps adopted by often global suppliers of radio equipment.

We agree strongly that International harmonisation is important - European alignment will bring significant consumer benefit.. This alignment is very important for the availability of network and terminal equipment for end users thereby facilitating the faster and cheaper delivery of services to end-users.

We would also add that in order to provide competitive services in Ireland our spectrum assignments, as well as allocations, should align with other EU countries in a timely manner.

### 5.2.1 Mobile, nomadic and fixed wireless broadband services

5.23 As discussed in chapter 3, the user demand for mobile wireless broadband services has increased significantly in recent years (see Figure 5 above) and growth forecasts for mobile wireless broadband traffic predict further significant increase in mobile traffic, particularly as the penetration of devices (particularly 4G smartphones) and its capabilities increase. The recent report for ComReg by Frontier Economics has conservatively estimated that between 2015 and 2035, user demand for mobile data will increase 33 times (see Figure 6 above). In carrying out this work, Frontier examined analysts' forecasts of UK demand for mobile data and ComReg observes that these forecasts are of a similar magnitude to Frontier's projections for Ireland. Such increases in end-user demand will likely result in increased demands for spectrum.

Vodafone strongly agree. We would like to see a long term plan for the allocation and assignment spectrum to match this demand. The timing of these assignments should be planned so that network can be built to meet demand.

5.24 At an international level, harmonisation measures have been recently been adopted by CEPT (e.g. 700 MHz, 2.3 GHz) and the EC (e.g. 1.4 GHz) to identify and make available more harmonised radio spectrum that can be used for mobile wireless broadband, and further harmonisation measures are expected (e.g. an EC decision on the 700 MHz band). The timely implementation of these harmonisation measures in Ireland, alongside other earlier harmonised bands such as the 2.6 GHz and 3.6 GHz bands, is likely to be sufficient to address the demand for mobile wireless broadband at least in the short-to-medium 5 year term. For illustrative purposes, Figure 8 below presents information on the total amount of harmonised radio spectrum that could be made available by ComReg should it continue to progress the proposed awards initially discussed in Documents 15/70 and 14/101.84 This serves to highlight that an additional 740 MHz of spectrum could be made available for ECS/ECN which would almost treble the amount of spectrum from its current total of 405 MHz (i.e. the post- MBSA assignments).

We agree that the assignments must be made in order to provide mobile services in Ireland that compete internationally. The timeliness of both allocation and assignment is important to drive the most effective investment in network and provide the best service for customers. As part of their three year strategy ComReg should aim to have spectrum assignments that align with other EU countries.

### 5.2.3 Radio links

5.35 Point-to-point radio links are used mainly by fixed and mobile operators, broadcasters, utilities and emergency services to provide transmission capacity and networks92, and to provide redundancy and back-up for other networks.

General comments on radio Link processes.

The Current process licencing process works well. But as recognised in this document higher bandwidth demands from mobile customers will lead to a significant increase in the number and bandwidth of links required to serve these customers.

Radio links are used more extensively in Ireland for a number of reasons. The market for dark fibre is less developed in Ireland than in many other EU countries, therefore we rely on radio link to provide timely and cost effective service to customers. Also widely spread base-station sites required to serve areas of low population density and short term contract for sites occupation also increase radio link usage

The use of Block Allocation to manage the large scale radio link deployment has been both effective and efficient. We would like to see the current Block Allocation in 26 GHz renewed and extended. The allocation of Additional Blocks in the 42 GHz band would also be effective. .

Future deployment of small cells will be a driver for the use of 60GHz band links.

Congestion charges may be effective in steering users towards the most efficient band. This is only useful if these alternative bands are available. In our view fibre based services are more expensive and less extensively available in Ireland compared to other countries and hence larger numbers of radio links will be required to meet customers demand.

We would also note that as customers expect higher bandwidths for the same price the cost/MHz of link has to reduce over time .

Chapter 6

# 6 Radio spectrum work plan for 2016 to 2018

6.2 ComReg has also identified licences that are due to expire over the next six years (i.e. up to 2021) 108 and welcomes the views of interested parties on same in the context of its proposed work plan.

## 6.1 Background

6.3 As spectrum is a finite and valuable resource, it must be managed in an effective manner so that efficient use can be made of it. While ComReg strives to meet the spectrum demands of all users, inevitably this is not possible because among other things:

- two or more services/potential users may have competing demands for the same spectrum resource;
- the timing of demand for the same spectrum resource may differ between services/potential users; and/or
- at any one time there may be demand for multiple spectrum bands or multiple spectrum management activities (e.g. the amendment of a licence) by a variety of potential users. Given practical considerations (e.g. resourcing) it may not be possible to carry out all of these actions at the same time.

**As we have discussed elsewhere it is important that we at least match the assignment of spectrum to ECS that exist in other European countries .**
**ComReg should aim to simplify the Auction Design and generate repeatable auction processes. This should facilitate a Program that must be demand driven and not resource limited.**

6.4 ComReg's radio spectrum workload is driven by a wide range of items including:

- the expiry of existing licences - where existing spectrum rights of use are set to expire within the near future [109] (e.g. within the next 3 years), ComReg endeavours to set out its proposals on the future use such bands well in advance of expiry including, where appropriate, defining and carrying-out an assignment process for the radio spectrum;

[109] For example, MMDS licences in the 2.6 GHz band expire on 18 April 2016 and FWALA licences in the 3.6 GHz band expire on 31 July 2017. ComReg's current proposals are set out in Documents 14/101 and 15/70.

The assignment of 2.6GHz deserves more than a footnote. In the European context this is a very significant ECS band. The assignment of this band should have been completed in advance of this date and must be a priority going forward. ComReg have not followed their prioritisation process stated in 6.4 above

### 6.1.1 Appropriate prioritisation of spectrum work activities.

6.5 Given the above, ComReg aims to manage its workload in a manner that attempts to appropriately and pragmatically address the needs of a diverse range of actual and potential spectrum users. Relevant considerations in this regard include:

- the capacity within the existing radio spectrum bands to meet spectrum demands. Where capacity exists, it may be possible to meet this demand via the existing spectrum assignments or to award new assignments via existing authorisation processes. In addition, advancements in technologies could lead to a consideration of new band sharing possibilities between different services in existing spectrum bands;
- the timing of the expiry of existing rights of use and the requirement for an appropriate re-assignment process in light of factors such as end-user demand, harmonisation status, equipment availability, and availability of related (e.g. substitutable and/or complementary) spectrum bands;
- the international harmonisation status of a spectrum band including any future harmonisation plans;
- the harmonisation status and appropriate timing for release of spectrum bands that are currently unassigned;
- the harmonisation status and appropriate timing of radio spectrum bands that could be re-farmed and/or liberalised from one use to another. This can increase the efficient use of spectrum, facilitate innovation and potentially free-up capacity which could be made available for other uses;
- the potential for including multiple spectrum bands in a single award process;
- the adoption of legislation (national or European) which requires ComReg to take defined actions with a set timeframe;
- the adoption of national priorities supported by legislation or similar instruments; and
- the potential for market mechanisms to address spectrum management issues.

In addition to these considerations ComReg should include the following :

- The need to make forward looking assessments of need of spectrum which take available forecasts for demand in to account.

- Timeliness of assignment having regard to European norms.
- The generation of simple auction design – this will facilitate more straightforward consultation and enable timely auction and assignment.

The aim must be to have a timetable of activity driven by the need to satisfy customer demand and not limited by resources.

6.6 The extent to which any of these factors affect ComReg's prioritisation is considered on a case by case basis. However, certain activities are likely to provide greater benefits than other activities. In particular ComReg observes that:

- the spectrum bands that are subject to harmonisation measures are generally the ones which deliver the most benefits to end-users, given benefits such as increased economies of scale and equipment availability; and
- where appropriate, holding a single award process for multiple spectrum bands can provide greater benefits compared to holding a series of award process for single bands.

In relation to ComReg's arguments in 6.6: the harmonisation of 2.6 allocation and assignment with other EU countries is important: As we discuss elsewhere the benefit of holding an early award for 2.6GHz outweigh the arguments for developing an auction with multiple spectrum bands.

ComReg should consider the timing of assignments versus the assignment of these bands in other EU countries. Aligning the timing of the assignment process with Euro norms has major advantage for Irish customers as the same terminal devices are generally available in all EU countries..

