Commission for
Communications Regulation

Response to Consultation on the Proposed Release of the 410-415.5 / 420-425.5 MHz sub-band

Submissions to Consultation 17/67

Submissions to ComReg Document 17/67

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1 Eircom Limited (trading as “eir” and “open eir”) and Meteor Mobile Communications Limited (“MMC”) (collectively referred to as “eir Group”)

eir Group

Response to ComReg Consultation:

Proposed Release of the 410-415.5 / 420-425.5 MHz sub-band

ComReg Document 17/67

1 September 2017

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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'.

Executive Summary

eir welcomes the opportunity to contribute to the development of Ireland's strategic spectrum resource. This consultation commences the ComReg process to progress the award of spectrum rights in the 400 MHz Band on a technology neutral basis. eir agrees that it is appropriate for the allocation of this spectrum to be approached from a technology and service neutral basis but we are concerned that throughout the consultation paper ComReg appears to express a bias towards the use of this spectrum for smart metering applications. This could lead to an inefficient outcome to the award process and subsequent use of the spectrum unless the following aspects of the award design are addressed:

- The relationship of this band to the National Smart Metering Plan and attendant risks to the efficient use of the spectrum must be fully considered before any decision is taken regarding the future use of the spectrum band. This should include the establishment of strict use it or lose conditions and / or appropriate roll-out obligations.
- There are other potential uses for this band which should not be precluded and as such there should not be any spectrum caps in the award process. Consistent with this we support ComReg's proposal not to specify a channel bandwidth.
- The award should be by means of a Combinatorial Clock Auction or Simultaneous Multiple Round Auction format.

In addition, for this to be a truly technology neutral award process, ComReg must establish a clear process on how Block Edge Masks are established. The proposed approach, bilateral engagement between licensees, is not appropriate.

We look forward to further engagement to develop an appropriate award process for the 400 MHz Band.

Response to Consultation Questions

Q. 1 Do you agree with ComReg's analysis of potential uses outlined above?

Q. 2 Do you have any suggestions for additional potential uses?

This is eir's response to questions 1 and 2.

In the consultation document ComReg considers the potential use of the spectrum for Smart Metering, Public Protection and Disaster Relief (PPDR), Digital Mobile Radio (DMR) and TETRA Enhanced Data Services (TEDS). ComReg does not believe this spectrum would be useful for PPDR, DMR or TEDS. eir

does not agree with this view. We note that Annex 3 shows uses of this spectrum in 10 Member States (including UK). The spectrum is in use in most of those countries for PMR / TETRA / Defence / PPDR. This means that there is existing equipment available for these purposes using the available spectrum and it would be unreasonable if Irish users were limited in the equipment available for them to use.

The Electronic Communications Committee Decision (16) 02 on Harmonised technical conditions and frequency bands for the implementation of Broadband Public Protection and Disaster Relief (BB-PPDR) systems, recognises that the current state of the compatibility analysis available means it is not possible to include the band 410 – 430 MHz into the current iteration of this ECC Decision. However studies are currently continuing and if agreed in ECC, this could lead to a subsequent revision of this ECC Decision and inclusion of the band. Therefore, depending on the lifetime of the licence award, BB-PPDR may become a use case after all. If this does develop then it is likely it will be based on 1.4 MHz, 3 MHz or 5 MHz channelling arrangements as decided within the 450MHz paired ranges.

Regarding Smart Metering, ComReg notes that these needs can be met from licence exempt bands. However ComReg then considers there may be a case for the use of licensed spectrum to allow higher power output and assure quality of service. ComReg notes Silver Springs and Sensus have equipment that could be used in the band in Ireland and the band is in use in the UK for Smart Metering. The remainder of the consultation document exhibits a bias towards making the band available for Smart Metering use.

ComReg has indicated Smart Metering as one possible use. We note this is just one use case of the many that are the Internet of Things (IoT). IoT is based on many different technologies targeting different use cases many of which are still to unfold. Ofcom noted in their consultation on the same band that the RSPG considered that an exclusive designation of spectrum to smart energy grids/meters was not necessary. eir supports this view.

Given the range of existing and potential future uses for the band it is difficult to see why ComReg has adopted a bias towards use for Smart Metering. This is not consistent with

ComReg's objective under Regulation 16(1) of the Framework Regulations (SI 333 of 2011) to "*take the utmost account of the desirability of technological neutrality in complying with the requirements of the Specific Regulations having particular regard to those designed to ensure effective competition*".

Too much focus on Smart Metering also carries a substantial risk of an inefficient award of the spectrum. As ComReg is aware the Commission for Energy Regulation has been developing over a number of years a National Smart Metering Programme (NSMP) and in November 2016 issued a Call for Evidence on wider programme costs and benefits for the NSMP (CER/16337).

According to CER Call for Evidence, "*During 2017, key decisions will be made about the NSMP. Most significantly, the results of a Cost Benefit Analysis will determine the CERs decision upon*

the scope, scale and timing of the NSMP." eir would point out that Smart Metering is an emerging technology and that there are no clear answers as to how best to implement it. It would draw ComReg's attention to the inefficiencies in the UK where the first generation of smart meters is in the process of being replaced.[1] The CER also notes the role of ESB Networks (ESBN) in the implementation of the NSMP with the expectation that ESBN begin the process of seeking and evaluating tenders for the communications infrastructure to deliver the NSMP in 2017. The tender process could distort incentives to participate in the potential award process for this spectrum particularly if ComReg sets rules for the use of the spectrum with a bias towards Smart Metering to the exclusion of other uses.

We note that the spectrum could be packaged as a 2x5 MHz block which may have attraction for use in the provision of wide area high speed data services. However such opportunities may be lost if the spectrum is acquired by an entity for the purpose of participating in the anticipated ESBN tender if the tender is significantly delayed, or if the CER changes the specification of the NSMP or if the licensed entity is unsuccessful in the ESBN tender process.

The relationship of this band to the NSMP and attendant risks to the efficient use of the spectrum must be fully considered before any decision is taken regarding the future use of the spectrum band. This is pertinent given there are other emerging potential uses for the band.

ComReg should exercise its powers under Regulation 17(3) of the Framework Regulations to "*safeguard the efficient use of spectrum*" and impose appropriate licence conditions. These could include strict use it or lose it conditions to avoid the availability of the spectrum being negatively influenced by the CER and ESBN activities in respect of Smart Metering, to be assessed within a period of time subsequent to the award of the ESBN tender and / or the application of appropriate coverage obligations. If the precedent of the 3.6 GHz award is followed the coverage obligation could be expressed as the rollout of 78 sites[2] anywhere in the State within 3 years of the licence commencement date.

Q. 3 Do you agree with ComReg's proposal for national licences?

Yes we agree the spectrum should be licensed on a national basis.

Q. 4 Is 2 x 500 KHz an appropriate lot size? Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users?

eir believes that arguments may be made for larger lot sizes however we have no objection to 2x500 KHz lots provided there is no constraint or cap on the quantity of spectrum that a bidder may acquire. This would preserve the flexibility for a 2x5 MHz block to be acquired by a single bidder. This is also fully aligned with the principle of technology neutrality.

[1] https://www.ofgem.gov.uk/consumers/household-gas-and-electricity-guide/understand-smartprepayment-and-other-energy-meters/smart-meters-your-rights

Q. 5 What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require?

In our view the requisite amount of spectrum completely depends on the use case and traffic dimensioning. While a single 200 KHz channel will enable an NB-IoT type deployment the number of channels and therefore the total spectrum required is a factor of the success of the service and the traffic volumes expected. It is not possible to determine the required amount at

[2] 78 sites is the aggregate number of regional rollout base stations required for the lower holding of up to and including 100 MHz, as detailed in Table 3 of ComReg 16/71, 3.6 GHz Band Spectrum Award Information Memorandum.

this time. However the award must be designed to ensure there are no constraints on bidders seeking to acquire most or all of the available spectrum.

ComReg asks is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? As noted above there is a risk of the spectrum being left unused if the potential inter-relationship to the

CER's NSMP and attendant risks is not properly considered and addressed. In our view strict use it or lose it conditions should apply.

To the question as to the risk that a licensee is assigned less than the amount they require, such a scenario can be avoided through the efficient design of an appropriate award mechanism. The auction should be designed to ensure that a bidder (licensee) is not assigned less spectrum than the amount they require and this can be achieved through the use of a Combinatorial Clock Auction (CCA) or potentially an appropriately designed Simultaneous Multiple Round Auction (SMRA).

Q. 6 Do you agree with ComReg's proposal on channel bandwidth?

eir agrees with ComReg's proposal not to restrict potential licensees to specific bandwidths.

eir notes in section 4.5 ComReg's proposal not to assign guard bands and to leave it to operators to negotiate adjacent channel interference mitigation arrangements. ComReg points to the example of the 26 GHz band where this approach has previously been adopted. However the 26 GHz band was targeted for specific use with a default documented Block Edge Mask (BEM) which could be adjusted based on mutual agreement. In order for a truly technology neutral approach to be applied ComReg's

must establish a clear process on how interference mitigation can be addressed between differing technologies and reference documents from CEPT ECC in relation to the BEM to be adhered to.

Q. 7 Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements.

As technologies are evolving rapidly and not all uses are yet identified eir recommends that a short lifetime is seen as best to allow ComReg to facilitate alternative uses of the spectrum band as the ecosystem grows.

Q. 8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum?

eir shares ComReg's preference for the use of a market mechanism to assign rights to use spectrum in this band, particularly where demand is likely to exceed supply. An application stage would determine if an auction is necessary. ComReg does not offer a view on potential auction format. It seems to us that to facilitate outcomes with different aggregate quantities of spectrum the auction format should be a CCA or a SMRA.

Q. 9 What are your views on ComReg's current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award?

eir agrees that the factors listed in paragraph 83 are appropriate considerations when setting minimum prices. ComReg has previously used opportunity cost pricing using benchmarking with similar awards in other countries. However given that there are a range of potential uses that may emerge in the coming years and the very limited number of similar awards elsewhere, we believe that ComReg should focus on setting reserve prices at a sufficient level to deter frivolous participation in the award process.

2 L.M. Ericsson Ltd.

Consultation on Proposed Release of the 410-415.5 / 420-425.5 MHz sub-band

Reference ComReg 17/67

Response from L.M. Ericsson Limited

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1 Executive Summary

Ericsson welcomes this opportunity to respond to Comreg on the subject of the Proposed Release of the 410-415.5 / 420-425.5 MHz sub-band.

Ericsson believes that the spectrum in question is potentially of high value, in particular for National Critical Infrastructure and security purposes. Ericsson welcomes the proposal for this band to be licensed on a technology neutral basis, however we disagree with the proposal for multiple narrowband licenses, and would propose a single 2*5MHz (or 2*5.5MHz). National license, compatible with both Broadband and Narrowband technologies and ready for alignment with future harmonisation activities in the EU.

Responses to the questions follow.

2 Responses to Questions

1. Do you agree with ComReg's analysis of potential uses outlined above? If not, please provide supporting evidence for your view.

Ericsson believes that the spectrum in question is potentially of high value for National Critical Infrastructure and security purposes. The proposal to use this spectrum for Smart Metering purposes fails to consider alternative solutions for Smart Metering or the potential for high availability broadband services in this band. The proposal of this band being used for Smart Grid communications on the other hand is an excellent example of the critical use cases this spectrum could support.

For Smart Metering, whilst the 400MHz band provides good radio propagation characteristics, the recent developments for Massive IOT in Cellular (e.g. NBIoT & Cat-M1) result in the potential for greater performance from the cellular network utilising 800MHz (4dB disadvantage) but with a site density significantly greater than any proposed 400MHz network (a network with 50% less sites than a cellular network would have approximately a 4dB disadvantage). The benefits of considering cellular technologies for use cases such as Smart Metering is also clear when looking at the economies of scale of chipsets and devices for a global market, thus making Smart Metering (for all utilities not just electricity) much more cost effective.

Whilst not subject to an ongoing EU harmonisation decision process, this band is the subject of interest for several industries and EU administrations asking for it to be raised in profile and subject to a harmonisation process.

Ericsson welcomes the proposal for this band to be licensed on a technology neutral basis, however we disagree with the proposal for multiple narrowband licenses, and would propose a single 2*5MHz (or 2*5.5MHz) National license.

Ericsson foresees the potential for a single National Critical Infrastructure Protection Communication provider to provide a multi service offering to multiple key industries in Ireland, e.g. for Smart Grid Communications, for Vehicular PPDR, for a resilient communications alternative in times of mobile network outages etc. This communication provider offering an extra level of resilience or performance to industries over and above that already available elsewhere.

Ericsson agrees with the suitability of this spectrum for Professional Mobile Radio / Group Calling use cases, however also agrees with COMREG that this should not be seen as being required for Tetra/DMR. In a similar manner to how the PPDR market is looking to evolve away from legacy technologies such as Tetra to mobile technologies, other industries are doing the same (as part of the general evolution to a 5G world). The future of Tetra and other such technologies is therefore of question for the long term. A technology neutral proposal allowing a greater selection of technologies to be deployed would be more favourable.

Ericsson does not propose this band to be reserved solely for PPDR, and whilst the ECC Decision 16(02) did not include the 410-430MHz range, this range is still subject to ongoing study and several EU administrations express interest in this band (in preference to the 450-470 range). COMREG should not discount this band as having value in the PPDR market. In fact, this range is still subject to ongoing studies by ECC WG SE7 to supplement the original work which led to ECC Decision 16 (02), the latest meeting being August 31st to 1st September 2017 in Copenhagen.

2. Do you have any suggestions for additional potential uses? Please provide reasons and evidence to support a potential use case.

See answer to question 1.

3. Do you agree with ComReg's proposal for national licences? Please provide reasons and supporting evidence for your answer.

Ericsson agrees to the proposal for a National licence. The key value of this spectrum band is its propagation characteristics and division into regional licences with resulting limitations on deployment and cross border coordination requirements would diminish this.

4. **Is 2 x 500 kHz an appropriate lot size? Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users? Please provide reasons and supporting evidence for your answer.**

Ericsson believes that a Narrowband lot size would detract from the ability for Ireland as a Nation to benefit the most from this scarce resource. Whilst there is nothing stopping a single licence holder from acquiring 10 individual lots in order to have a 2*5MHz licence, the probabilitly of this happening is greatly reduced as it is easier for another party to scupper this strategy by bidding aggressively for just 1 or 2 lots.