# 6.2 ComReg's draft work plan 2016 to 2018

### 6.2.2 Mobile, nomadic and fixed wireless broadband services

6.14 ComReg has identified the following work plan items for mobile, nomadic and fixed wireless broadband services for the period 2016 to 2018:

i. Complete the assignment process for the 3.6 GHz band significantly in advance of the expiry of existing FWALA licences on 31 July 2017;

We agree that the 3.6GHz plan should be advanced, but this should not delay the assignment of other bands. .

ii. Actively engage with relevant stakeholders to progress the repurposing of the 700 MHz band so as to obtain clarity on its timing availability;

It is important that this is progressed - but activity in other bands should not be held up while waiting for this.

iii. Further develop ComReg's award proposals in relation to the 700 MHz, 1.4 GHz, 2.3 GHz, and 2.6 GHz bands116;

**We ask that ComReg complete the assignment process for the 2.6 GHz band as quickly as possible.**

[116] On 30 November 2015, Vodafone wrote to ComReg outlining its views on spectrum strategy (a non-confidential version of which is contained in Annex 4). In light of the nature of the matters raised by Vodafone, ComReg is treating this letter as an input to this consultation process, to be considered alongside submissions received from interested parties (non-confidential versions of which will also be published in accordance with ComReg Document 05/24)..

**The following text from Vodafone's letter of the 30th November remains valid :**

**" Vodafone would ask that any auction in 2016 would take the opportunity to auction a number of bands not just 3.6GHz. Vodafone would argue it is inefficient use of spectrum if the 2.6GHz spectrum band remains unassigned when there is clear demand and to await the release of 700MHz could result in no assignment of 2.6GHz until 2017, at the earliest. The spectrum imbalance which exists at the moment creates a competitive disadvantage for Vodafone and by extension the overall competitiveness of the market. The longer the imbalance exists the more potential damage exists for Vodafone and the market. It is Vodafone's view that there is no impediment to ComReg conducting an award process for 2.6GHz spectrum in 2016 "**

6.15 In relation to the above, ComReg observes that:

- the envisaged next step in relation to the 3.6 GHz band is the issue of a response to consultation and draft decision in Q4 2015;

**as per above, 2.6GHz could be included, or run in parallel ( ie not necessarily joint lots).**

- noting the considerable work required in relation to the 3.6 GHz band, it is envisaged that proposals outlining the next steps in the 700 MHz, 1.4 GHz, 2.3 GHz and 2.6 GHz band award process(es) are likely to be provided from the second half of 2016 onwards. ComReg notes that there are various spectrum band options available, including the holding of award process for multiple bands, the holding of an award process for a single band, or some combination of these. ComReg will consider each award process on a case by case basis in light of the prevailing circumstances;

We would add that for the 2.6GHz band there are now significant drivers to assign this spectrum in as short a time as possible :

- Customers mobile devices now being sold have the capability to use this band.
- The assignment of this band has been completed in most European countries.
- The previous licence for this band will expire in this quarter.

As well as supporting our customers with additional 4G capacity and speeds 2.6GHz would support :

- o enhanced service at special events (AVIVA, festivals, concerts, fairs…)
- o better service at high footfall areas (shopping centres, hospitals, …)
- o outdoor hotspots (commercial streets, parks, …)

## 6.2.4 Point-to-Point Radio Links

6.18 ComReg has identified the following work plan items concerning point-to-point radio links for the period 2016 to 2018:

i. Consider the use of national block licensing in the 26 GHz band in advance of its 2018 licence expiry and if warranted establish further national block licensing in the 42 GHz band;

A position on the renewal of the 26GHz band is urgently required. Our base-stations have a high dependency on this band with more than 1000 links installed using frequencies from this block. The future of this band should be clarified at least 2 years before licence expiry. We would also welcome a block assignment process in the 42GHz band.

iv. Review congestion issues associated with the licensing of fixed links to ascertain if the current congestion areas and frequency bands remain congested and if there are any other areas and frequency bands that have or are reasonably likely to become congested;

The best solution to this issue is the allocation and assignment of alternative frequency bands. An important consideration it that while the demand for data from customers increases exponentially the revenues remains static. We need to bring down the cost per bit . Congestion charges will not help if there are not alternative bands available. .

6.19 In relation to above, ComReg observes that:

- the national block licences in 26 GHz band expire in June 2018. ComReg envisages that further information would be provided on same in early 2017;

Vodafone are concerned that this proposed date is too late to protect the service that is currently provided by radio link in the 26GHz band. Vodafone rely heavily on the use of links in this band to provide service to customers. It would take a considerable time to re-configure these links if the spectrum is re-allocated from these links. Starting a process of consultation in early 2017, followed by an auction process in this band would not allow adequate time to re-configure network if the band is not re-assigned to Vodafone.

• the making available of other spectrum bands for either national block or individual radio link licensing will be considered on a case-by-case basis in line with ComReg's statutory objectives; and

Our opinion is that further block allocation would be the most efficient way of providing these radio link services to

# Chapter 7

# 7 Topical spectrum management issues

• auctions also promote, among other things, regulatory certainty, competition (both for the spectrum rights and in the downstream provision of services to consumers and end users), and the internal market by ensuring there is no favourable treatment of particular undertakings thereby providing fair opportunities for new entry from within the State and throughout the EU.

Agreed

To achieve this regulatory certainty we need regular, timely auctions of spectrum. To maximize consumer welfare we need to ensure there is no artificial shortage of spectrum caused by delays in assignment processes.

124 The assignment round auction permitted ComReg to resolve the issue of winners' location in the relevant bands without the need for administrative decision-making particularly in circumstances where it was faced with imperfect information and idiosyncratic values of different winners.

Agreed A separate assignment round was an effective process.

ComReg's current thinking

7.14 In relation to the assignment of spectrum rights for ECS/ECN, ComReg:

- firstly reiterates that it does not favour any specific approach for awarding spectrum rights but prefers to consider each award on its merits;
- notes the clear benefits that auctions offer for the award of spectrum rights of use in bands harmonised for fixed/mobile wireless broadband services (such as identified by it regarding auctions in Documents 11/89 and 11/88) and further observes that both Irish and international spectrum management experience would support the continued appropriate use of auctions generally;
- observes that there are different auctions formats available and that the most appropriate format will, of course, be the one which best addresses the specific circumstances that arise. Nevertheless, a few general observations can be made based on international experience and ComReg's own experience to-date:
  - the CCA format has proven to be an effective auction format, both here and internationally, and can significantly mitigate against a number of award risks including gaming and common value uncertainty. It also particularly effective at addressing aggregation risks that may be faced by bidders. For example, when bidders may want a particular suite of spectrum rights across a number of related (i.e. substitutable and/or complementary) bands being award simultaneously, or may want a particular combination of spectrum rights in geographic areas when such rights are being awarded on a sub-national (e.g. local or regional) basis;
  - the SMRA format has been used internationally and could be effective, particularly in circumstances where gaming opportunities are limited, fragmentation risks can be sufficiently addressed, and aggregation risks are not a material issue; and
  - sealed bid combinatorial auctions have been used both here and internationally, and could be an effective auction format, particularly in circumstances where the common value uncertainty is likely to be low and competition for spectrum is likely to be weak

## Vodafone view on auctions

## Auction objectives

In terms of appropriate auction objectives, the Vodafone agrees these should include efficient use of spectrum and increasing access to mobile broadband services.

We support the following GSMA position

"However, while there should be no barrier to new entrants in an auction, the GSMA is cautious about the suggestion that auctions should be used to "promote new entrants / facilitate market entry". Positive discrimination towards possible new entrants means discrimination against existing players and should be avoided because it may result in: inefficient assignments of spectrum; spectrum left unassigned and fallow; higher costs for the industry and reduced benefits for customers. Recent auctions in the Netherlands, Portugal, Hungary and the Czech Republic bear witness to this. Auctions should provide a level playing field for all interested parties."

*.(GSMA Response to RSPG Report on Efficient Awards and Efficient use of Spectrum)*

## Financial objectives

The GSMA recognises the right of governments to raise revenue from spectrum licensing, but cautions against excessive spectrum fees. Governments should consider the longer-term impact on the economy of excessive fees. Spectrum is a critical input to the digital economy, and lower spectrum fees will result in lower input costs and enable greater sector investment, growing the digital economy and associated benefits to the wider economy.

The GSMA believes greater consensus is required among Member States on the fundamental purpose of an auction - to identify the most efficient users of spectrum. In this case, maximising the revenues raised for a national government must be understood to be a counter-productive objective.

Focusing on maximising licence revenue can have further unintended consequences - governments in some markets have sought to artificially restrict supply (i.e. hold back spectrum) purely in order to drive prices higher. This has a double impact on mobile services, where speeds and capacity are lower, while input costs are higher.

## *(ibid)*

## Award mechanisms

The GSMA supports the RSPG view that **simultaneous, multi-round** auctions (whether SMRA or CCA) are **the most efficient way to assign new spectrum.**

The GSMA supports the RSPG view that **sealed bid** auctions are inefficient, and can distort competition and are therefore inappropriate.

(ibid)

## 7.2 Spectrum trading/transfers

ComReg's position in Documents 11/89 and 11/88

7.15 In Documents 11/89 and 11/88, ComReg set out its then current thinking on the transfer of spectrum rights between undertakings (i.e. secondary trading). In summary and among other things, ComReg stated that:

- it sees spectrum trading as an important right that spectrum rights holders should have and could lead to market-based exchanges that increase the welfare not just of the parties to the trade but society generally;
- it did not consider that indefinite licence durations were required to substantially realise the potential benefits of spectrum trading; and
- it intended to specify a secondary trading regime for the bands identified by the European Commission under Article 9(3) of the Framework Directive, as subsequently specified in the EU RSPP Decision135 of 2012.

**Vodafone agree with spectrum trading in principle, in countries where this has been allowed it is not generally used, probably because there is constantly a spectrum shortage, and uncertain future supply.**

**We note also GSMA's position on Spectrum trading and leasing**

***The GSMA supports the promotion of spectrum trading and leasing across Europe. Further analysis is required to understand why there has been so little trading of mobile spectrum so far, and what needs to be done to encourage this. For example, uncertainty over whether existing licences can be re-secured on expiry may make operators reluctant to dispose of surplus spectrum, preferring to retain it as a contingency – administrative renewal or perpetual licences might mitigate this behaviour. Greater clarity on the roadmap for licensing new mobile spectrum (and increasing the overall supply of mobile spectrum) might enable operators to concentrate network investment on a preferred subset of bands and trade surplus frequencies.***

## 7.3 Appropriate duration for spectrum rights for ECS and timing of assignment processes

ComReg's position in Documents 11/89 and 11/88

**Vodafone supports the RSPG view that licences terms should be lengthened and consideration given to creating perpetual licences (as already exist in the UK) in order to promote ongoing investment and upgrades in mobile broadband networks.**

## 7.4 The sharing of spectrum and collaboration between wireless operators

7.4.2 Collaboration between wireless operators

Various sites and Network sharing models have been used between operators. We expect that operators will continue to explore these possibilities as they can reduce prices and increase the speed of rollout. Any agreements between operators on this sharing should be voluntary and not need regulatory intervention.

# 7.5 Competition Caps on Spectrum

7.56 In light of these factors and responses received to that consultation, ComReg stated that it remains of the view that competition spectrum caps are an important measure by which to ensure that competition in downstream markets is not harmed or stifled by the spectrum assignment competition itself and additionally noted that:

- absent a justified concern in relation to the level of competition in a market/s, ComReg would not normally consider reserving spectrum for new entrants;

Vodafone agree with the GSMA position on spectrum set asides.(GSMA Response to RSPG Report on Efficient Awards and Efficient use of Spectrum). The GSMA does not support the concept of spectrum set-asides for possible new entrants, which it regards as discriminatory and inefficient. Historically, this practice has often resulted in failed new entry and/or premium spectrum lying fallow for many years.

7.58 In the MBSA process for the 800 MHz, 900 MHz and 1800 MHz bands, ComReg imposed the following competition caps on bidders (either bidding as a single entity or as a consortium of same):

- 2 × 10 MHz of 900 MHz (Time Slice 1 only);
- 2 × 20 MHz of sub-1 GHz spectrum (i.e. 800 MHz and 900 MHz spectrum); and
- 2 × 50 MHz of total spectrum in the three bands.

7.59 In arriving at this position155, ComReg noted, among other things, that:

- A 900 MHz cap was appropriate for Time Slice 1 as there were likely to be short-run substitutability issues (e.g. equipment/device availability) between the 800 MHz and 900 MHz bands;

- A sub-1GHz spectrum competition cap was appropriate given the particular characteristics of this spectrum (e.g. propagation, equipment availability, etc.); and
- An overall cap was appropriate as it would guard against extreme outcomes which could harm competition while also ensuring that the distribution of spectrum rights are determined by competition amongst the bidders.

7.60 ComReg also considered whether other relevant existing spectrum holdings should count towards the above competition cap. Given that the only other spectrum band of relevance was the 2.1 GHz band, where each of the four incumbent MNOs had 2 × 15 MHz of paired 2.1GHz spectrum at that time, ComReg determined that:

- the size of these existing spectrum holdings were not likely of themselves to be large enough to materially affect the long-run structure of the market after the award process, in light of the total amount of spectrum rights being made available in the MBSA proposed award (i.e. 2 × 140 MHz); and
- existing spectrum assignments in the 2.1GHz band should not count towards the spectrum competition cap in the MBSA.

**In assessing the optimum caps to apply in an auction ComReg must have regard for the existing holding of operators but also the technical capability of different spectrum bands . In the MBSA it was correct to apply a cap to sub-1GHz spectrum as this spectrum has very different propagation characteristic to the 1800MHz band. Future auction should take account of total spectrum assigned to operators but should also have regard for the different values of the bands in which it is held.**

7.61 In its proposed award of the 2.6 GHz band and other potential bands (see section5.5.1 of Document 14/101), ComReg proposed the use of spectrum competition caps. It observed that the extent to which a band-specific or a multi-band cap or both should apply depends on the amount of spectrum available for the award and the extent to which these bands may be substitutable. In addition ComReg noted that:

- new entry could be promoted by "setting aside" spectrum rights for new entrants; and
- should the 700 MHz band be included in the proposed award process, then a band-specific or sub-1GHz spectrum competition cap may also be required in order to promote entry, and in turn, competition.

**Vodafone would not agree with the setting aside of spectrum for new entrants. We would agree with the GSMA positon " However, the GSMA does not support the concept of spectrum set-asides for possible**

new entrants, which it regards as discriminatory and inefficient. Historically, this practice has often resulted in failed new entry and/or premium spectrum lying fallow for many years." *(GSMA Response to the RSPG Report on Efficient Awards and Efficient Use of Spectrum)*

| | |
|---|---|
| 7.62 | In its proposed 3.6 GHz band award, in Consultation 15/70 ComReg expressed its preliminary view that it was appropriate to consider a spectrum competition cap in the range of 150 to 250 MHz. |
| 7.63 | In considering whether existing spectrum rights associated with the mobile spectrum bands (i.e. 800 MHz, 900 MHz, 1800 MHz and 2100 MHz) should count towards the above proposed competition cap, ComReg observed that the 3.6 GHz band is unlikely to be a close substitutable to these bands and therefore proposed that existing spectrum holdings should not count towards any competition cap in that particular award process. |
| 7.64 | At the same time, ComReg observed that, for certain uses, the 3.6 GHz band may become more substitutable with other "mobile bands" – the 2.3 GHz and/or the 2.6 GHz bands in particular. Accordingly, ComReg noted that 3.6 GHz holdings obtained under its proposed 3.6 GHz band award process may be taken into account for a competition cap in an award of sufficiently substitutable spectrum bands in the future. |

We disagree with this assessment – propagation of 3.6GHz band is so different to 2.3 and 2.6 GHz that they are not 'equivalent'. This raises particular issues if 3.6Ghz is auctioned in advance of 2.6GHz. Potential purchasers of 3.6GHz may be reluctant to bid for this spectrum to provide wide area fixed service if it would lower an operator's ability to bid for the 'mainstream' mobile band 2.6GHz. The very different propagation and different technologies available in these bands mean they are not substitutable.

2.6GHz should be considered an equivalent band to 1.8GHz and 2.1GHz in setting any 2.6GHz auction cap. These are already considered equivalent bands in, for example, base station antenna infrastructure where the 'highband' port on many antennae runs from 1710 to 2690MHz. Also the user equipment ecosystem is mature in the 1.8 to 2.6GHz range

Two other factors are relevant. Carrier aggregation will allow FDD bands at 2.6GHz and 2.2/1.8GHz to operate efficiently together, but aggregation between FDD and TDD systems is not yet available.

Also in the event of bidding for regional and not national 3.6GHz licences the implementation of associated auction caps on a national 2.6GHz may be complex.