Ericsson proposes to license this spectrum as one National 2*5MHz (or 2*5.5MHz) lot, compatible with both Broadband and Narrowband technologies and ready for alignment with future harmonisation activities in the EU.

5. **What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? 29 Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? Please provide reasons and supporting evidence for your answer.**

A single National licence holder for 2*5MHz (or 2*5.5MHz) could deploy a mission critical network offering supporting multiple industries and use cases. Thus the risk of spectrum being unused would be diminished.

If licensing in 2*500KHz lots, then there is a risk that potential licence holders with ambition for broadband capabilities fail to acquire the necessary amount of spectrum and thus the spectrum would remain fully or partially fallow.

6. **Do you agree with ComReg's proposal on channel bandwidth? Provide reasons and supporting evidence for your answer (ComReg proposes not to restrict potential licensees to specific bandwidths, but rather to allow potential licensees to use their blocks with whatever bandwidth they wish**.

Ericsson agrees with ComReg's proposal not to restrict the channel bandwidth, thus allowing broadband deployment (subject to the required amount of spectrum being secured).

7. **Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements.**

When considering mobile technologies in this band, a typical asset life of 8 years is used.

8. What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

No Comment

9. What are your views on ComReg's current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award? Please provide reasons and supporting evidence for your answer.

No Comment

3 Electricity Supply Board Networks Ltd. (ESBN)

Energy for generations

Telecom Services, ESB Networks

ESB Networks' response to ComReg's Consultation on Proposed Release of the 410415.5 / 420-425.5 MHz sub-band (17/67)

01/09/2017

Contents

1. INTRODUCTION

ESB Networks (ESBN) welcomes the opportunity to respond to the Commission for Communications Regulation (ComReg) consultation in relation to its proposed release of the 410-415.5 / 420-425.5 MHz sub-band[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.

The electricity industry is undergoing unprecedented change and how electricity is produced and consumed is fundamentally altering. Secure telecommunications are fundamental to this change and to the safe and efficient operation of the grid.

In Ireland we are already transitioning to a low carbon electricity system. Ireland is a world leader in the adoption of renewable energy. Through the successful development of our wind farm industry we now have the third highest wind penetration world-wide. However more work is needed to further increase renewable generation and also to decarbonise our transport and heat systems.

ESB Networks is committed to supporting Ireland's target of becoming a low carbon system. Securing spectrum is a key to ESB Networks and Ireland realising this target. ESB Networks strongly believe that the proposed spectrum should be administratively allocated to it to secure the development of a future electricity network which empowers customers, delivers value for money and provides a sustainable energy system in Ireland. Without prejudice to this position, if a competitive mechanism was determined by ComReg to be the more suitable, then an auction is the preferred option. Our response looks at both options in order to provide ComReg with the feedback necessary to determine the correct release mechanism.

2. INTRODUCTION TO ESB NETWORKS

ESB Networks Ltd. (ESB Networks), a regulated subsidiary within ESB Group, is the licensed operator of the electricity distribution system in the Republic of Ireland. ESB Networks 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. ESB

[1] https://www.comreg.ie/publication-download/consultation-proposed-release-410-415-5-420-425-5-mhzhttps://www.comreg.ie/publication-download/consultation-proposed-release-410-415-5-420-425-5-mhz-sub-bandsub-band

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

ESB Networks' telecommunications network requires connectivity in a significant number of locations throughout the country, often in remote areas where propagation of high frequency signals is limited (e.g. within High Voltage substations). A significant proportion of ESB Networks' 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 a fundamental component of ESB Networks' existing safe and resilient narrowband network.

The levels of renewable generation to be connected to the distribution and transmission networks is set to increase significantly by 2030, with approximately 5800MW of wind based generation and 2400MW of solar PV generation estimated. 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[2], which is also a low-carbon energy source. Solar energy will contribute increasing amounts of energy to the Grid in the future[3], and this can only be achieved with additional intelligence in the electrical network. Both of these energy sources creates the opportunity for 'prosumers'[4] 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. Decentralised intelligence and control is necessary to support such innovation[5].

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.

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

[3] http://www.irishtimes.com/business/energy-and-resources/future-looks-bright-for-irish-solar-powerhttp://www.irishtimes.com/business/energy-and-resources/future-looks-bright-for-irish-solar-power-1.25071341.2507134

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

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

To meet these challenges ESB Networks needs to continue to be at the forefront of Smart Grid developments. A key enabler of Smart Grid is radio spectrum.

3. COMMENTARY

ESB Networks has responded with comments on the sections of consultation document which ComReg did not provide any questions on. These comments are outlined below:

Definition of Smart Grid

ComReg has provided a reasonable description of Smart Grid requirements in paragraph 18 of its consultation.

ESB Networks would add that there is no discussion on the technical intricacies of Smart Grid operation. For example, attention needs to be given to the Duty Cycle of a device; whether communications from a remote device sends bursty traffic, constantly streams or reports by exception; and whether real time information is required. This point on real time information is particularly relevant and is one reason why existing public offered networks do not have the ability to deliver on the requirements for numerous Smart Grid applications.

Smart Grid technology is being deployed worldwide (e.g. Alliander in the Netherlands[6], various utilities in Canada[7]). 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 onto the electrical network by providing greater visibility of the network and energy generation.

The EUTC has previously correctly identified ESB Networks' technical performance requirements for a Smart Grid network (as outlined in paragraph 18 of ComReg's consultation document). 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, and coverage from designated base station as well as robust cybersecurity.

Guard Bands

Section 4.5 (55) - Guard Bands

ComReg's proposal to internalise guard bands in spectrum allocations is reasonable. However this must be tied to the fact that users need to obtain sufficient spectrum to deliver its services and be able to incorporate a guard band. A block edge mask must be proposed by ComReg in order to allow for maximum utilisation from adjacent spectrum users whilst protecting each

[6] Explanatory video on Alliander's network available here, https://www.youtube.com/watch?v=JIL0WDK8YKk [7] http://www.nrcan.gc.ca/energy/electricity-infrastructure/smart-grid/4565

other from interference. ESB Networks urges ComReg to consider these matters and address in its response to consultation.

Maximum Permitted EIRP

ESB Networks considers that 50 W EIRP is more than sufficient for users.

ESB Networks believes that the MoU needs to be revisited to protect users both sides of the border. For example, the entirety of the proposed band being released isn't factored into the existing MoU. ESB Networks is available to assist ComReg by providing more specific recommendations for the MoU if desired.

4. RESPONSE TO CONSULTATION

Q. 1 Do you agree with ComReg's analysis of potential uses outlined above? If not, please provide supporting evidence for your view.

ComReg outline the following potential uses for the 400 MHz band;

- Smart Metering and Smart Grids;
- Public Protection and Disaster Relief (PPDR); and
- Other potential uses (DMR / TETRA Enhanced Data Services (TEDS)).

ESB Network are in broad agreement with ComReg's analysis but the following should be considered:

Smart Metering and Smart Grids:

ESB Networks considers that there are suitable alternative bands available to deliver on Smart Metering requirements. For example, such a narrowband technology can be delivered using licence exempt solutions, third party networks and/or private or public narrowband UHF or VHF solutions. Smart Metering is a narrowband technology and this use for the available spectrum would be inefficient given the alternatives available.

ESB Networks believes that this spectrum band is most suitable to facilitate wider-band applications such as Smart Grid. Narrow band (i.e. 2 x 50 kHz and less) technology is tried and trusted and facilitates a wide range of important applications for various users. Access to wider band technologies (2 x 50 kHz upwards) does not exist, except for Mobile Network Operators (MNO). This impacts the ability of interested parties to deploy dedicated wide band technology solutions to deliver on its requirements. This creates major issues as organisations have only one option; utilise a third party Mobile Network Operator. This MNO may or may not deliver on the organisations requirements, which in itself is a fundamental issue. Secondly, the reduction in number of operators in Ireland from 4 to 3 has reduced the number of options available (which can impact cost) and also the coverage footprint.

ESB Networks notes that there is work being carried out at European level (CEPT SE7 and FM54 working groups). CEPT SE7 is carrying out analysis on LTE compatibility with other applications in the 410 – 430 MHz range[7].

ESB Networks urges ComReg to recognise the opportunity it has with this specific spectrum band and not sterilise it for narrow band technology and ensure that wide band technology has an opportunity to operate in it.

Public Protection and Disaster Relief (PPDR);

ComReg is correct in its assessment that the 400 MHz spectrum is not suitable for this application. ECC Decision 16(02)[8] states the following;

> "*that since only the 700 MHz range can be considered as a stand-alone solution for the BB-PPDR requirements as calculated in ECC Report 199, it is considered as the core frequency range for enabling interoperability ..*
>
> *The 700 MHz range can provide the core spectrum requirements for the terrestrial networks and be considered as a stand-alone solution for the BB-PPDR requirements as calculated in ECC Report 199 [3]. The 400 MHz range does not provide enough available spectrum to provide a stand-alone solution as calculated in ECC Report 199*"

400 MHz spectrum is currently not harmonised in Europe, and there are no plans to do so. Conversely, the 700 MHz spectrum has a clear plan for release. The European Commission, Parliament and Council mandate that all Member States must release the 700 MHz band by June 2020 (with potential leniency of 2 years). Also, "*Member States will adopt and make public their national plans for releasing this band by 30 June 2018*".

ECC Report 239 presents different feasible options for assigning spectrum to PPDR in the 700 MHz range without affecting the amount of spectrum released to the market for mobile services or causing interference to other uses. Indeed, France has released 2 x 8 MHz (in two tranches, 698 – 703/753 – 758 MHz and 733 – 736/788 – 791 MHz) for PPDR[9].

ESB Networks has offered a letter of support to the Broadmap project[10] which will take the "*first steps towards future procurement of 'interoperable next generation of broadband radio communication systems for public safety and security' (DRS-18) to improve PPDR's service to Europe's citizens and enhance interoperability across borders*". This project is likely to

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[7] https://cept.org/ecc/groups/ecc/wg-se/se-7/news/outcome-of-the-se7-meeting-15-16-june-2017-at-eco-inhttps://cept.org/ecc/groups/ecc/wg-se/se-7/news/outcome-of-the-se7-meeting-15-16-june-2017-at-eco-in-copenhagen-denmark/copenhagen-denmark/

[8] www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1602.PDF

[9] https://www.rrmediagroup.com/Features/FeaturesDetails/FID/642/

[10] http://www.broadmap.eu/?wb48617274=56D34E95

investigate acquiring spectrum in the 700 MHz band as there is European harmonisation on this spectrum band and there is sufficient spectrum available for PPDR purposes.

Taking all of this into account, PPDR is unsuitable for the 400 MHz band, and is ideally suited for the 700 MHz band.

Other potential uses (DMR / TETRA Enhanced Data Services (TEDS))

ESB Networks notes that there is a vast amount of spectrum available for DMR (note ComReg use the term 'PMR' for this application in its 'frequency of allocation table'[11]). ComReg has details on the amount of licences issued. ESB Networks notes that there is sufficient spectrum available in VHF and UHF bands to deal with the long term demand for spectrum for these purposes. Indeed, one could argue that utilisation of private mobile radio (PMR) is likely to remain as is or reduce over the coming years. This in turn will make more spectrum available for DMR. ESB Networks believes that the existing spectrum bands assigned for DMR purposes is sufficient to meet demand in the long term and therefore agreed with ComReg that DMR is not suitable for this spectrum band.

TETRA and its variants currently operates in the 380 – 400 MHz band in Ireland. This is a NATO band, harmonised in Europe and suitable for this application. This 20 MHz block is ideal for TETRA. ESB Networks notes that TETRA Ireland currently utilises 2 x 4.5 MHz of this spectrum. ESB Networks believes that there are few assignments in the 'Civil' TETRA band which consists of 2 x 5 MHz. ESB Networks believes that this block of 2 x 5 MHz has sufficient capacity to meet additional TETRA spectrum requirements for the long term. ESB Networks therefore considers that TETRA services and all its variants should utilise the technology specific spectrum band dedicated to it (which can meet long term demand) and not sterilise other useful spectrum bands unnecessarily.

Q. 2 Do you have any suggestions for additional potential uses? Please provide reasons and evidence to support a potential use case.

No. ESB Networks knows of no other suitable applications for this spectrum band.

ESB Networks believes that ComReg exhausted all potential options in the analysis it presented. As previously mentioned, ESB Networks considers this spectrum band should be allocated for wide band technology only. ESB Networks notes that of all the potential uses discussed by ComReg, Smart Grid is the only use case that does not already have spectrum available to it currently or in near future.

Q. 3 Do you agree with ComReg's proposal for national licences? Please provide reasons and supporting evidence for your answer.

Yes. ESB Networks believes that the spectrum in question should be released on a national basis.

[11] https://www.comreg.ie/publication-download/radio-frequency-plan-ireland

ESB Networks believes that wide band use cases, such as Smart Grid, have a national requirement and indeed often have more pressing requirements in rural areas. Rural areas would especially benefit from Smart Grid developments as this would enhance system reliability and continuity.

Reliability of electricity is an important facet of a well-functioning society and economy. Maintaining continuity of electricity of supply in rural Ireland is particularly challenging. The dispersed population is served by overhead lines networks which are vulnerable to disruption due to weather (wind and lightning) and other external factors e.g. contact by machinery.

ESB Networks has a very distributed set of customers with 40% living in one off houses or in small towns and villages (670,000 live in one off houses and 230,000 in villages and small towns). This results in a significant amount of infrastructure, which requires telecommunications, residing in rural areas. Without access to dedicated spectrum, these rural locations cannot be served by third parties (limited if any coverage in these locations) or by fibre (not financially viable). As a result of the distribution of the electrical network assets and the lack of viable communications media, Ireland lags behind other European countries in terms of continuity performance indices.

ESB Networks' strategy to improve continuity of electricity supply in rural areas involves the deployment of a range of devices on its rural network that will:

- Provide remote network visibility e.g. information on the status of the network and on faults currents to our control centre via a communications link (devices such as fault passage indicators, sensors, auto-sectionalisers, circuit breakers and reclosers); and
- Devices incorporating switches that that can receive a command from a control centre to carry out a switching operation to restore supply to healthy network.