ComReg's current thinking

7.68 In competitions for spectrum rights (and, in particular, auctions), ComReg considers that spectrum competition caps are an important tool by which to safeguard and promote competition - both for spectrum rights and downstream competition. ComReg would add that:

- the main purpose of a competition cap is to ensure that the distribution of spectrum is determined by competition amongst the bidders, subject to ensuring that extreme outcomes which could harm downstream competition do not emerge from the proposed auction;
- it will consider appropriate measures to promote competition (e.g. new entry) where objectively justified and proportionate;
- it is ComReg's practice to consider, amongst other matters, other relevant (e.g. substitutable and/or complementary) existing spectrum holdings when determining the level of a competition spectrum cap (if any) prior to a given competition; and
- following the completion of a spectrum award, a spectrum competition cap does not constrain an operator from acquiring additional spectrum rights from other operators on a transfer/lease or sale basis, subject to the normal controls on competition and spectrum management.

**We note the following from "GSMA Response to the RSPG Report on Efficient Awards and Efficient Use of Spectrum"**

## "Spectrum caps and set-asides

**The GSMA supports the applications of reasonable caps, as long as they do not restrict operators from making reasonable trade-offs in the amount and mix of spectrum they require to operate efficient networks.**

**However, the GSMA does not support the concept of spectrum set-asides for possible new entrants, which it regards as discriminatory and inefficient. Historically, this practice has often resulted in failed new entry and/or premium spectrum lying fallow for many years."**

## 7.6 Spectrum fees

ComReg's position in Documents 11/89 and 11/88

7.74 While there are various methods of determining the level of a licence fee or the minimum price, ComReg in the past has generally used appropriate benchmarking information tailored to the Irish context and spectrum band/licence type as its preferred approach. For example in the MBSA process, and more recently in ComReg's proposed award of the 3.6 GHz band, relevant benchmarking information has been used to determine (or propose) a conservative minimum price for those award process.

ComReg's current thinking

7.80 Overall, it is ComReg's current thinking that:

- spectrum fees for rights for ECS are an important tool by which ComReg can ensure the efficient use of same;
- the level of the spectrum fee (and any minimum price) will continue to be determined on a case by case basis in light of the relevant circumstances of the spectrum award (such as the particulars of the rights of use/spectrum band, international benchmarks etc.);
- the timing and manner in which the usage fees are to be paid will continue to be determined on a case by case basis, noting that such fees can be apportioned between an upfront spectrum access fee and ongoing spectrum usage fees (SUFs); and
- SUFs should be updated on a regular basis (preferably annually) using the Consumer Price Index (CPI) to maintain the value of these usage fees constant in real terms.

## Annual spectrum fees

**Vodafone agrees that there is a possible role for appropriate annual fees as an incentive to ensure ongoing efficient use of licences that are perpetual, or term-based but renewed on an administrative basis. Fees set on this basis should be at the minimum level to secure efficient use (i.e. to incentivise return or trade of an under-utilised licence), and should not be used as a revenue-raising instrument.**

**Reserve Prices**

**In relation to reserve prices we agree with the GSMA position detailed in the document "GSMA Response to the RSPG Report on Efficient Awards and Efficient Use of Spectrum"**

## Reserve prices

The GSMA believes the RSPG report does not adequately address the question of reserve prices (other than commenting that higher reserve prices may mitigate strategic demand reduction). The underlying issue is that Europe's national authorities are unable to agree a coherent and defensible position on reserve prices, particularly where some authorities, or their governments, are focused on maximising rents from the mobile industry, while others regard spectrum as an input to the digital economy and focus on the greater benefits that result from its efficient and cost-effective assignment.

Reserve prices serve one purpose only - to establish the opportunity cost of the next best use, and therefore to ensure that, if spectrum is sold, it sells for a higher price than the value to the next alternative user; and if it remains unsold, it will still be of marginal value to that next best user, and can be assigned to them.

There are multiple examples of mobile auctions around the world where spectrum has remained unsold and yet it has not been assigned to, or even sought by, the alternative users – all as a consequence of the reserve price being set too high.

A well-designed and well-run auction will reveal the market value of the spectrum. Using an inflated reserve price to attempt to second-guess the market value reveals a crisis of confidence that an authority will be able to design and execute an efficient auction.

It is also common practice in some markets for authorities to take spectrum auction prices in other territories (in particular Europe) and use them to set their own reserve prices. This can result in a ratcheting up of prices over time, and a further departure from efficient pricing. European regulators should demonstrate consistently the correct use of reserve prices and auctions, and demonstrate their commitment to genuinely market-based awards and corresponding consumer benefits."

**The "ratcheting up" referred to in the GSMA document is evident in ComReg's proposal to benchmark 3.6GHz spectrum reserve prices against previous 2.6GHz auctions in Europe.**

## 7.7 Coverage/Rollout conditions

ComReg's current thinking

7.92 ComReg current thinking on coverage and/or rollout is that:

- Coverage and/or rollout obligations are an important tool to ensure the efficient use of radio spectrum, and to promote the interests of users generally;
- Given the broad range of potentially relevant factors involved and often a complex relationship between same, it is necessary to determine the appropriate nature and extent of coverage and/or rollout conditions on case by case basis in light of the particular facts and circumstances arising;
- It should remain mindful of the potential for competition to drive coverage to high levels.

**Vodafone supports reasonable coverage obligations in order to maximise access to mobile broadband services. Coverage obligations should not be changed once a licence has been issued, except by genuine mutual agreement.**

## 7.8 Mobile retail consumer experience issues

ComReg's current thinking

7.96 Given the diverse range of factors that may be affecting the mobile consumer experience (including but not limited to those identified above), ComReg considers that a better understanding of these, and any other relevant, factors and the nature and extent of their respective impact on the consumer experience is first required. ComReg observes that such an approach would, firstly, facilitate an informed discussion and ensure that the full range of potential measures are identified and considered. To inform same, ComReg would welcome the views of interested parties on this issue, including on the factors that could be contributing to this perception, the relative importance of such factors and any appropriate measures to address same.

**Vodafone continue to invest in network improvements to bring the best possible service to our customers. In parallel we actively engage with the public in communicating these improvements through multiple channels. We are happy to discuss further with ComReg ways in which we can give the public a better understanding of factors that affect their experience.**

## 7.9 Technology and Service neutrality

ComReg's current thinking

7.100 ComReg's current thinking on technology and service neutrality is that:

- Where appropriate, ComReg favours and promotes the application of technology and service neutrality in line with the relevant harmonisation measures; and
- In applying such harmonisation decisions to a frequency band where there are existing rights of use, ComReg remains conscious that there are potential impacts to be considered on a case by case basis, including:
    - o the benefits to consumers in terms of furthering their interests by, for example, encouraging innovation, investment, and the availability and use of liberalised services in Ireland which can result in better choice, price, quality of service and value for money; and/or
    - o whether liberalisation may give rise to a material risk of a distortion of competition to the detriment of consumers such that any benefits resulting from liberalisation would be outweighed by the detriment to consumers resulting from any such a distortion of competition.

### Technology, service neutrality and standardisation

**Vodafone strongly support the GSMA position on Technology and Service neutrality. The GSMA supports the RSPG view on the importance of technology neutrality, and the increasing importance of promoting compliance to standards, in order to minimise the risk of interference, particularly where poor equipment design (for example, WiFi modems, cable TV modems) fails to provide adequate rejection of adjacent mobile frequencies.**

# 14 Three Ireland Hutchison Ltd. (“Three”)

# Spectrum Strategy 2016 to 2018

# Response from Three Ireland

Three.ie

## Introduction

As ComReg has pointed out in its consultation document, the radio spectrum is something we all use and depend upon on a daily basis without giving it much thought. We just take for granted that our key will unlock the car; that Met Eireann will use radar and satellite imaging to predict the weather; and that the air traffic controllers can communicate with pilots. More and more Irish people now carry a smartphone (over 82%) and these have become much more than just a device for making phone calls. Apart from being most individual's main camera, they are a business tool running both corporate e-mail and proprietary applications, and also are the primary means of access to social media, and entertainment. These devices alone make multiple use of the radio spectrum for Bluetooth, Wifi, SatNav, and of course mobile voice and data.

An orderly and well managed administration of the radio spectrum is vital. This becomes obvious when we consider the myriad of industries and services that depend on its use (from air navigation, to broadcasting, to mobile communications). However this becomes even more obvious when the economic impact of spectrum usage is considered. ComReg has calculated that this is currently €4.2bn per annum, or 2.4% of Ireland's GDP. While Three doesn't comment on the calculation of this contribution, we note that it doesn't reflect extraneous benefits that are derived from spectrum. By way of example, we believe Ireland would find it considerably more difficult to attract multinational investors and the skilled employees to service them if we did not have mobile communications services that are on a par with the best that's available globally. Any loss of competitiveness in this respect would have a significantly negative impact on the wider competitiveness of the economy. This is over and above the €4.2bn counted in ComReg's calculation.