At present, fault information is acted upon by technicians in a Centralised Distribution Control Centre. It is possible to remotely operate switches but it is also necessary to dispatch field operators which can take up to 2 hours to restore supply to the electrical network and much longer after large scale damage following storms. With a more resilient and reliable communications infrastructure, fault information could be communicated back to a head end system which would make a decision to automatically intervene, allowing the electrical network be restored automatically within three minutes.

The ability to monitor status of the electrical network and communicate to switching devices would also contribute to public safety. Smart Devices on the network can assist in identifying and locating dangerous scenarios (e.g. where a line falls to ground) and connected switches can be utilised to switch out the network remotely from a control centre.

ESB Networks already has over 2,400 devices deployed on rural networks via a third party GPRS communication solution. The base stations that are communicating to these devices can themselves be impacted by the loss of electricity supply and may not be available when they are most needed. This for example occurred during Storm Darwin in

early 2014 where some rural customers were without electrical supply for over a week. ESB Networks devices using third party GPRS were unavailable as a consequence of the storm. A robust and resilient communications network (i.e. Smart Grid using dedicated spectrum) would have maintained communications with remote devices and enabled the electrical network to be returned to healthy status in minutes, not days.

Equally, coverage from third party networks can be insufficient in less populated rural areas, and availability can be intermittent as a result of cell breathing. Further, GPRS is likely to be a technology not offered by third party operators in the short-medium term, so there is an issue and huge cost by enforced replacement of third party equipment as a result of changes to the third party network configuration.

National applications, such as Smart Grid, therefore require national spectrum licences. This would meet ComReg's objectives regarding spectrum efficiency. National licences would facilitate investment in network deployment, whereas regionalised licences would reduce the incentive to invest. The deployment of a national network creates economies of scale when purchasing equipment, enhancing the utilisation of spectrum. Equally, there are fixed costs in deploying a network (e.g. core network) and these costs are assumed regardless of the size of the network. A national network is therefore more efficient as it facilitates a much reduced cost per communication device as opposed to regionalised licences. This would be more efficient utilisation of spectrum.

National licences simplifies the coordination/sharing issues both domestically and with the UK. ESB Networks therefore considers issuing of national licence(s) in this band in line with ComReg's objective to promote "*efficient investment and innovation in new and enhanced infrastructures*".

Q. 4 Is 2 x 500 kHz an appropriate lot size?[28] Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users? Please provide reasons and supporting evidence for your answer.

No.

[redacted]

[redacted]

Alliander in the Netherlands has deployed a nationwide Smart Grid. For this Alliander required 2 x 3 MHz of UHF spectrum.

There is sufficient narrowband spectrum available in existing VHF and UHF bands to support long term demand. This new spectrum band should be wideband only and should ensure wideband users have access to spectrum. Wide band equipment available in this spectrum band requires a minimum of 2 x 1.25 MHz carriers. Any user of such wide band

technology is likely to require a minimum of 2 of these channels (indeed likely to be more) in order to design a network with sufficient capacity and which also does not cause intra-network interference issues.

Smart Grid can require two-way real-time communications with thousands of devices with reasonable data rates and high availability. This can only be achieved if sufficient spectrum was available to support the requirements of the network.

Q. 5 What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? [29] Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? Please provide reasons and supporting evidence for your answer.

As previously stated by ESB Networks, this spectrum band is optimal for wide band technology such as Smart Grid. ESB Networks, sees no other potential use cases for this spectrum band. Therefore, in the event that insufficient spectrum was available to a user who wished to deploy wide band services, this spectrum release would be inefficient. Any use other than wide band technology with this spectrum will simply result in another narrow band spectrum band being made available even though there is no demand.

ESB Networks urges ComReg to consider facilitating the possibility that a minimum of [redacted] would be made available for wide band applications.

Q. 6 Do you agree with ComReg's proposal on channel bandwidth? Provide reasons and supporting evidence for your answer.

No. [redacted]

ESB Networks does not see the rationale as to why ComReg wishes to facilitate for "*up to 11 licensees to deploy different technologies in this band*". ESB Networks considers that such an outcome would simply cause multiple licensees to operate multiple narrow band applications. As ESB Networks already mentioned, this band should be utilised for wide band applications and not sterilised by narrow band applications.

Q. 7 Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements.

ESB Networks is cognisant of ComReg's traditional approach to licence duration. ComReg has recently typically offered licences lasting for between 10 and 15 years. This has been appropriate in those situations for many reasons. For example, mobile technology rapidly evolves and the replacement cycle for user devices changes rapidly. Equally, these mobile licences have a huge market (e.g. more mobile subscriptions than people in the country) and as such it is important for ComReg to have breakpoints in order to determine who is best placed to be licensed this spectrum. This is based on the concept that the user willing

to pay the most will get the best usage of the spectrum which creates benefits for Ireland Inc. and meets ComReg's objectives for spectrum efficiency.

ESB Networks considers a different approach is more suitable for the 400 MHz spectrum band. Should an organisation get access to this 400 MHz spectrum band, it is likely to have plans to utilise it as effectively as possible and deploy a network as intensively as required to meet its needs. In order to do so, that organisation will need to have the ability to invest in its network. In order to invest in a vast network, a user needs to factor in the life time of the asset. As opposed to MNOs, a wide band user of this spectrum will not have a significant revenue stream available to it to rapidly deploy a network and rapidly realise the fiscal benefits of roll out. In order to make investment in technology, a wide band user of this spectrum would need assurances that this spectrum will be available to the user for a long time.

Electrical assets have long physical lifetimes, for example:

- 50 years for an overhead line
- over 80 years for underground cabling
- 40 years for transformers
- 35 years for electromechanical meters

Unlike telecommunications equipment, technological obsolescence does not occur before physical obsolescence, so there is nothing to prevent the assets being utilised for the full length of their natural lives.

If ComReg, for example, issued a national licence for 15 years this would create investment issues for a licensee. Other than MNOs, other users of spectrum do not have access to such amounts of capital to invest in deploying a network. Therefore the full roll out of a network can take many years to allow for cost benefits to be accrued which enables additional investment. For example, at year 10 of a 15 year licence, the incentive to invest is significantly reduced if there is only 5 years remaining. Therefore a 15 year licence is unsuitable for this spectrum band. A longer licence of 25 years plus enables and incentivises more investment in a network.

ESB Networks believes that a licence in this band must be issued for a minimum of 25 years. Such a duration would incentivise a user to invest in its network which in turn is efficient use of spectrum.

Although ESB Networks prefers administrative allocation of this spectrum, if ComReg does chose to auction the spectrum, ComReg has another lever available to it to ensure efficient use of spectrum. Interested parties from the outset would know the licence duration (25 years plus) and factor that into its valuation of the spectrum. If ComReg were to apply a split between Spectrum Access Fees and Spectrum Usage Fees as it is prone to doing recently, this creates an incentive for users to relinquish any spectrum not being used.

Q. 8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the

efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

ESB Networks considers that administrative allocation [redacted] of this spectrum to ESB Networks to deploy Smart Grid is the optimum outcome.

ESB Networks is concerned that this spectrum band has the potential to attract speculators who wish to acquire spectrum and hope to find a use for it. Spectrum is a hugely valuable asset as proven by ComReg's recent 3.6 GHz spectrum auction. There is a concern that certain organisations or venture capitalists are willing to gamble and purchase spectrum on the hope it pays off. Genuine spectrum users find it very difficult to compete with this. Such speculative purchasing of spectrum is likely to result in no usage of the spectrum at all. For example, ComReg previously released spectrum in the 1785 – 1805 MHz range which was purchased in an auction and never utilised. ESB Networks recognises the potential of this spectrum band to deliver applications such as Smart Grid and, if blocked, may have far reaching consequences for Irish Society.

Some will argue that spectrum auctions are the definitive fair means of assigning spectrum rights of use. ESB Networks recognises that this has been the case for certain spectrum releases in the past, but the optimum release mechanism is situational. For example, the 2005 spectrum award for this spectrum in Ireland resulted in 2 licences being issued. ESB Networks notes that neither licensee ever utilised the spectrum or relinquished it in advance of licence expiry. Given that auctions are imperfect solutions; specifically for non-harmonised spectrum bands; and that the previous 400 MHz spectrum release via auction in Ireland was unsuccessful, ESB Networks believes that administrative assignment [redacted] is the optimum outcome and ensures efficient use of spectrum.

ESB Networks recognises that ComReg does not have the power to make such decisions on spectrum and such decisions belong to Department of Communications and its Minister. It is our strong view that an Administrative allocation of [redacted] of this spectrum to ESB Networks should be proposed to Department of Communications before the structure of a competitive mechanism is finalised.

Without prejudice to ESB Networks' preference for administrative assignment, if a competitive mechanism was determined by ComReg to be the more suitable, then an auction is the best option.

Q. 9 What are your views on ComReg's current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award? Please provide reasons and supporting evidence for your answer.

Please see ESB Networks' answer to question 8. ESB Networks believes administrative assignment is the optimum release mechanism.

Without prejudice to the foregoing; ESB Networks considers that if there was an award process, the reserve price should be very low as the threat of collusive bidder behaviour is

very low. With low risk of collusion, the award mechanism should not attempt choking demand by trying to predict market value for a non-standard band. Market should decide the price and reserve price should therefore be minimal, especially as ComReg has little or no empirical evidence it can use to benchmark such a reserve price.

ESB Networks believes that a split of 50% between upfront fees and ongoing fees is the optimum option. This is optimum for numerous reasons. This split gives the licensee the ability to stagger payments which is extremely important when rolling out a network, as this is when Capital costs are highest and when cost benefits have not yet been realised. This split also encourages licensees to make efficient use of the spectrum and hand it back to the regulator in the event it is not utilising it.

5. SUMMARY

Radio spectrum is a vital natural resource which must be managed efficiently to facilitate economic, social, technological and environmental advances within Ireland. ESB Networks welcomes the opportunity to respond to this consultation

Securing spectrum is a key to ESB Networks developing and operating a reliable smart network necessary to meet Ireland's decarbonisation targets. Smart Grid produces significant benefits for every electricity user in Ireland, specifically economically and environmentally. A fundamental requirement of Smart Grid is the 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, but 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. However these Smart Grids are all underpinned by secure communication networks. ESB Networks encourages ComReg to support and enable Smart Grid so that the benefits can be realised in the near future.

As stated throughout our response we strongly believe that the proposed spectrum should be administratively allocated to ESB Networks. However without prejudice to this position, if a competitive mechanism was determined by ComReg to be the more suitable, then an auction is the preferred option.

ENDS

4 European Utilities Telecom Council (EUTC)

EUTC Response to the Irish Commission for Communications Regulation Consultation on Proposed Release of 410-415.5/420-425.5 MHz sub-band

Deadline for submission of comments – 17:00 hrs on Friday 1st September 2017

EUTC

The European Utilities Telecom Council (EUTC) is a non-profit organization delivering education, collaboration, best practices and thought leadership in telecommunication technology to utilities, other critical infrastructure providers and regulators, ensuring efficient, secure, sustainable and affordable smart infrastructure solutions.

The membership is comprised of major gas and electricity transmission and distribution companies from across Europe plus vendor partners representing telecommunications suppliers focused on utility telecoms provision.

Summary

EUTC welcomes ComReg's proposal to release 2 x 5.5 MHz of spectrum in the 410-430 MHz band which might be used to provide smart meter and smart grid services within Ireland.

Whereas smart metering services can be delivered by a variety of market solutions as well as within this spectrum, critical smart grid communications are optimally delivered by radio networks in the 400 MHz region.

EUTC recognizes a global move towards provisioning smart grid communications in the 400 MHz region. Although in some countries 2 x 5 MHz is being sought, EUTC is focusing on 2 x 3 MHz of contiguous spectrum in this region as a minimum allocation requirement.

EUTC notes that although there have been many allocations of spectrum in the 400 MHz band around the world, in most instances, commercial telcos have not been able to sustain operations in these bands. The most successful examples of the use of wideband services in the 400 MHz band are where utilities are the prime user.

Joint reports by the Utility Telecom Council (UTC), EUTC and the Joint Radio Company Ltd in 2012 and 2014 evaluated a firm socio-economic case for awarding spectrum to utility operations.

[http://utc.org/europe/wp-content/uploads/sites/4/2016/04/Socio-economic-value-of-Spectrum-used-by-utilities-v1.1.pdf]
[http://www.jrc.co.uk/sites/default/files/JRC-EUTC%20Report%20on%20socio-economic%20value%20of%20spectrum-Jan2014-issue1.pdf]

Background

As a representative organization of various European utilities, it would not be appropriate for EUTC to respond directly to the questions posed in the consultation. ESB is one of EUTC's members and will therefore respond directly to the questions posed by the Irish Commission for Communications Regulation (ComReg).

EUTC does however welcome ComReg's proposal to release spectrum in the 410-430 MHz band which might be used to provide smart meter and smart grid services within Ireland.

On a global basis, utilities – especially electricity companies – face major and urgent challenges meeting increasing demands for electricity whilst fulfilling obligations to meet carbon reduction targets, reduce costs to consumers and ensure security of supplies.

Traditionally, electricity networks have been one-way systems to deliver power from large centralised generation sources into a transmission grid at high voltage, and then distributed to customers at low voltage.

The current challenge is to accommodate large numbers of intermittent sources of renewable generation connected into the distribution networks at their extremities where the power infrastructure is at its weakest; whilst at the same time reducing 'customer minutes lost' by increasing the reliability of the network.

These challenges must be met while containing costs, reflecting that poor households are the most severely disadvantaged by rising energy costs.

These current challenges are being compounded by new developments such as demand management, embedded storage – mainly batteries - and the electrification on heat and transport. Smart meters can help utilities by understanding better what is happening at the edge of the network, but cannot contribute to the need for enhanced awareness and control of the distribution and transmission networks themselves.

Smart Grid Telecommunications Requirements

- High availability
- High reliability
- Resilient architecture
- Mains power independence
- Low latency and guaranteed symmetry
- Cyber security
- Wide area coverage
- Cost effective
- 9.6kbits/s – 10Mbits/s bandwidth
- Capable of supporting distributed control
- longevity of support for technology
- Graceful degradation
- Air-ground-air operation
- Flexible payloads, but primarily uplink centric

The more information and control a utility has of its network, the more dynamically it can be managed. Techniques such as dynamic rating of assets – varying the current carried by

conductors depending on actual operating parameters etc can enable a utility to increase the loading of the network without building new infrastructure.