We are pleased that ComReg has included a review of activities since the previous spectrum strategy (2011 – 2013), this has been an eventful period with several significant tasks completed and lessons learned during that time. It is noted though that the previous statement (11/89) is now two years out of date. Although it is acknowledged that this statement sought to extend beyond the primary two-year timeframe, ComReg should be careful to avoid gaps of policy continuity.

Industry does not sit still though, and ComReg is facing an equally challenging set of tasks during the forthcoming strategy period. It is important that ComReg's decisions are well considered, but also that they are delivered in a timely way as delays will have substantial implications for spectrum users. ComReg's activities in radio spectrum are important, and they generate significant income for the state through ComReg's licence fees. ComReg must ensure that all of its divisions working in these areas (policy, licensing operations, and enforcement) are well resourced so that there is no delay in delivery of its decisions. ComReg needs to

ensure that it can run multiple projects in parallel so as to avoid a situation where some issues must "wait in line" and are delayed.

While capacity demand on networks continues to grow, both access and backhaul networks will need to develop to meet this demand. As technology enables improvements in access networks, backhaul is becoming more of an obstacle to connectivity. Ireland already relies heavily on microwave links in the provision of backhaul, and while this is set to continue, access to fibre-based backhaul will be required, particularly in rural areas. ComReg will need to ensure availability of spectrum for microwave links, but it is also important that the state investment in the National Broadband Plan can be used to improve backhaul access in rural areas.

In the following sections, we comment on the points raised by ComReg, largely in the same order as the consultation document. In particular, we would highlight the following points in order of importance:

- ComReg should revise its work-plan to prioritise the following two items: (i) Concluding its consultation on liberalisation of 2100MHz; and (ii) extension or re-licensing of the 26GHz point to point band;
- Demand for mobile data is growing inexorably. ComReg's market data and our own network experience indicates a growth rate of [ ✂ ] per annum. This is above the "High" prediction of Frontier Economics and shows that more spectrum will be needed in the medium term;
- Three agrees with ComReg's plan to progress the redesign of the DTT plan in UHF and prepare for release of the 700MHz band;
- Three also supports ComReg's plan to award licences in the 3.6GHz band as soon as possible;
- ComReg should revisit its approach to setting both the reserve price within auctions, and linking annual fees to the Consumer Price Index;
- ComReg should again revisit its position regarding rolling licences and renewals. The current policy leaves licensees without regulatory certainty during the final years of a licence, and creates a disincentive to invest during that time. This is problematic in a practical way for licensees, as we now see in the 26GHz band;
- Three generally supports ComReg's position in relation to award caps – this should be considered on a case by case basis.

## Events Since Last Statement

Three is pleased to see that ComReg has included a review of events since publication of the previous spectrum strategy in 2011. This has been an eventful period with a number of major decisions implemented:

- Expiry of the original GSM 900MHz and 1800MHz licences.

- Analogue switch-off, recovery of the 800MHz band and subsequent relicensing.
- Successful completion of the first multiband spectrum auction, which as ComReg has said licensed 140MHz of paired spectrum, and raised €855m in licence fees from mobile operators. This was followed by the two network transition implementations (Time slice 1 and Time slice 2), both of which were completed without issue.
- The acquisition of Telefonica Ireland by Three. Substantial commitments were given to the European Commission at that time, which have now been delivered, including the successful launch of service by two MVNOs (ID and Virgin) and the network independence delivered to Meteor by the provision of access to sites and equipment.

ComReg's previous spectrum strategy statement was issued in 2011 (11/89), and covered the period from 2011 to 2013, leaving a "gap" in continuity of more than two years. While that statement anticipated events that would occur further ahead than the two year period covered, ComReg itself has pointed out how important spectrum is to the economy, and Section 31 of the Communications Regulation Act requires that a statement is published every two years. ComReg should ensure that no such gap is allowed to emerge, even if that means publishing a brief update to state that "everything is on track" and no further change is necessary.

**Lessons Learned**

The MBSA process was successfully completed since the last statement, and there are many lessons which can be learned from this period, including:

- It can take several years to complete the process of consultation, decision and award of spectrum from early consultation to award process. In the case of the MBSA, this took 4 years. While the process might accelerate a little for future awards by auction or for less complicated awards, nonetheless ComReg needs to allow significant time to complete the various activities in preparation for an auction. The process must begin early enough to allow re-licensing of spectrum before existing licences expire.
- Given that several significant projects are required to progress on an on-going basis, ComReg should be resourced to run overlapping activities. It is not optimum that preparation for each process must wait in turn until the previous activity has concluded.
- Auctions can work well as an award mechanism; however Three agrees with ComReg that it is not always the best method, and that this needs to be decided on a case by case basis for each award.
- Where auctions are competitive, the reserve price set by ComReg will be quickly passed, and in this case a significant reserve price serves no function.

> If on the other hand either demand for spectrum or bidder valuations is uncertain, then ComReg must be cautious to set a low reserve price as otherwise it will simply choke off legitimate spectrum demand. It is better to have spectrum in use even at a low licence fee than to have it lie fallow. We have already seen spectrum remain unsold in two auctions in Ireland because minimum prices deterred bidder entry: (i) the 2006 proposal to award 26GHz spectrum (ComReg Document 06/37b) where minimum prices were set at a level that eliminated all bidders. This spectrum was later awarded in 2008 using a lower minimum price. (ii) In 2013 ComReg proposed to auction 1800MHz spectrum that remained unsold in Time Slice 1 following the MBSA (ComReg Document 13/104). Again this spectrum remained unsold as the minimum price was excessive in the light of the short duration licence available. We must conclude from the above that setting minimum prices at a level that is non-trivial but substantially below expected valuations is optimum to facilitating spectrum award in an auction. Whereas setting a high reserve price has been shown to deter bidders from even entering an auction. As there is considerable likelihood of error when ComReg tries to predict operator valuations of spectrum, a cautious approach should be taken when setting auction reserve prices. This is necessary for ComReg to comply with its statutory obligation to ensure efficient and effective use of spectrum.

The fact that it has been more than four years since the publication of ComReg's previous Spectrum Strategy means that some important events have not been included in the work plan on time. As an example, liberalisation of the 2100MHz band was not included in document 11/89, and since then the European Commission has decided (Decision 2012/688/EU) that this band should be made available on a liberalised basis no later than 30th June 2014. As this is a European Commission Decision, it is binding. If ComReg had refreshed its spectrum strategy in 2013, it is to be expected that this work item would have been included and prioritised. ComReg needs to ensure that it is prioritised within the current work plan.

Three agrees with ComReg's statement in paragraph 3.13 of the consultation document that "*Effective spectrum management also requires flexibility and responsiveness so as to adapt to changes in, among other things, technologies, demand from spectrum users and end-users, market developments and public policy*." While this requires that ComReg should have the flexibility to act on priority matters that arise which might be outside of the work plan, it is more difficult to resource and prioritise this work if the spectrum work plan is not kept up to date.

With growing utilisation of spectrum by existing services, and entirely new services emerging, it is important that sources of interference are eliminated. There is a growing workload for ComReg in this area, and it must be properly resourced.

Almost all spectrum planning requires some degree of international activity – whether to avoid interference or to create harmonised bands. Harmonised bands are important, as standardised equipment is generally available and we have seen

that the absence of standardised equipment can be a barrier to successful use of spectrum – Ireland is too small of a market for most mass market vendors to produce customised equipment. This is evidenced in the WDMDS licences issued by ComReg in 2005 which have either failed to launch entirely or have had no market impact. Three agrees with ComReg's conclusion to prefer the use of harmonised bands, however this should not be an absolute rule as there can always be cases where local circumstances require a local solution. One example of this would be the use of 2.6GHz for MMDS, and although its time has passed, this solution has fulfilled a market and social need for several years.

## Demand for Radio Spectrum

One of the big challenges for spectrum managers is to predict future demand for spectrum from various different users in various bands. This is never an easy task, and the practical reality is that it can take several years for spectrum to be repurposed and awarded. As ComReg has explained, there are significant benefits to be gained from awarding spectrum in harmonised bands. In addition, the chief trends in technology and usage in Ireland can largely be expected to follow those of other European countries, albeit with some local variations.

One consistent trend to emerge over the past number of years, and in all CEPT countries is growing demand for spectrum access. This can come from entirely new applications (like the Internet of Things) or simply increasing demand for existing services. A continuous trend has been established of increasing data throughput by end users. This can be seen in broadcasting with the move from analogue to DTT to HD, and now 4K TV service. Similarly, it seems that mobile users demand ever higher quality services which means data throughput or consumption per user is destined to grow continuously for the foreseeable future.