These improved operating regimes can only be introduced if matched by appropriate telecoms provision. In some cases, these telecoms facilities can be delivered over fixed fibre or copper telecoms; non-critical communications can be provided by public mobile networks and short range devices operating in licence-exempt spectrum. However, critical real-time services often have to be self-provided by the utility itself using dedicated radio systems. These radio systems need access to licensed radio spectrum to enable long range communications with certainty that any interference problems can be addressed by the telecommunications regulator. Operational security and privacy of customer's data are further drivers towards private networks.

The preferred spectrum for operating these services is the 400 MHz band which combines long range, good penetration of obstacles (natural and man-made) together with reasonable payloads. There are a variety of standardized European technologies used by utilities capable of operating in this spectrum including:

- LTE
- CDMA
- Tetra
- DMR
- Point-to-multipoint systems conforming to ETSI EN300113

The preferred sub-band for utilities is 450-470 MHz, and utility companies in Netherlands, Germany and Austria are currently introducing dedicated systems in these bands, together with systems with wider participation in Scandinavia. We are expecting further announcements of new dedicated utility networks in this sub-band in at least two further European Countries before the end of 2017, and possibly some other countries outside Europe.

As can be seen from Annex 3 in the ComReg consultation document, 410-430 MHz is lightly used by utilities currently, but is the preferred alternative in countries where 450-470 MHz is not available for utility wideband systems, as in Ireland. The UK has 2 x 2 MHz of spectrum in 410-430 MHz for smart metering, but other countries are yet to announce allocations suitable for wideband services in this band. US utilities are currently lobbying for shared access to the military 406.1-420 MHz band for smart grid operations, possibly using a WiMax standard IEEE802.16s.

What is certain is that utilities will need a range of technologies to address their diverse and specialized needs, hence EUTC has been arguing for access to a range of frequencies to fulfil their requirements as outlined in this table.

EUTC Spectrum Proposal

Within Europe, multiple small allocations within harmonised bands:

- **VHF spectrum (50-200 MHz**) for SCADA, automation, smart grids and smart meters. [2 x 1 MHz]
- **UHF spectrum (400 MHz)** for SCADA, automation, smart grids and smart meters. [2 x 3 MHz]
- **Lightly regulated or licence-exempt shared spectrum** for smart meters and mesh networks. (870-876 MHz)
- **L-band region (1-2 GHz)** for more data intensive smart grid, security and point-to-multipoint applications [10 MHz]
- **Public microwave bands (1400 MHz – 58 GHz)** for access to utilities' core fibre networks/strategic resilient backhaul.

Adrian Grilli
Secretary, Radio Spectrum Group
European Utility Telecom Council
1 September 2017
Brussels

5 Huawei Technologies Co. Ltd

Huawei response to the ComReg consultation 17/67: "Consultation on Proposed Release of the 410-415.5 / 420-425.5 MHz sub-band"

Huawei welcomes the opportunity to comment on this important consultation on the options for the release of the 410-415.5 / 420-425.5 MHz sub-band which is certainly an interesting band with its propagation characteristics allowing for greater geographic coverage.

This band could represent an important resource to ensure connectivity for vertical / IoT markets. The licensing conditions should therefore be designed with this target in mind.

In particular, this portion of spectrum would be of particular interest for the smart metering application which would allow to cost effectively support service continuity for the safe distribution of electricity also in rural areas, allowing smooth integration of renewable supplies.

This spectrum resource could be also a good candidate for public safety applications (e.g. PPDR, DMR); other alternative frequency bands should also be considered in the VHF and UHF ranges and for which an ecosystem is being developed.

Given the limited bandwidth, the 2x5.5 MHz available, the 410-415.5 // 420-425.5 MHz range would not introduce significant value on top of the already available spectrum for mobile broadband application from the already harmonized bands[2] by CEPT for the European market which are already providing channels of 20 MHz or more to European operators (below 1GHz and in the 1GHz to 4GHz range).

From a global perspective, this band has been proposed in several countries to support energy / power grid use (e.g. state grid, wind power, offshore oil field); public safety has been considered by some countries that do not foresee the introduction of PPDR application in the 700MHz band guard band and duplex gap.

From a technology perspective, while acknowledging the technology neutral principle which is at the basis of the European regulations and we fully support, we expect that LTE systems and NB-IoT in particular will be widely adopted in this range.

Given the limited amount of available spectrum, we suggest to assign this band to a single party for nationwide use. While this approach promotes more efficient and reliable use of

[2] 694-790 MHz, 790 MHz - 862 MHz, 880-915 // 925-960 MHz; 14521492 MHz, 1710-1785 // 18051880 MHz, 1900-1920 MHz, 1920-1980 // 2110-2170 MHz, 2010-2025 MHz, 2300-2400 MHz, 25002570 // 2620-2690 MHz, 2570-2620 MHz, 3400-3600 MHz, 3600-3800 MHz.

spectrum (e.g. by avoiding complexities from inter-operator interference coordination), more players would still be able to benefit from the availability of the spectrum resource through wholesale or leasing agreements.

License duration should be longer than 15 years and spectrum fees should be sufficiently low in order to enable successful business models and support the required investments in infrastructure.

6 M2M Smart Grid Communications Lab

Annex: 4 Consultation Questions

Q. 1 Do you agree with ComReg's analysis of potential uses outlined above? If not, please provide supporting evidence for your view. ***Response: Yes.***

Q. 2 Do you have any suggestions for additional potential uses? Please provide reasons and evidence to support a potential use case.
Response: Yes. An additional potential Use Case is a dedicated National Internet of Things (IoT) Network to support critical applications. Such application Verticals include Health, Industrial, Energy, etc.
Requirements are for full bi-directional communications, low latency, medium speed (ca. 100 Kbps), reliability, superior in-door penetration, low-power dissipation End Devices (Sensors) and Firmware over the Air (FOTA) provisioning. Operation in the licenced 400 MHz band is ideal for such a network. A number of technologies are under development to address these requirements. For such a network a minimum of 2 x 500 KHz spectrum is required.

Q. 3 Do you agree with ComReg's proposal for national licences? Please provide reasons and supporting evidence for your answer. ***Response: Yes.***

Q. 4 Is 2 x 500 kHz an appropriate lot size? Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users? Please provide reasons and supporting evidence for your answer. ***Response: Yes.***

Q. 5 What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? Please provide reasons and supporting evidence for your answer.

Q. 6 Do you agree with ComReg's proposal on channel bandwidth? Provide reasons and supporting evidence for your answer. ***Response: Yes.***

Q. 7 Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements. ***Response: 10 to 15 years.***

Q. 8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

Q. 9 What are your views on ComReg's current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award? Please provide reasons and supporting evidence for your answer.

7 Joint Radio Company Ltd. (JRC)

Consultation on Proposed Release of the 410-415.5 / 420-425.5 MHz sub-band

Executive Summary

The Joint Radio Company (JRC) welcomes the opportunity to respond to this consultation. JRC supports the actions of the Commission for Communications Regulation (ComReg) for the proposed release of the radio spectrum sub-band 410-415.5 / 420-425.5 MHz this being the first step in enabling this band for the Smart Grid capability in Ireland

ComReg has identified a range of potential applications for the sub-band and in its analysis roundly dismissed all potential applications apart from 'Smart Grid,' a selection of other bands being available and deployed for 'Smart Metering.' Furthermore, the 'Smart Grid' capability requires a minimum of 2x3 MHz of spectrum and hence implies no excess demand for the sub-band. JRC therefore encourages ComReg to establish an administrative approach to the award to ensure that the spectrum is given over to the Smart Grid application in an orderly and timely manner in keeping with the requirements of the Energy Industry so that investments can be made to ensure the stability of future energy supply for Irish citizens and Industry whilst at the same time addressing commitments made by the Irish Government to reduce CO2 emissions to address the challenge of global warming.

Background

Joint Radio Company Ltd is a wholly owned joint venture between the UK electricity and gas industries specifically created to manage the radio spectrum allocations for these industries used to support operational, safety and emergency communications.

JRC manages blocks of VHF and UHF spectrum for Private Business Radio applications, telemetry & telecontrol services and network operations. JRC created and manages a national cellular plan for coordinating frequency assignments for several large radio networks in the UK.

The VHF and UHF frequency allocations managed by JRC support telecommunications networks to keep the electricity and gas industries in touch with their field engineers. These networks provide comprehensive geographical coverage to support installation, maintenance and repair of plant in all weather conditions on 24 hour/365 days per year basis.

JRC's Scanning Telemetry Service is used by radio based Supervisory Control And Data Acquisition (SCADA) networks which control and monitor safety critical gas and electricity industry plant and equipment throughout the country. These networks provide resilient and reliable communications at all times to unmanned sites and plant in remote locations to maintain the integrity of the UK's energy generation, transmission and distribution.

JRC supports the European Utility Telecommunications Council's Radio Spectrum Group, and participates in other global utility telecom organisations. JRC participates in European Telecommunications Standards Institute (ETSI) working groups developing new radio standards, and European telecommunications regulatory groups and workshops.

JRC also manages microwave fixed link and satellite licences on behalf of the utility sector.

JRC works with the Energy Networks Association's Future Energy Networks Groups assessing ICT implications of Smart Networks, Smart Grids & Smart Meters and is an acknowledged knowledge source for cyber-security in respect of radio networks.

JRC's responses to the consultation questions

Q. 1 Do you agree with ComReg's analysis of potential uses outlined above? If not, please provide supporting evidence for your view.

Response

Yes, ComReg has correctly identified the potential uses of the sub-band as;

- *Smart Metering and Smart Grids;*
- *Public Protection and Disaster Relief (PPDR); and*
- *Other potential uses (DMR / TETRA Enhanced Data Services (TEDS))*

*In its own analysis ComReg has rightly determined that the PPDR and Other potential uses (DMR / TETRA Enhanced Data Services (TEDS)) are not relevant to this sub-band. This leaves Smart Metering and Smart Grid as the potential uses. Furthermore, ComReg has also acknowledged that there are a range of frequency bands available and being utilised to support Smart Metering deployments and as such no additional spectrum would be required to enable this application in Ireland. Furthermore, the recent Opinion by the Radio Spectrum Policy Group[3] has identified the extensive range of spectrum bands available to "Internet of Things" / "Machine2Machine" type applications of which Smart Metering is a component and did not identify a pressing need for additional spectrum at this time. Based on this appraisal of the potential uses Smart Grid is the **ONLY** appropriate use of the sub-band. In addition, the amount of spectrum needed for Smart Grid deployment, as identified by the European Utility Telecommunications Council (EUTC)[4] in 2013, is a contiguous block of 3 MHz of paired spectrum, i.e. 2 x 3 MHz Hence, with only one application for the sub-band and this only requiring 2 x 3 MHz of contiguous paired spectrum JRC urge ComReg to acknowledge that there is no excess demand for the sub-band and that a market based / competitive award process would not be appropriate and may result in a regulatory failure. JRC therefore encourages ComReg to establish an administrative approach to the award to ensure that the spectrum is given over to the Smart Grid application in an orderly and timely manner in keeping with the requirements of the Energy sector so that investments can be made to ensure the stability of future energy supply for Irish citizens and Industry whilst at the same time addressing commitments made by the Irish Government to reduce CO2 emissions to address the challenge of global warming.*

Q. 2 Do you have any suggestions for additional potential uses? Please provide reasons and evidence to support a potential use case.

Response

As noted in response to Q.1 above there are no additional potential uses for the sub-band beyond that of Smart Grid.

[3] A Spectrum Roadmap for IoT Opinion on the Spectrum Aspects of the Internet-of-things (IoT) including M2M, RSPG17-006, 09 November 2016.

[4] Spectrum Needs for Utilities, White Paper from the European Utilities Telecom Council 2013.

Q. 3 Do you agree with ComReg's proposal for national licences? Please provide reasons and supporting evidence for your answer.

Response

ComReg's own analysis, as outlined in the consultation, indicates that Smart Grid is the only appropriate application for the sub-band. In order to establish Smart Grid technology solution, it is imperative that the spectrum given over to it is released on a national basis to ensure that the application can be deployed effectively to serve the energy networks, citizens, enterprise and public institutions across Ireland.

Q. 4 Is 2 x 500 kHz an appropriate lot size? Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users? Please provide reasons and supporting evidence for your answer.

Response

As has been noted in response to Q.1 the Smart Grid service requires 2x3 MHz of paired contiguous spectrum and hence we urge ComReg to ensure that the release process is designed to deliver the required 2x3 MHz of spectrum to the Smart Grid service as a minimum.

Q. 5 What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? Please provide reasons and supporting evidence for your answer.

Response

The Smart Grid service requires 2 x 3 MHz of contiguous spectrum and as such can be readily accommodated within the sub-band under consideration. However, if insufficient spectrum were to be given over to the Smart Grid service because of the release process adopted by ComReg then this would potentially have profound implications to the Irish energy industry in terms of its ability to efficiently deliver the future energy needs of Irish society and enable Ireland to achieve its environmental obligations.

Q. 6 Do you agree with ComReg's proposal on channel bandwidth? Provide reasons and supporting evidence for your answer.

Response

*Whilst, the selection of 25 / 12.5 kHz bandwidth would readily support the Smart Grid technology and service, we have noted that for the service to be deployed effectively it will be a wide-band service utilising 2 x 3 MHz of the spectrum. Furthermore, the observation that up to 11 users could be deployed within the band seems to overlook ComReg's own analysis that Smart Grid is the **ONLY** relevant application and with this service requiring 2x3 MHz of contiguous spectrum there is no excess spectrum demand.*

Q. 7 Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements.

Response

The Energy sector works with long investment horizons and with this spectrum being central to the deployment of Smart Grid capability it is anticipated that the design / operational life of the communications equipment will be of the order of 25 years, as such we encourage ComReg to establish a regulatory solution that offers the Energy sector appropriate security of access to this sub-band on which future Smart Grid deployments will depend, i.e. minimum initial term of 25 years with the potential for continued access after the initial period based on administrative charging principles.

Q. 8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

Response

As a minimum 2x3 MHz of spectrum should be allocated to the Smart Grid service via an administrative award process. ComReg in parallel could choose to award the remainder of the subband on a technology neutral basis via a competitive process, however, based on the lack of excess demand it is questionable whether this process would be effective. Furthermore, the allocation of the 2x3 MHz of spectrum to the Smart Grid service for a minimum 25-year term will afford the Irish energy sector sufficiently certainty to optimise the design of the communications network to be both efficient and effective.

Q. 9 What are your views on ComReg's current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award? Please provide reasons and supporting evidence for your answer.

Response

JRC acknowledge ComReg's approach to the setting of spectrum fees and wish to emphasise that without an excess demand for the spectrum, as is the case for this sub-band, it should be allocated via an administrative process to the Smart Grid service with annual fees based on the direct effort needed to administer the spectrum.

Conclusion

JRC welcomes ComReg's intention to release this sub-band to the market which is ideally suited to the deployment of Smart Grid capability to the Irish energy sector and we urge ComReg to ensure that the spectrum is released via an Administrative Award process to ensure that Smart Grid capability can be deployed in Ireland in a timely and cost -effective manner

8 Nokia Corporation

NOKIA

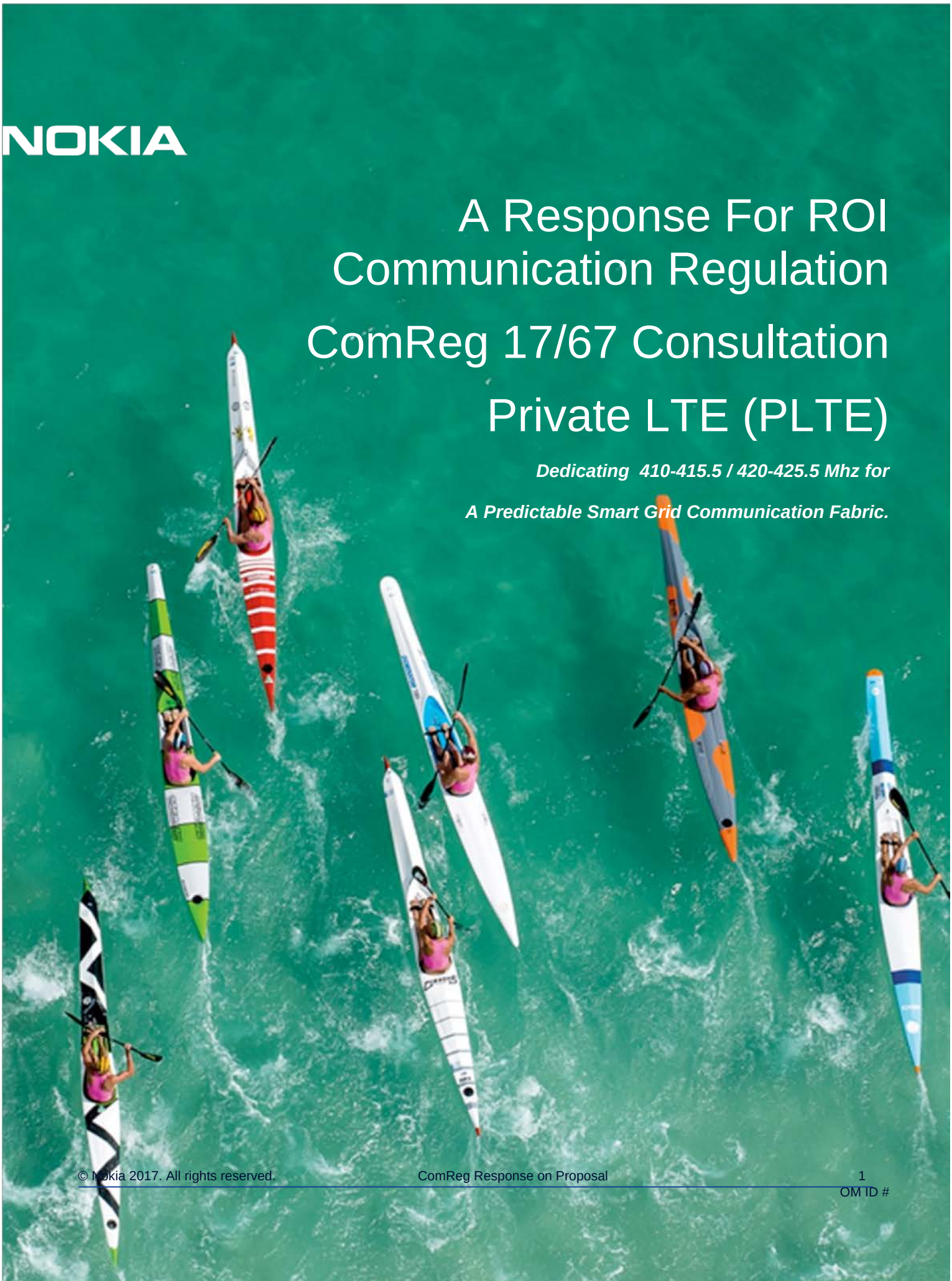
A Response For ROI Communication Regulation

ComReg 17/67 Consultation

Private LTE (PLTE)

Dedicating 410-415.5 / 420-425.5 Mhz for

A Predictable Smart Grid Communication Fabric.



NOKIA

Nokia Executive Summary

Nokia is pleased to provide input to ComReg's consultation for the employment of "the 400Mhz band" ***[3]***. Nokia is following the market, standards organizations and regulators. Nokia develop radio infrastructure and CPE for standardised bands that show a growing ecosystem. Nokia is also ready to develop custom made products with a confirmed demand. It is Nokia's intention to draw focus to the following overall key points as the main undertone to our response:

Our Aim – to highlight that a mobile technology Private LTE (PLTE) based on 3GPP/GSMA standards and which is further supported by multiple vendors offers the best value and eco system chain across a number of stakeholders for employment of this band ***[4]***. The immediate needs and growth requirement of the energy sector can be fulfilled through standardisation of these bands. Utilities such as ESB are now urgently tasked with on-boarding new low carbon generation and smart grid control applications (including the impact of EV's) but are somewhat inhibited by lack of communication technology at the distribution levels.

Many application scenarios will only be well served by the use of appropriate long range industrial mobile connectivity such as LTE/4G, this could by provided in a dedicated manner to the aspiring utility, either as a managed service or as procured /owned. It is also worth highlighting that all utilities can benefit from a common band deployment in this region due to the multi service capability of wider band LTE (3Mhz , 5Mhz) ***[7,12-18]***. (Water, Gas, Heating Oil, and of course the Power sectors)

Several trials in UK and EU have now started to see the key benefits of electricity distribution automation using UHF based LTE due to its propagation characteristics. Using 3 or 5 Mhz channels in dedicated use, allows for enough predictability in the radio and resource fabrics (*predictable in sense of quantifiable for QoS / SLA purposes*) and use of such a "wider channel" offers the service multiplexing for a number of key utility applications (see bulleted list below).

In addition, using newer signalling techniques within LTE access technology , such as NB-IOT we can extend the application base beyond any initial data communication reach to serve downstream energy system requirements e.g. building control HVAC, and municipal street lighting monitoring. *(NB IOT uses specific narrow band signalling channels within wider LTE services for range and propagation of simplex data communication)*

In brief LTE and its multiservice capability offers unique value to public sector stakeholders with excellent rural and indoor coverage. This is all from a single multi service 4G fabric licensed within an appropriate spectrum (the 400Mhz band as a FDD designation ***[44]***)

Suggested application / benefits through 400mhz FDD LTE 3GPP secondary grid automation :-

- Real Time Charging (AMI) (EV/ PEV tariffs)
- Administration of micro grid including on boarding renewable sources and storage (eg for frequency/quality control)
- Potential of Micro level Feeder Tariffing – (Local district/community grid inputs including DER – Distributed Energy Resources)
- Improved rural resilience preventing CML (Customer Minutes Lost) due to improved telemetry
- Non Obtrusive Data communication overcoming urban rights of way to 11KV/415v transformers
- Inherent security through Primary Air Encryption/ Secondary Packet Core authentication

Within the Republic of Ireland it is still the case that secondary substation connectivity is poor from an operational telecom point of view. With ROI's focus upon smart grid initiatives there is an ironic gap between the telecom control requirements and the aspirational need to build out the smart grid for economic benefits.

It is clear that grid related devices are estimated to grow, and the PLMN is already serving the adoption of smart metering in domestic dwellings. These are catered well by narrow band technologies such as LPWA / LoRa, NB-IOT and 3G but do not offer the lower latency that expands the smart grid application remit into control engineering. Thus a wider band deployment of LTE (incorporating IOT) is suggested for greater return on net spectrum service value.

According to the ENA/telent research, currently, approximately 54,000 sites within the current UK& I DNO networks have communications, which could expand to well over 1 million over the next decade of time. These exclude residential Smart Meters, as these would be catered for by the Smart Meter DataCommsCo (DCC) based initiatives, although their connectivity is relevant from a communication fabric perspective.

The industry is in clear need of a predictable multi service fabric, that is based on appropriate frequency designations ***[30,35,36].***

Nokia feel that together with its partners we would be able to help lead such an initiative within Ireland to demonstrate to ComReg and ESB on the proven potential that exists through LTE adoption for smart grid applications of the Sub band.

Consultation Indices and mapping into chapter narratives are shown as ref [n]

Annex 4 – Consultation Questions

Q. 1 Do you agree with ComReg's analysis of potential uses outlined above? If not, please provide supporting evidence for your view.

Nokia agrees with ComReg's view that BB PPDR may be best served by other bands as evident with ESN migration in other countries. In [12] we feel that LTE offers the best employment of the "400 Mhz band" for a multi service data perspective and do not see TETRA (TEDS) as the best implementation of this band area for the widest value chain and resultant stakeholders.

Q. 2 Do you have any suggestions for additional potential uses? Please provide reasons and evidence to support a potential use case.

We feel that Distribution Automation, the rural and district electrical network is where this spectrum can best serve the Republic of Ireland. It would address the communications requirement by underpinning the emergence of flexible demand, storage and micro grid services for a wide community and value chain.

Another additional use case could be that of flexible Demand Response (DER) enabling the use of very distributed energy sources such as that of electrical vehicles and distributed power storage systems of different sorts to level out peaks in districts/communities/industrial environments.

In effect LTE dedicated for the sector would offer a predictable fabric. (Predictability comes via dedication / engineered for specific numbers of user and contexts, as opposed to using shared medium via commercial service provider 4G or future 5G architectures)

LTE wireless communication solutions offer the bandwidth, redundancy, and security needed for reliable smart grid applications. LTE technology is now granular enough to provide economic (small cell) architectures for the required rural coverage via small Pico or Small cell augmentation (alleviating need for any major civil / planning works).

Q. 3 Do you agree with ComReg's proposal for national licences? Please provide reasons and supporting evidence for your answer.

Nokia agree with some level of granularity of the radio blocks. In order to promote a more broadband transport, we feel that channels should remain in the Mhz region. Eg 1.5, 3Mhz to allow for IP multi service data com, this is as opposed to "slicing" for any specific narrow band service. 3Mhz would be ideal, starting at 412/422 Mhz in order to avoid impact with UK ESN designation at reasonable power levels of emitted EIRP ***[61]***.

Using LTE of sufficient bandwidth we feel that NB-IOT variants can serve for the needs of data metering or monitoring at the same time as supporting broadband multi service channels from say a 3Mhz channel. NB IOT can be typically deployed through employment of LTE signaling channels (in band) as opposed to guard band use ***[55]***. (this follows the typical deployments now growing in commercial 4G deployments)

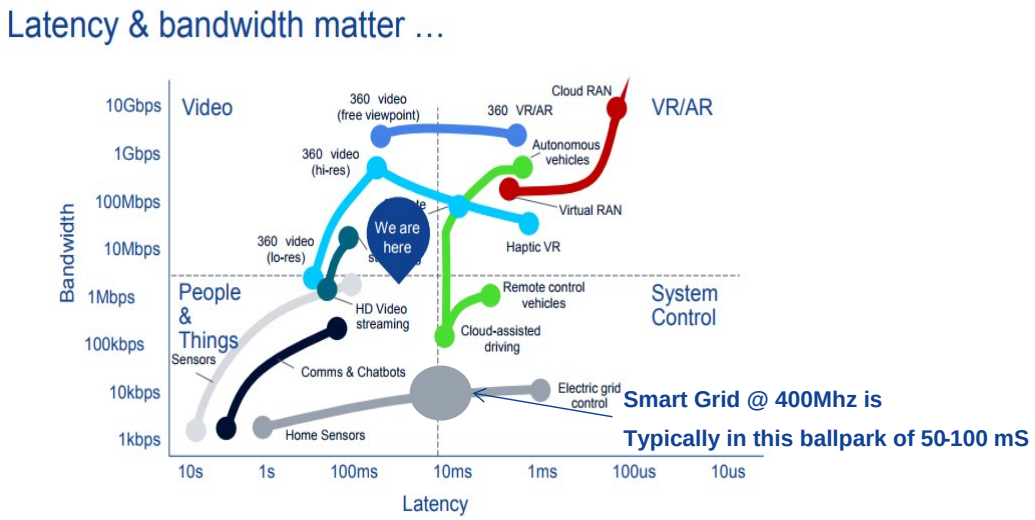
Nokia participates in several standardization organizations including ETSI, 3GPP and ITU-R as well as relevant Industry organisations like the 450 MHz Alliance. Nokia leads the Standards and Regulatory working group and is supporting the finalisation in ETSI SE-7 working group of the 450 MHz Band 31 as well as the new 3GPP Bands 72 for European Utilities and Band 73 for APAC ITU Region 3.

Nokia is also involved with the 450 MHz Alliance of the development of a 3GPP Band for the 410-430 MHz spectrum range with a 2x5 MHz FDD Band plan that will be able to support Channels of 1.4 MHz, 3 MHz and 5 MHz. There is also interest for a 3GPP FDD band plan for the 380-400 MHz range as we continue to see migration of existing narrowband PMR technologies to broadband technologies like LTE. We welcome the opportunity to have further in detail discussions with ComReg et al on this topic.