To some extent, this increased demand can be met by advances in technology which can deliver more bits per Hz, and in the case of mobile, densification of networks will also increase capacity, however if current trends continue (see below) these measures will not be sufficient to keep pace with growing demand. In the medium term, more spectrum will be needed by mobile operators in order to meet consumer demand.

ComReg's data shows growth in demand for mobile data across all operators at 87% year on year up to Q2 2015. Three's own data is consistent with this trend, as shown below.

[✂ confidential section removed]

The above graph shows actual growth of busy hour data throughput on the Three Ireland mobile network for the year from January 2015 to January 2016. The actual growth is [ ✂ ] year on year. Using Excel trend analysis, the trend has been projected forward to 2018, and shows a continued or slightly accelerated growth rate for the following two years. This growth is also consistent with that observed in periods prior to that shown on the graph.

While projecting several years forward becomes increasingly uncertain, Three is of the view that real network traffic growth will be greater than that forecast by Frontier Economics even in their *High growth scenario*. It will not be possible to meet this growing data demand by network and technology improvements alone, and in the medium term, mobile operators will require access to more spectrum. Unlicensed spectrum and shared spectrum might play a role in meeting this demand in future, but that is uncertain, and it is unlikely to be a substitute for licensed harmonised spectrum. Three supports ComReg's work to repurpose the 700MHz band in particular, but also the plans to award capacity spectrum from among the 1.5GHz, 2.3GHz, 2.6GHz and 3.6GHz bands.

Spectrum availability and availability in particular of end user equipment on a harmonised basis will be important considerations for the timing of spectrum awards. Multiband auctions can be advantageous if the spectrum in the different bands are good substitutes for each other, however it would not be appropriate to delay the availability of a particular band simply for the purpose of holding a multiband auction. Three acknowledges that ComReg accepted industry views that the 3.6GHz band should be separated from ComReg's proposed second multiband auction, and we agree that ComReg is following the right course in relation to the award of the remaining bands. ComReg should continue with work to clarify its position on the timing for availability of the other bands (700MHz, 1.5GHz, 2.3GHz and 2.6GHz) in parallel with the work to award 3.6GHz spectrum. This work should not have to wait until after the 3.6GHz process is complete.

## 2.1 GHz Liberalisation

One attribute of licences that can help operators to make the most of existing licenced spectrum is service and technology neutrality. This allows operators to upgrade as technology advances, and gives the licensee flexibility to choose the optimum technology to deploy, taking into account the various bands they operate in, and the capability of their network and base of terminals. Such flexibility allows operators to change technology in response to consumer demand, so ultimately is beneficial to consumers. Service and technology neutrality also allows operators to maximise spectrum efficiency. Three supports ComReg's general intention to allow service and technology neutral licences, as described in paragraph 7.100 of the consultation document.

One particular case of technology neutrality that should be moved to the top of ComReg's work plan is the liberalisation of 2.1GHz spectrum. This band was originally licensed by ComReg with a technology restriction to 3G service only. In 2012, the European Commission decided that this band should be liberalised in each Member State no later than the end of June 2014 (Decision 2012/688/EU). This is a mandatory decision, and Ireland is non-compliant with the requirement until such time as the matter has been concluded.

In 2014, ComReg issued a consultation calling for input on this topic (ComReg Document 14/65), however has never published the responses received, or a follow-up document. Current licences are due to expire in 2022, and if operators were considering introducing new technology in the band, the investment case becomes more difficult as licence expiry approaches. Three now requests ComReg to clarify its position on this matter, and believes it should be moved to the top of ComReg's work plan.

## Licence Fees

A lot of ink has been printed over the past five years or so in exchanging views on radio licence fees. While ComReg has developed certain positions as necessary in advance of award processes, Three believes all users are not treated in the same way. This should be reviewed so that all spectrum users are treated fairly, in the context of the service provided and spectrum used. While licence fees for spectrum awarded at auction are transparent, it is not clear how other licence fees are developed, or when they apply. If ComReg is to use licence fees as a means to ensure efficient use of spectrum, then it is not sufficient to apply this tool only to a certain narrow class of spectrum user. ComReg proposed in 2011 to review the use Administrative Incentive Pricing, however Three is not aware of any further progress in this proposal. It is important that all spectrum users are treated consistently – if

spectrum fees are appropriate to act as an incentive for spectrum efficiency for one licensee, then it should also be appropriate for others.

**Indexation of Annual Fees**

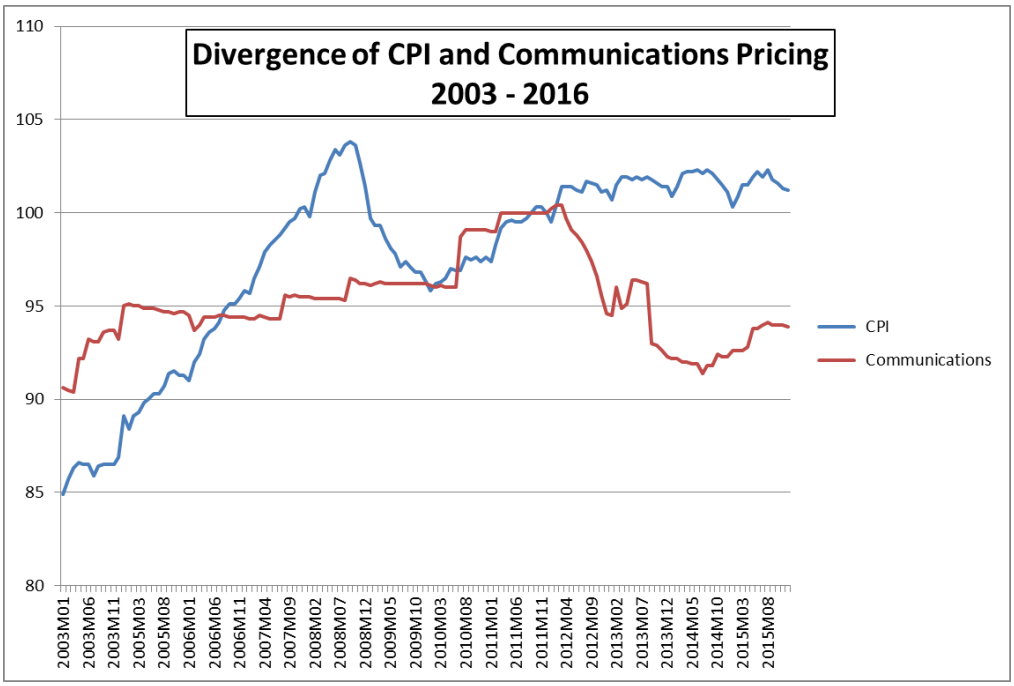
In recent spectrum awards, ComReg has included a link between the annual licence fees and the general rate of inflation as measured by the Consumer Price Index (CPI). ComReg explains the reason for this link in paragraph 7.71 of the current consultation document:

> "In relation to annual spectrum usage fees, ComReg stated that it will become increasingly important for such fees to be updated on an annual basis to account for the general rate of inflation to ensure that these fees continue to incentivise efficient spectrum use during the licence term. ComReg noted that such indexation will keep the value of these usage fees constant in real terms and, as such, maintain proper incentives for firms to continually assess whether they should continue to hold particular spectrum usage rights".

Whether or not it is appropriate to adjust licence fees annually, it is certainly inappropriate to link this adjustment to the CPI. If the aim is to provide an incentive that is constant to the licensee throughout the lifetime of the licence, then only the markets in which a licensee operates and uses spectrum can be considered. For example, if total revenues of licensees in a relevant sector increased tenfold over the lifetime of a licence, but the CPI index was flat or only increased by say 10%, then linking the annual licence fee to CPI would not maintain an equal incentive for the licensee to use spectrum efficiently. Equally if revenues in the relevant sector declined, over the lifetime of a licence, but CPI increased by 10%, then the licence effectively becomes more expensive in real terms to the licensee. Of course these examples only apply in cases where prices or revenues in the relevant sector do not track the CPI.