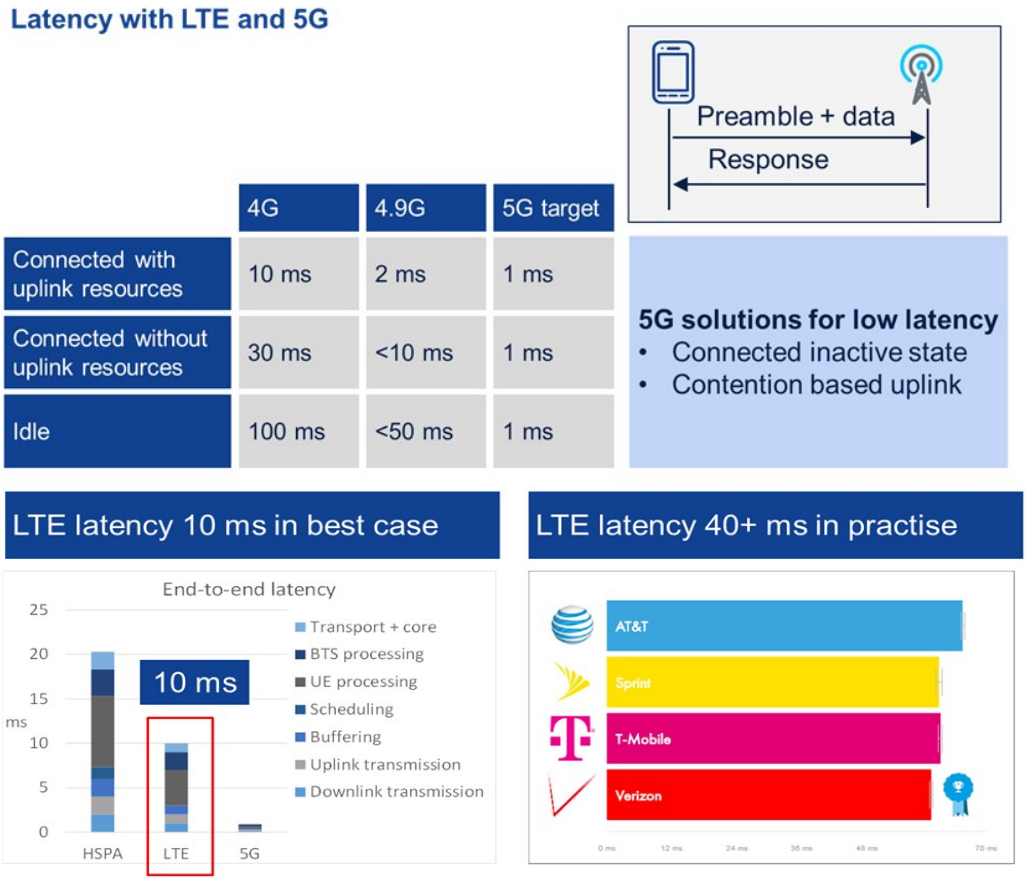
Q. 4 Is 2 x 500 kHz an appropriate lot size? Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users? Please provide reasons and supporting evidence for your answer.

As per Q3 we feel that narrow band services can be deployed within a more broadband context (eg NB-IOT) over traditional wider broadband channel designations. (i.e. using QPSK and its tighter signaling plane)

Although 500Khz may serve certain needs (telemetry/metering) it may also hinder employment of a wider value chain of broadband services (eg monitoring substations or low latency services) . In addition, given the growth of smart grid applications, the constrain on bandwidth may impact meeting levels of SLA required. The following highlights the impact of latency vs inferred bandwidth constraint as set by current technology and trends. What it shows is the eternal need of low latency and higher throughput for increased value of the service. Given the low consumption of most smart grid telemetry (< 1Kbps per devices) LTE @ 400Mhz represents an ideal transport layer for these services.



The 3GPP specification is 10ms delay for LTE with 1 ms on 5G. The figure below shows the e2e latency as per 3GPP standards. As the LTE technology is an “evolution” we feel this also provides the best approach to leverage the spectrum with its future potential adaptations.



	LTE Cat 1	LTE Cat 0	LTE Cat M1 (eMTC)	LTE Cat NB1 (NB-IoT)	EC-GSM-IoT
3GPP Release	Release 8	Release 12	Release 13	Release 13	Release 13
Latency	50-100ms	not deployed	10ms-15ms	1.6s-10s	700ms-2s

Latency for different LTE Standards

Q. 5 What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? Please provide reasons and supporting evidence for your answer.

Nokia's view is that the spectrum should be of sufficient capacity to alleviate service fragmentation and the typical narrow band locking problem of services which is evident by examples cited in Ofcom's recent review of UHF 1 and UHF 2 within the UK. Ofcom mention the difficulty in aligning with continental EU at the 450 Mhz region for example.

In Smart Grid deployment we must consider the headroom necessary to effect a true multi service fabric that is capable of delivering control information, measurement, and polled status. In addition, the network should be predictable enough to allow for engineering of services within the confines of limited radio resource (the channel itself), the delay (processing of radio and data plane), and any buffering (jitter).

Empirical testing suggests that at 400Mhz, a channel of 3Mhz is sufficient to allow 2-3 Mbps data rates over metropolitan areas (typically 3-5 Km) with delays of 50mS-100mS in typical fashion. Several entities are looking at proving these data rates with a view offering benchmarking and it is suggested that Nokia would be pleased to research this under a test and development license with stakeholders in the Republic of Ireland.

In the following we can see how different aspects of smart grid data traffic flow could be quantified. AMI/Smart Metering should be considered as a narrow band component of the overall fabric channel.

DER (distributed energy resources) refers to the potential of EV charging stations and connected admin data points which will become significant in the next decade.

	Application Service Requirements					LTE QOS Requirements				
Utility Application	Data Rate	Latency Sensitivity	Reliability	Security	QOS	GBR	QCI	ARP	MBR	AMBR
SCADA	Med-Low	Low	High	High	HP2	Yes	2	High	10-200 kb/s	
DA: Syncrophasors	Med-High	Med-High	High	High	EF	Yes	6	Med-High	320 kb/s	
DA: Reclosers, Capacitor Banks, Transformers, etc.	Med-Low	Medium	High	High	HP2	Yes	6	Medium	256 kb/s	
Distributed Energy Resources	Medium	High	High	High	HP2	Yes	2	High	128 kb/s	

Data Rate: Volume of data at UE
Latency Allowance: One way delay tolerance
Reliability: Tolerance to uptime SLA (99.999%)
Security: Traffic isolation and/or Encryption
QOS: Service level Quality of Service (not LTE QOS)

GBR: Guaranteed Bit Rate
QCI: Quality of Service Class Identifier
ARP: Allocation and Retention Policy
MBR: Maximum Bit Rate
AMBR: Aggregate Maximum Bit Rate

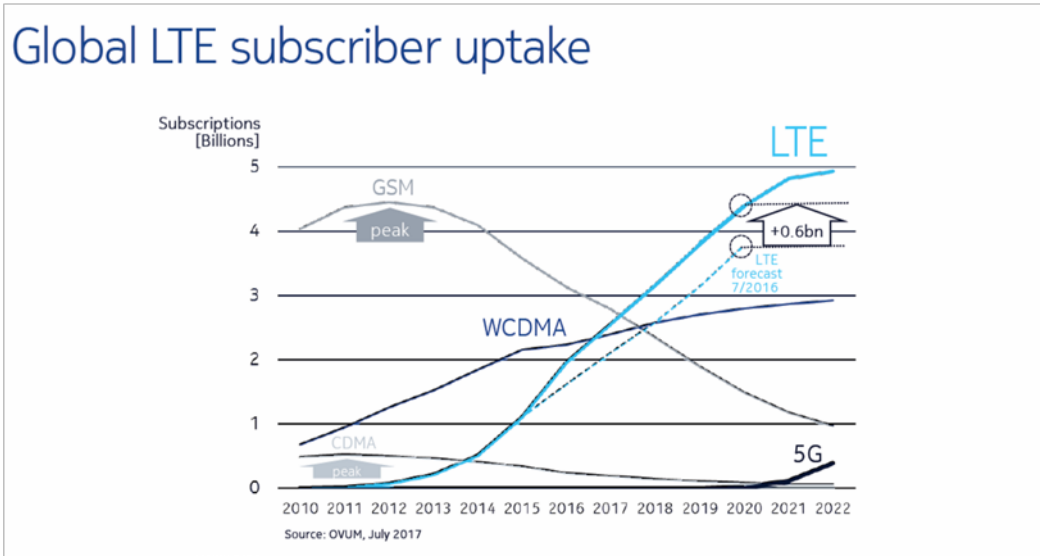
Typified bandwidth that might be employed in a 3Mhz Channel

Q. 6 Do you agree with ComReg's proposal on channel bandwidth? Provide reasons and supporting evidence for your answer.

If we consider the shift form dedicated circuit to multi service networks, we feel the same philosophy must be adopted by use of the spectrum under debate. That is, using wider channels and IP/Radio ISO modeling to provide multi service capabilities. This will allow business value chains to unfold if one considers the retail side of EV charging by example who might employ dedicated VPN or APN transport, as well as provide dedicated control, measurement , and metering under a predictable and quality assured fabric for the Utility services (eg Micro generation, storage, distributed supply control etc).

Q. 7 Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements.

Nokia provide carrier grade technologies and thus follow the typical asset life associated with carrier grade technology. In the following we can infer that such carrier grade technology (EPC, RRU, eNODE, and Industry CPE) have lifespans approaching well towards a decade (see GSM lifecycle). This is a common lifecycle term for carrier grade deployments and Nokia would be pleased to discuss specific cases further.



Carrier Grade Service Lifecycles

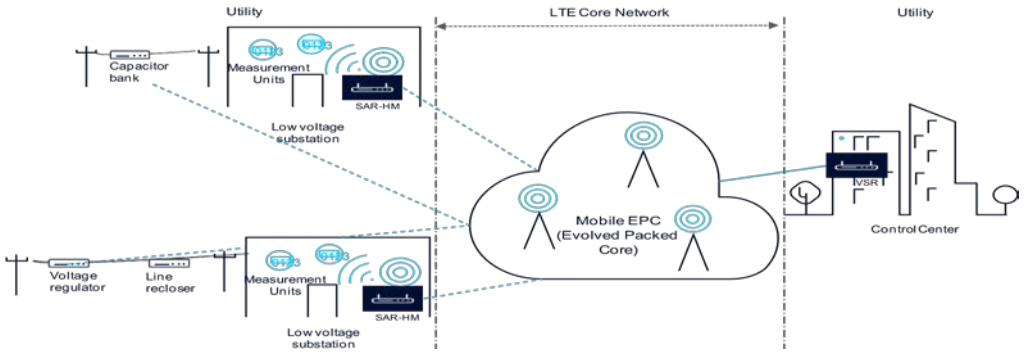
Components will sustain under service wrap (typically towards 10+ years but would be subject to service management discussions for individual components involved)

Q. 8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

Nokia believe that both “dedicated carrier assignment via auction” and also potential Utility owned mechanisms “administrative” assignment have parity for delivering the services required and that ultimately this spectrum should not be wholly focused on monetization given the socio-economic benefits for smart grid enablement. That is not to say revenue streams cannot be facilitated, from either outright purchase or as a managed service. Nokia would support all stakeholders under these models and build innovative value chains around both forms.

Q. 9 What are your views on ComReg’s current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award? Please provide reasons and supporting evidence for your answer.

Nokia agree on finding methods / minimum price set-up and usage fees but feel this should be agreed with a number of key stakeholders to ensure there is no choking of genuine use cases, that is being agnostic to how services are fulfilled (Managed Service Subscription or contracted assignment fee) . An end-to-end value chain could be incubated around a number of identified services. Nokia’s view is that we will support all “provider of services” that might co-exist and therefore remain generic in view to the setting of fees on service employments.



(Subscription or Assignment) Agnostic Model of Multiple Service Overlay/ Provision

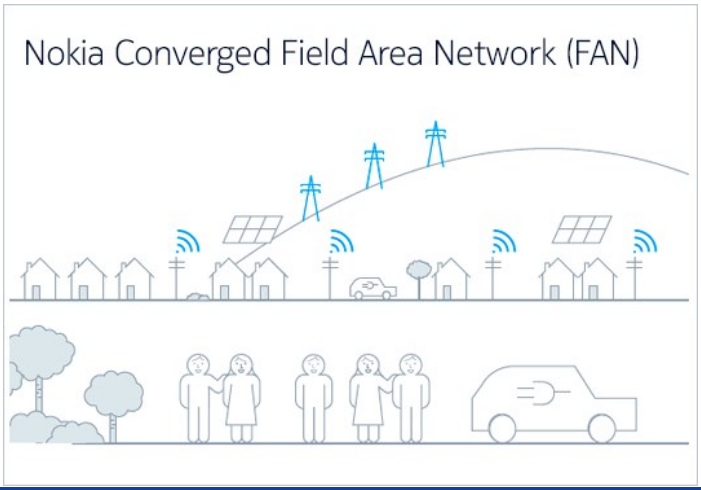
Nokia LTE/IOT Smart Grid Proposition

Supplemental Material

Highlights & Value Propositions

Powered by the research and innovation of Nokia Bell Labs, we serve communications service providers, governments, large enterprises and consumers, with the industry's most complete, end-to-end portfolio of products, services and licensing. From the enabling infrastructure for 5G and the Internet of Things, to emerging applications in virtual reality and digital health, we are shaping the future of technology to transform the human experience. A truly global company, we are 160 nationalities working in more than 100 countries.

Delivering High Value Enablement from valuable spectrum resources



Leverage missioncritical WAN technology for wireless deployments	**Enable advanced distributed intelligence**	**Foundation for IoT use cases**
Nokia technology leadership in wired and wireless	**Ubiquitous networks for remote control and monitoring**	**Technology for today and the future**

IP/MPLS E2E	**LTE + wlan**	**Diversity, QOS, availability, security**	**Large scale networks E2E management**

Meet the future needs ahead of the curve

The power grid is vital to delivering the energy that people have come to expect in their personal and professional lives. Ensuring the safe and reliable delivery of high-quality power is the utility's primary objective. While utilities have for many years met this goal very successfully, factors such as aging power grids, increasing demand and the incorporation of renewable energy are now driving many of them to transform the way they do business.

To enable this transformation utilities are looking closely at a different kind of power — the power of the smart grid using Information and Communications Technology (ICT), to sustain and improve the security, reliability and efficiency of the grid.

Do more and gain more with Nokia's Solution

Telecommunications networks play a central role in transmission and distribution grid operations. This role is evolving as utilities begin to move away from legacy circuitswitched communications services and embrace new IP- and packet-based grid applications. To succeed with this transition, utilities need reliable and secure communications solutions that will give them more control over grid applications and enable the flow of information required for greater automation and for that LTE is the broadband technology of choice for such IoT and multi service applications.

With a worldwide reach in experts and experience, Nokia offers you the best blend of latest technology and rich services. Nokia has proven experience of delivering the best Telecom and Utility operational networks and have a strong global footprint with unmatched products and reliable services. Its high capacity core Network Elements and widely used network management systems contribute to create the best value for the overall solution.

Having experience from building and operating mobile communications infrastructures, we at Nokia believe to be well positioned to offer state-of-the-art solutions including all its main elements such as radio, aggregation and core networks as well as ruggedised, utility-grade CPE. In cooperation with local subcontractors, we can arrange for fast roll-out and seamless execution in order to provide as fast as possible time to market for Iberdrola.

solution benefits

- Nokia's is a recognised leader of LTE equipment worldwide.
- The Nokia LTE portfolio includes RAN,EPC and Utility grade CPE routers. The supply of other CPEs can be managed using Nokia and OEMs.
- Nokia's solution is 99.999 percent reliable with guaranteed Quality of Service (QoS) and full redundancy
- Today's reliable, high-quality power delivery includes energy from nontraditional sources.
- Using automation to improve asset management, grid maintenance and workforce dispatch is a key capability through which the smart grid improves operational efficiency, and a robust communications network.

Modernize your Grid – With Nokia Adaptive Communication Network

Below challenges drive a new way of doing things:

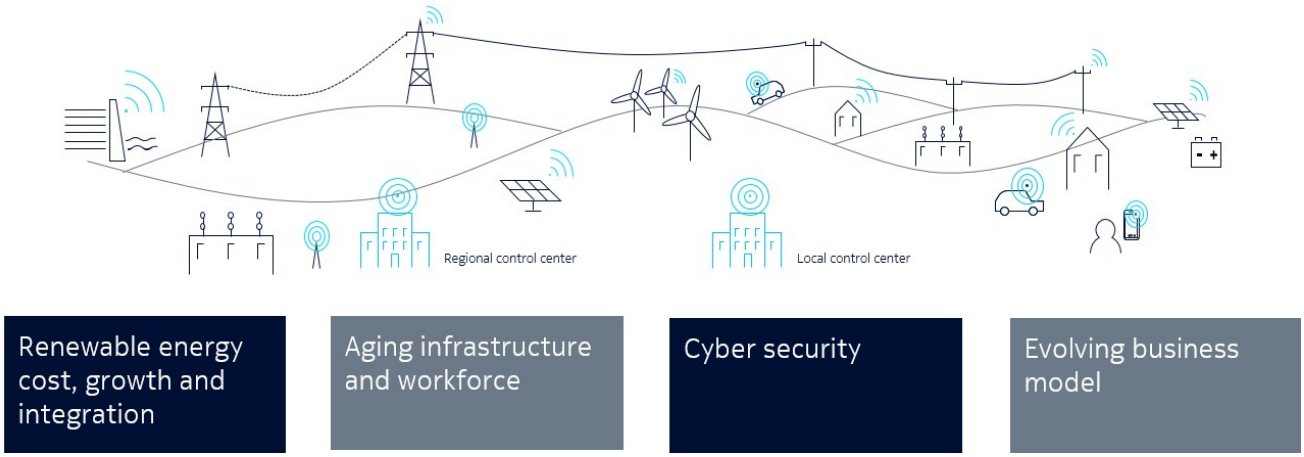


Figure 1: Modernize your Grid with Nokia Adaptive Communication Network

Nokia relies on an adaptive communications network for real time exchange of information for greater efficiency, reliability and safety.

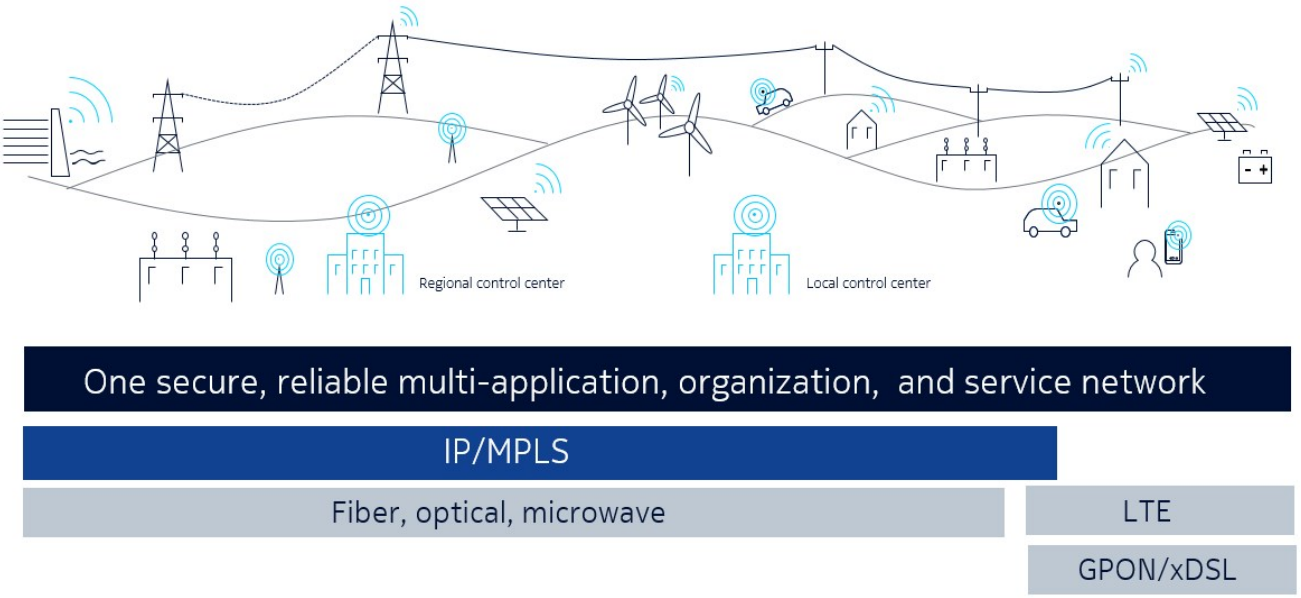


Figure 2: Nokia adaptive Communications Network for real time exchange of information

Modernize your Grid – With Private LTE Network

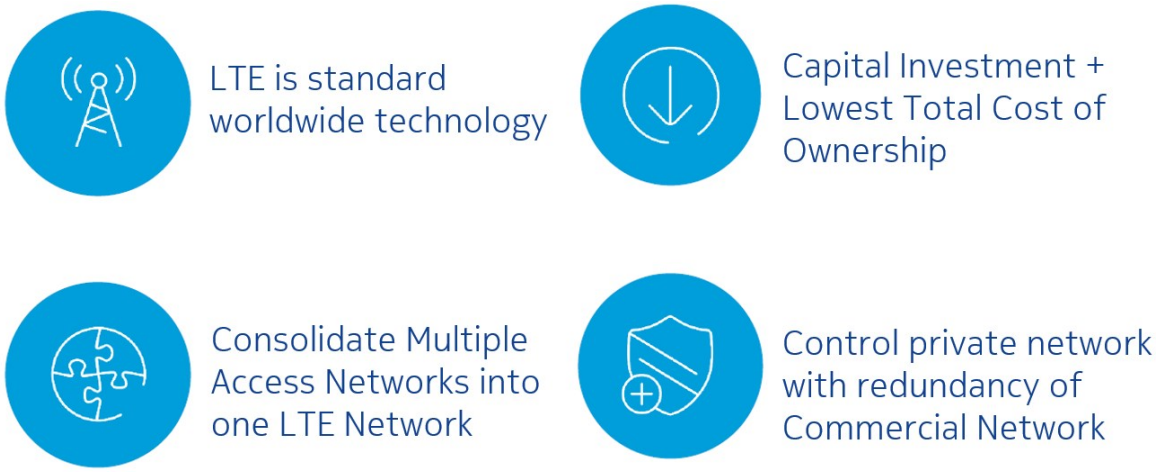


Figure 3: Modernize your Grid with Private LTE Network

Nokia meets the critical requirements of IoT applications with an extensive portfolio of LTE networks (including private LTE networks) and small cells (including unlicensed MuLTEfire™). We also address the massive IoT use cases with our LowPower WideArea (LPWA) and ShortRange LowPower (SRLP) technologies.

With standards-based licensed cellular technologies such as EC-GSM (Extended Coverage GSM), NB-IoT (Narrow Band IoT) and LTE-M complemented by unlicensed spectrum LoRa, we provide LPWA capabilities for a massive amount of IoT devices and applications.

These technologies also support low power consumption and simple devices in massive numbers, each communicating using small data packages. Our broad portfolio also offers Wi-Fi networks for outdoor and indoor locations.

The solutions for LTE-M, NB-IoT and EC-GSM-IoT will equally operate in spectrum shared with existing LTE or GSM networks - LTE-M and NB-IoT would be supplementary solutions addressing different use cases, with LTE-M offering higher capacity and NB-IoT slightly lower cost and better coverage.

Some alternative proposals for NB-IoT is to operate in a dedicated 200kHz carrier re-farmed from GSM, but do not support spectrum sharing with LTE networks. Therefore Nokia has supported the NB-IoT proposal from the 3GPP Study Item phase. Based on an LTE narrowband evolution, this is designed to operate in a 200kHz carrier re-farmed from GSM but has the further advantage of being able to operate in shared spectrum with an existing LTE network, thus requiring no additional deployment of antennas, radio or other hardware. The solutions for LTE-M, NB-IoT and EC-GSM-IoT will equally operate in spectrum shared with existing LTE or GSM networks - LTE-M and NB-IoT would be supplementary solutions addressing different use cases, with higher capacity on LTE-M and slightly lower cost and better coverage on NB-IoT.

The deployment options for the Cellular IoT solutions are different and depend on the mobile operator’s installed base. In the core network, our key optimizations are:

- The deployment of an IoT dedicated core network
- Signalling reduction by minimizing periodic location updates
- IoT device power savings by allowing IoT devices to go to sleep
- Sharing subscriber data storage in the HSS, as IoT devices share many of the same attributes

Connectivity challenges in broad IoT projects are generally due to the numerous IoT applications and legacy radio access technology, which require professional assistance.

Nokia offers services spanning the complete lifecycle of IoT networks and devices. These services can help define the IoT business strategy, assess current networks, design new ones and maintain them over their lifetime.

Nokia LTE Network Solution

To meet the soaring demand for IoT connectivity, the radio network needs to be optimized to account for the different characteristics of these applications.

Nokia offers a wide range of network solutions to allow this network optimization, with an extensive portfolio of both LTE macro and small cells. Nokia also offers services spanning the complete lifecycle of IoT networks and devices, offering assistance in planning strategy, designing networks and maintaining them over their lifetime.

Nokia's innovative and advanced solution will help Iberdrola to provide high end-user service quality at minimized CAPEX and OPEX over the entire lifecycle.

The Nokia LTE portfolio includes RAN and EPC. The supply of CPEs can be managed using Nokia and OEMs.

Nokia radio access network and core technologies leverage on licensed, unlicensed and shared spectrum for robust private mobile networks to meet communications and innovation needs of vertical industries. Nokia will apply Multi-access Edge Computing (MEC) capabilities and leverage its Flexi Zone, Cloud Packet Core and global services expertise to open up new opportunities for enterprises as they automate operations and connect employees and customers.

Nokia's LTE solution

"Our portfolio of technologies and services will allow us to build and operate private networks working with enterprises or with providers to serve their enterprise customers. We can leverage our leadership in censed, unlicensed and shared spectrum to tailor the network to meet specific demands using the most appropriate access technologies to right-size capacity for enterprises and serve their business needs in a highly reliable and secure way."

The Nokia flexible multi-access Cloud Packet Core enables common anchoring of licensed spectrum such as 2G, 3G, 4G and 5G as well as shared and unlicensed spectrum including Wi-Fi to support a diverse range of mobile broadband, IoT/massive machine-type communication enterprise services and applications. Nokia is further expanding the Cloud Packet Core deployment options with a new range of pre-integrated Cloud Mobile Gateway and Cloud Mobility Manager platforms to support a diverse range of business and operational deployment models for enterprises.

These end-to-end enterprise network capabilities are complemented by Nokia global services expertise. Leveraging the AVA platform, Nokia can offer extensive network planning, optimization, care services and full managed services.

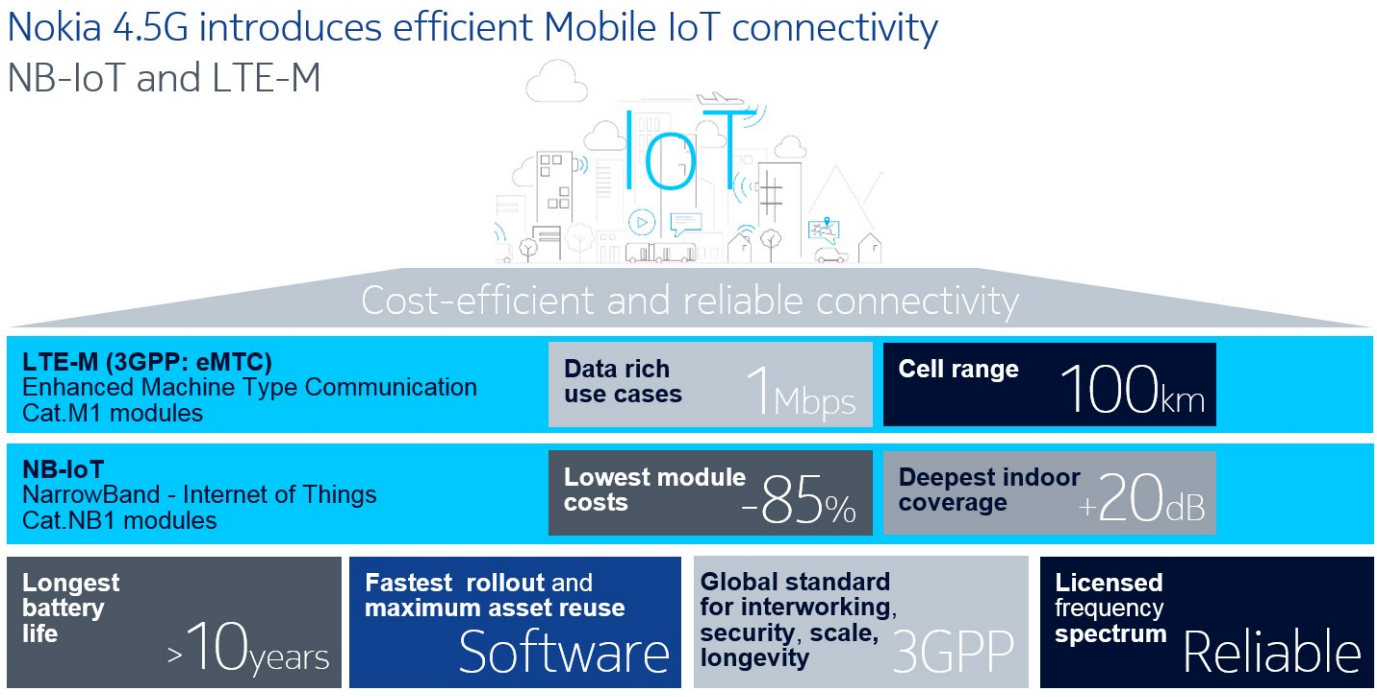


Figure 4: NB-IoT and LTE-M

Building the Best Private LTE Networks for the Winning End User Experience

Private networks for enterprises, critical infrastructure, transportation and utilities

Public LTE networks are likely to cover about two thirds of the world's population in the early 2020s. However, enterprises in certain industries operate sites at remote locations far beyond the reach of a public network. Providing employees at remote mining or oil and gas exploration sites with broadband connectivity that improves their safety and quality of life, as well as raising productivity. In areas in which public network operators cannot build a supporting network, private LTE networks are an ideal alternative, as broadband on mainstream devices and macro cell coverage are cost effective. In 2016, Beach Energy, Australia selected Nokia for such a private LTE network. This achieves significant productivity gains at lower operating expenditure using Nokia LTE base stations, each of which can replace multiple Wi-Fi access points.