So, let's take a look at how well communications revenues track the CPI, and this will show us if the CPI is an appropriate reference to use in the communications markets. The chart below shows the change in index for both the CPI, and communications services in the period from 2003 to 2016.[1]

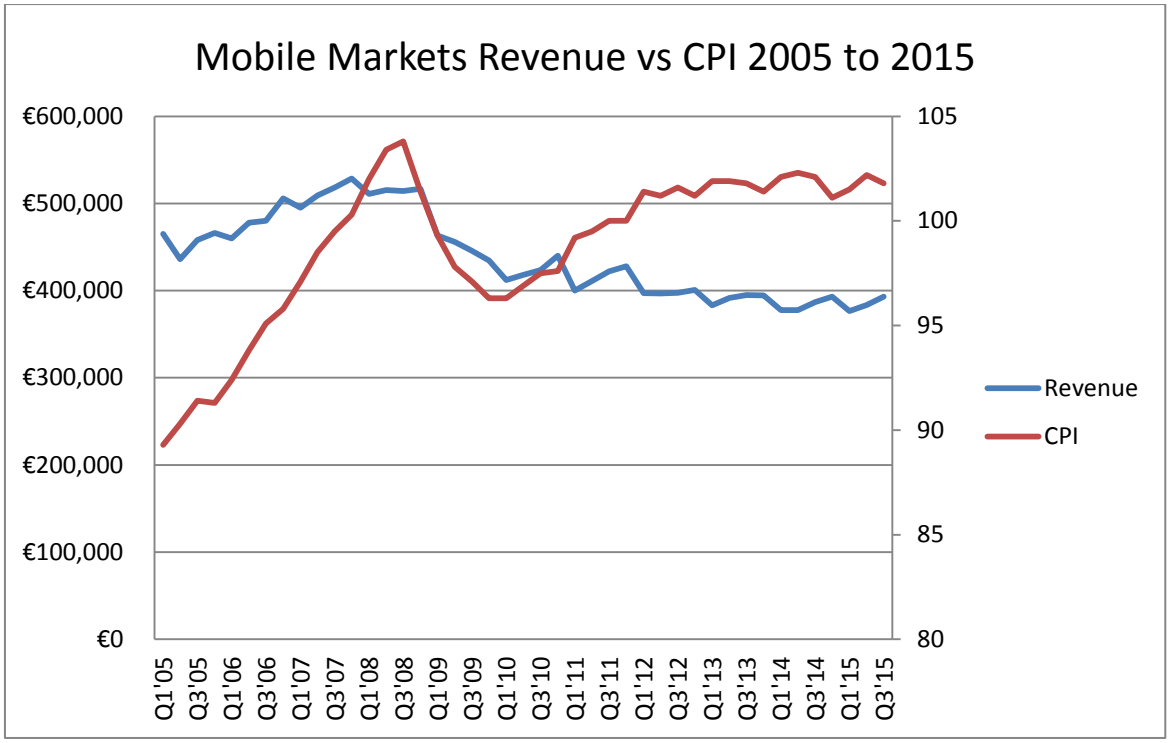
[1] Source data from the Central Statistics Office. Base, Dec 2011 = 100




As can clearly be seen, there has been no correlation between the two indices during the past 12 years, so this data indicates that it is inappropriate to use CPI as an index for spectrum fees. Of course it is possible that pricing could be falling within a relevant sector, but volume growth would mean that overall revenues grew over the relevant time period. By way of another example, let's take a look at the trend in mobile market revenues.

The chart below shows the general trend in mobile market revenue contrasted with changes in the CPI from 2005 to 2015[2].

[2] Revenue Data from ComReg Quarterly Market Information




Again, the chart clearly demonstrates the inconsistency between changes to the CPI and mobile markets revenue over a 10 year period. So it should be clear that if ComReg's intention is to ensure that annual spectrum fees maintain a constant incentive to use spectrum efficiently over the lifetime of a licence, then linking fees to CPI does not achieve this.

Over the past ten years, mobile market pricing and revenue has fallen consistently as a result of competitive market pressure and regulatory intervention. In contrast, the CPI has increased (albeit erratically) over the same period. During this time, we have seen that operators have had to increase investment in new technology and network expansion simply to keep pace with growing capacity demand.

In practice, the above data shows that linking spectrum pricing to CPI over the past ten years simply increased the cost to licensees, whereas if the licence fees were linked to either pricing or revenue indicators then licence fees would have declined over the past ten years.

**Minimum/Reserve Fees at Auction**

The Wireless Telegraphy Act and the Authorisation Regulations provide that ComReg can impose licence fees for use of spectrum. This authority is constrained by other functions and obligations of ComReg's, including the requirement to ensure that such fees are objectively justified, transparent, and proportionate for their

intended purpose[3]. ComReg's approach in the MBSA, and proposed for the 3.6GHz band has been aimed at finding a balance between the requirements to deter frivolous bidders in an auction, setting annual fees to incentivise the return of unused spectrum, and avoiding default which could result from setting the upfront fee too low relative to annual fees.

ComReg typically uses benchmarking to determine a "conservative" estimate of the expected market value of spectrum in Ireland, and this value is then used to determine the auction reserve price and the annual licence fees. In the case of the MBSA, the split was 50/50, and the proposed split for the 3.6GHz award is 40/60. Three agrees that there is a requirement for annual fees that are material in the context of the relevant usage in order to avoid spectrum hoarding. We also welcome ComReg's willingness to review the split on a case by case basis to find the most appropriate balance for each individual auction.

Three does not agree with ComReg's general approach to setting reserve prices in auctions. The use of benchmarking data to derive expected spectrum valuations in Ireland is prone to error, and sample data rarely recreates a significant number of data points that reflect the circumstances in Ireland at the time of a particular award. At best, benchmarking should be treated as a "rough guide" to spectrum valuations, and it is only the auction itself that will determine the actual market value of spectrum.

In setting auction reserve pricing, ComReg needs to consider its relevant statutory objectives, including the requirement that spectrum is efficiently used. This necessarily requires that if there is a legitimate spectrum use which might place a relatively low valuation on spectrum, then it is preferable that the spectrum is in productive use for low spectrum fees rather than lying fallow.

Setting reserve pricing too high at auction will choke off legitimate demand. This is not theoretical; we have seen it already in the 2006 auction of 26GHz, and in the 2013 auction of 1800MHz. To set reserve prices that prevent legitimate use of spectrum is contrary to ComReg's statutory objectives.

Given that benchmarking does not produce a reliable guide to spectrum valuations at auction, and that the setting of reserve pricing too high will choke off demand and prevent legitimate spectrum utilisation, there are clear risks to using benchmarks of market valuation in setting auction reserve prices. Given a legitimate desire to deter frivolous bidders, Three is of the view that a significant discount factor could be applied to benchmark data in order to avoid choking legitimate demand. While the discount factor should be considered on a case by case basis, Three is of the view that setting the reserve price at 10% of the benchmarked value would be sufficient to deter frivolous bidders, while minimising the possibility of choking demand. This will not affect the final price paid by licensees, as this will be determined by the

[3] Regulation 19 of the Authorisation Regulations , S.I. 335 of 2011

competitive auction process. The only way reserve prices can influence an auction outcome is by preventing entry or assignment, in which case less revenue will have been generated and less spectrum licensed. In considering this matter, ComReg must weigh the certainty that increasing reserve pricing leads to less spectrum licensed, against the possibility that reducing reserve pricing leads to frivolous bidders, or future default.

This matter is also considered by ComReg in its response to the 3.6GHz consultation (document 15/140), where ComReg refers to the possibility of speculative bidders who would buy spectrum in the hope of obtaining a higher value sale later through re-sale. It should be noted that such a bidder would need to out-bid all existing legitimate bidders in order to do so, and that this applies regardless of the reserve price. This would be a highly risky strategy, and no evidence has been provided to demonstrate the likelihood of this occurring. Neither has it been demonstrated how this would be contrary to ComReg's statutory obligations or duties.

In Consultation document 15/70 ComReg refers to the setting of reserve prices by reference to the "real economic value". ComReg has not indicated how this value could be determined in advance of the auction itself and Three is concerned that in seeking to set reserve prices at this level, ComReg will choke off demand. It is also unclear how seeking to obtain this real economic value is provided for in ComReg's statutory duties and Three requests that ComReg clarify this matter.

Again, Three believes ComReg should carry out a review of the fees that apply to all spectrum users in order to ensure all are treated fairly.

**Licence Term and Rolling Licences**

The matter of whether spectrum licences should have a fixed duration or rolling renewal has been considered by ComReg in its consultations for previous spectrum strategy statements, and also in advance of specific awards. At present, it is understood that ComReg only awards licences that have a fixed duration. As previously explained, Three believes this is sub-optimal both for the licensees and for the state.

Almost all radio networks require investment in infrastructure and network equipment, in addition to end user or terminal equipment. The normal business case requires that this investment is recovered within the usable asset lifetime, and (with the exception of site and mast infrastructure and mobile handsets) this is typically 5 to 7 years. In the event that a licence was lost or not renewed, then network equipment would have low or negligible recoverable value. For this reason, when deploying radio equipment, licensees must have certainty that it can continue in operation for sufficient time to recover the investment. Within the final 5 years of a

network licence, operators face a growing disincentive to maintain investment, unless they have certainty regarding licence renewal. It is in nobody's interest that these dead periods of investment are built into licences.

ComReg can alleviate this problem by removing the uncertainty that currently exists in radio licences. This could be achieved by relicensing of spectrum significantly before expiry, however ComReg has tended to disfavour this for fear of giving advantage to incumbents. In practice, ComReg has been unable to deliver processes that re-licence spectrum sufficiently in advance of expiry – we have seen this with GSM 900 licences in 2011 and 2.6GHz which will expire in April this year. We also note that the 26GHz link licences will expire within 2.5 years. Three is a holder of licences in the 26GHz band and is within a period of growing uncertainty as whether it should continue to invest in this band.

An alternative method to alleviate this problem that has been suggested is to use "rolling licences". These would have an initial minimum term, following which they would automatically be eligible for renewal on an on-going basis. ComReg would be able to terminate the licences for spectrum management reasons by serving reasonable notice to the licensee.

ComReg has provided its views regarding rolling licences in the current consultation document, and ComReg does not favour rolling licences stating that:

"licences of finite duration allow a spectrum manager to seamlessly maintain the co-ordination of the most important bands because they:

- ensure that Member States can implement any future major allocation and harmonisation changes made by the EC to bands in order to exploit the advantages arising from the internal market and to prevent any significant delays to the deployment of new services which could have serious consequences for consumer welfare; and
- alleviate ComReg's concerns that indefinite licences (or licences that are automatically renewed) could potentially lead to strategic behaviour whereby one or more firms resist the band/s being coordinated in perhaps different manner with a view to obtaining some of the higher rents from a new potential use";

In relation to the first point, this is as true of rolling licences as it is for definite term licences, except at the time of expiry. Allocation and harmonisation changes can be provided for with rolling licences. The second point above is unclear, and ComReg should explain this point further.

ComReg further explains that:

- "reducing investment may actually encourage outside firms to enter on the basis that the incumbent firms appear to believe that their substantial advantages of incumbency are not sufficient to allow them to outbid their likely competitors in an auction"

Three interprets this statement as meaning that the drop in investment can be mitigated by the threat of new entry, however we do not see that this would work in practice, as new entrants do not have access to the relevant spectrum during this period of investment disincentive.

Reduced investment clearly is undesirable and is harmful to consumer interest. Normal investment criteria would auger against investment in equipment where the usable life of that equipment is very short or uncertain.

Rolling licences have been found to work in the UK and other countries, and Three believes ComReg should now commission an independent review of their effectiveness. It should be noted that rolling licences with a mimnimum would maximise valuations at auctions.

**Service and Technology Neutrality**

Three supports the award of service and technology neutral licences (provided this doesn't lead to harmful interference). They facilitate technology evolution and can allow greater efficiency in spectrum use. We agree with ComReg's position that this will be facilitated where possible, particularly in harmonised bands.

**Award Caps**

While Three accepts that caps within an award process can be a useful tool to prevent any single operator from obtaining a disproportionate holding of spectrum, it should be noted however that caps control auction outcomes, and if they are overly restrictive they can impair competition within the auction itself. There should be no blanket policy on whether to or how to apply caps. The merits of award caps need to be considered on a case by case basis for each award process. Three generally supports the position taken by Comreg in its consultation document.

**Spectrum Pooling/Leasing**

Three notes ComReg's intention to develop a framework for spectrum leasing during next spectrum strategy period. Three supports this proposal and will contribute to the process as required.

**Fixed Links**

As noted above, Three expects that demand for data throughput will continue, at least in the medium term. While mobile operators will ultimately need additional spectrum to meet that demand, the structure and topology of networks will need to be changed in the short to medium term. Networks will become denser and will need to reach closer to end users, and there will be more sites providing localised capacity.

This change in network structure will be facilitated to some extent by technology advances – lower cost "Small Cell" technology is coming available in which the equipment itself is lower cost, but also the site requirements and cost are significantly reduced. These developments are helping to make it feasible to deploy a larger number of these small sites, however the availability of backhaul or transmission is emerging as a bottleneck to deployment of these lower cost sites. This is particularly the case in suburban and rural areas.

At present, many parts of Ireland are poorly served with fibre based backhaul products, and there is a heavy reliance on microwave links for this purpose. As ComReg notes in the consultation document:

> "5.40 Compared to many other European countries, radio links are more extensively used in Ireland and since 2010 there has been a 12% increase in the number of point-to-point radio link licences. This suggests that in Ireland the demand for radio links may continue to increase in the short to medium-term, although this may also depend on other factors such as the availability of fibre".

While microwave links will play an increasingly important role in providing backhaul in the medium term, Three does not believe it is feasible to meet the requirement for low cost high capacity backhaul for small cells by using microwave. Instead, ubiquitous access to fibre based transmission will be required. Three notes ComReg's comment in paragraph 5.18 of the consultation document that: "*The delivery of the NBP may result in improved backhaul connectivity within the country and this could assist the development of wireless networks, for example by providing new backhaul locations that could increase network coverage and capacity*." Though not directly a spectrum related point, we agree that the NBP has the potential to remove the bottleneck in many locations and could facilitate significant improvements in mobile and nomadic services. This of course is only possible if the NBP can be used to provide backhaul services.

Three is itself an intensive user of 26GHz spectrum. This licence was awarded following an auction in 2008, and we currently operate over [ ✂ ] links in the band.

Given that the licence is due to expire in 2018, we currently have a dilemma as to whether we should continue to deploy links in this band. Three now requests ComReg to provide an opportunity to renew or extend the existing 26GHz licences so that we can continue their use. At this time, we believe certainty to 2020 (whether by way of extension or re-licensing) is the minimum required.

### Interference Investigation

ComReg has noticed an increasing workload and a higher number of cases of interference in recent times, and this reflects Three's own experience. There are multiple possible reasons for this increase, including larger network deployment, use of more advanced technology that is more sensitive to interference, but also the ready availability equipment which is not intended for use in the Irish market. These are trends that are set to continue.

This is an important part of ComReg's spectrum management functions. It is not possible for a licensee to enter premises which is the suspected source of interference – only ComReg can do this. Licensees depend on ComReg to eliminate sources of interference to their services. In most cases this interference is directly affecting customer service. Given the importance of this matter, ComReg should ensure that it has sufficient resources available within its investigations division to meet demand.

It would also be useful for ComReg to provide feedback when cases have been closed. This will help operators to recognise future sources of interference and would help speed up the whole process of elimination.

### Low Power and IoT

ComReg has identified the Internet of Things as an important growth area during the time of the next spectrum strategy. We agree with this position, and also that it is too early to know how this will impact on spectrum policy. This is an item that ComReg should keep under review.

## Work Plan

Three is generally in agreement with ComReg's proposed work plan, with two important exceptions:

(i) ComReg should conclude its consultation and liberalise the 2100MHz licences as required by the European Commission Decision (2012/688/EU). This work should be completed in H1 2016;

(ii) Three requires ComReg to provide assurance regarding the availability of 26GHz spectrum beyond June 2008. If ComReg cannot clarify its position before the end of June 2016 (2 years from expiry), then ComReg should grand a two year extension to existing licensees.

Regarding other items on the Work Plan, Three comments as follows:

- Completing the assignment process for the 3.6 GHz band significantly in advance of the expiry of existing FWALA licences on 31 July 2017; - Three agrees with the proposal.
- Actively engaging with relevant stakeholders to progress the repurposing of the 700 MHz band so as to obtain clarity on its timing availability; and
- Further developing ComReg's award proposals in relation to the 700 MHz, 1.4 GHz, 2.3 GHz, and 2.6 GHz bands; - Three agrees with the proposal.
- Collaborating with the Broadcasting Authority of Ireland (BAI) and 2rn to find an internationally coordinated spectrum plan for DTT services in the UHF band below 694 MHz; - This is part of the process required for the above two actions. We note the intention to have this plan completed by Q2 2016.
- Promoting Test and Trial Ireland and the benefits of using Ireland as a location to test or trial wireless products and services in a real world environment. - Three supports this proposal.
- Set out a regulatory framework for the leasing of spectrum rights in the RSPP bands in advance of 31 July 2017 – We support this plan.

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