Pipelines, electricity grids and water supply lines also pass through scarcely populated areas beyond the coverage of public networks. Mobile IoT on LTE provides the necessary combination of cost-efficiency, security and reliability to connect meters and sensors, which allows the monitoring of smart grids and locate leakages in pipelines. Beyond the reach of public LTE network coverage, private LTE networks could be the alternative.

In February of this year Nokia and AT&T have announced the rollout of a dedicated LTE network, specifically to meet the demands of the power utilities in the US to deliver smart grid services which require fast, low latency and highly secure telecommunications services. More information about this AT&T project can be found here: https://resources.ext.nokia.com/?cid=193969

Industrial Grade Alliances

In additional to close working with chipset vendors Nokia is actively engaged with 6 of the leading Module vendors;Telit, Ublox, Sierra Wls, Gemalto, Quecteland WNC securing access to a wide array of device solutions that each has developed and is now evolving to support LTE-M and NB IoT use cases that might employ the 400Mhz Spectrum.

Nokia is also engaged with a large number of different device vendors supporting NB IoT devices across a range of different use cases; Accent(Tracking), Bordatech(Tracking),Intercomp(Parking), Mobilisis(Parking), Veolia (Waste), EcoMobile(Waste), Shitek (Metering), Pessl(Agriculture), Raycap(Industrial).

Testing is on-going with: -LTE M; QCT, Sequans, Altair and -NB IoT; Neul, QCT, Intel (stopped) and Sequans/Altair in Q4/17. The following highlights are serious investment across an Industry Partner EcoSystem Program.

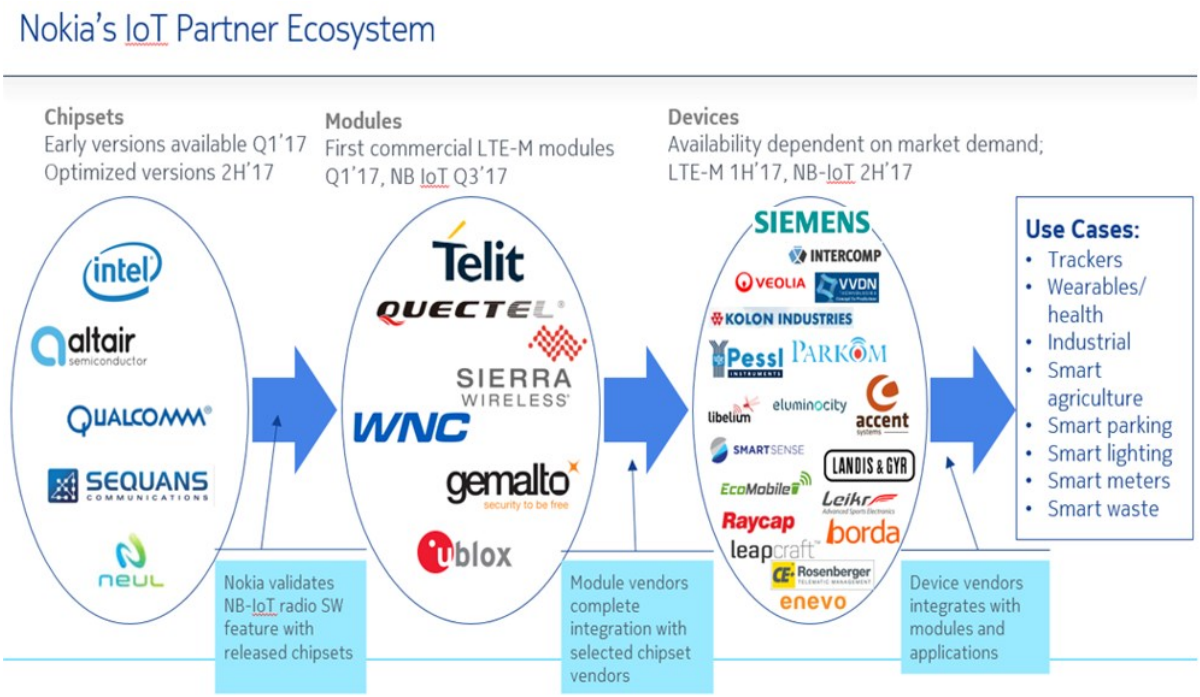


Figure 5: Nokia IoT Partner Ecosystem

Nokia IMPACT IoT Platform enable service providers, enterprises to easily deploy IoT services

8.4 billion connected things will be in use worldwide in 2017, up 31 percent from 2016, and will reach 20.4 billion by 2020. Total spending on endpoints and services will reach almost $2 trillion in 2017

Nokia IMPACT gives communication service providers, enterprises and governments a secure, standardsbased platform on which to build and scale new IoT services. It manages data collection, event processing, device management, data contextualization, data analytics and applications enablement for any device, any protocol and across any application. It also features robust, multi-layered security across the platform to safeguard data, identities and devices. The latest version of the Nokia IMPACT IoT Platform provides new capabilities and a suite of pre-integrated applications that allow customers to easily create and deploy secure revenue-generating IoT services.

1. Nokia's Intelligent Management Platform for All Connected Things (IMPACT) provides pre-integrated applications for public sector/smart city and transportation/automotive verticals
2. Machine learning-powered video analytics automatically identifies patterns and anomalies in traffic conditions, crowd behaviour and other settings, triggering real-time alerts if necessary
3. Support for the Narrowband IoT (NB-IoT) and LoRa protocols meet the need for low-power, wide area (LPWA) connectivity options for IoT devices

A horizontal platform approach to enable mass adoption

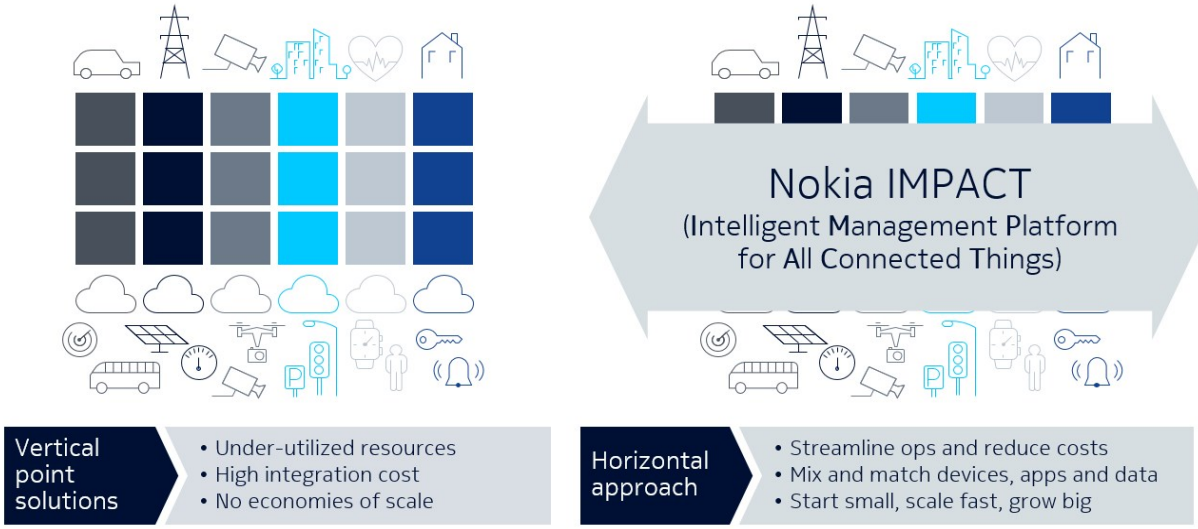


Figure 7: A horizontal platform approach to enable mass adoption

The NOKIA IMPACT platform - Unlock your competitive advantage and growth opportunities

- #1 Leadership position in device management, proven to massively scale with 1.5B devices managed and 15,000 devices certified
- Analytics driven NetGuard security portfolio.
- Prevents contagion via security analytics and threat intelligence
- Wide range of IP based protocols and Non-IP based Low Power Wide Area radio protocols: licensed (NBIoT) and unlicensed (LoRa)

- IoT Ecosystem with over 100 IoT Community partners

Nokia IoT portfolio from a helicopter view

Figure 8: Nokia IoT portfolio a Helicopter view

Industry award winning technology

Figure 9: Industry award winning technology

Why Nokia?

Figure 10: Why Nokia

Proven Experience of delivering the best solution

Nokia has worked extensively during the past 30 years with utilities worldwide, providing more than 200 mission-critical networks and Smart Grid transformations. We also have extensive experience with utilities that provide broadband, video, and voice services to their customers. Nokia works closely with utilities on every major continent and in every region of the world. Below is a list of many of the utility deployments in each region. This includes deployments supporting transmission and distribution grids, as well as providing broadband services.

AMERICAS

- Alliant Energy, USA
- Allegheny Energy, USA
- AltaLink, Canada
- Amazonas Energia, Brazil
- BC Hydro, Canada
- Bristol Virginia Utilities, USA
- BTES, USA
- CFE, Mexico
- Chelan County Public Utility, USA
- CHESF, Brazil
- Consumers Energy
- Dalton Utilities, USA
- Dayton Power and Light, USA
- EDELCA, Venezuela
- EPB, Chattanooga, USA
- First Energy, USA
- FPL Fibernet, USA
- Furnas, Brazil
- Grand River Dam Authority, USA
- Lafayette Utilities, USA
- MINET, USA
- Morristown Utility Commission, USA
- NPP, USA
- OG&E, USA
- Oncor, USA
- Paducah Power System, USA
- PDVSA, Venezuela
- PECO, USA
- PEPCO Holdings, USA
- Salt River Project
- We Energies, USA

EMEA

- ADWEA, Abu Dhabi
- AES Sonel, Cameroon
- AEW, Switzerland
- BEWAG, Germany
- BKW FMB Energie, CH
- C Power NV, Belgium
- C4 ENERGI AV, Sweden
- CEPS, Czech Republic
- CEZ, Czech Republic
- Creos, Luxemburg
- DELTA, Netherlands\
- Desanet, Germany
- EDF, France
- EETC, Egypt
- EKZ, Switzerland
- Electro Ljubljana, Slovenia
- ELIA, Belgium
- ENDESA, Spain
- Energy Ouest Suisse, CH
- Energimidt, Denmark
- EPAL, Portugal
- ESB, Ireland
- Eskom, South Africa
- EWZ, Switzerland
- Gas Natural Fenosa, Spain
- Hafslund, Norway
- IBERDROLA, Spain
- Israel Electric Corp, Israel
- Jöökoping Energi, Sweden
- KELAG, Austria
- NEK EAD, Bulgaria
- NRGI Fibernet, Denmark
- Repower, Switwerland
- RTE, France
- Saudi Electric Company, Saudi Arabia
- Salzburg Stadtwerke, Austria
- Scottish Power, United Kingdom
- SSE, United Kingdom
- Stadtwerke Schwedt, Germany
- STATTNETT, Norway
- Stedin, The Netherlands
- Swissgrid, Switzerland
- SYDFYNS INTRANET, Denmark
- TEIAS, Turkey
- Teletrans, Romania
- Tennet, Netherlands
- Transco, UAE
- TWL, Germany
- Unified Energy System, Russia
- USEPS, Slovakia
- Vattenfall, Germany

APAC

- Anhui Power Company, China
- Ausgrid, Australia
- Energex, Australia
- Ergon Energy, Australia
- GNPG, China
- HES, China
- Jiangsu Electrical Power, China
- LAOS EDL, Laos
- Power Grid Corporation of India
- Provincial Electricity Authority, Thailand
- PGCIL, India
- Taiwan Power Company, Taiwan
- Tenaga Nasional Berhad, Malaysia
- Tianjin Power Group, China
- Transpower, New Zealand
- Yunnan Power, China

Table 1: Nokia Power Utilities References

Summary

The demand for Utility/IoT connectivity is set to soar in the next few years, with estimates of up to 46 billion IoT connected devices by 2020, of which up to five billion will be connected over cellular networks. Utility Network Operators will need to massively increase their capacity to handle the sporadic transmissions generated from these billons of devices. An assured spectrum that offers multi service capability and based on vendor agnostic LTE / 3GPP would serve this community well.

Nokia offers a wide range of network solutions to allow this network optimization, with an extensive portfolio of both LTE and small cells solutions as well as the Evolved Packet Core, the IP/MPLS mobile aggregation network and industrial LTE CPE routers.

Nokia also offers services spanning the complete lifecycle of IoT networks and devices, offering assistance in planning strategy, designing networks and maintaining them over their lifetime.

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About Nokia

Nokia is a global leader in the technologies that connect people and things. Powered by the innovation of Bell Labs and Nokia Technologies, the company is at the forefront of creating and licensing the technologies that are increasingly at the heart of our connected lives.

With state-of-the-art software, hardware and services for any type of network, Nokia is uniquely positioned to help communication service providers, governments, and large enterprises deliver on the promise of 5G, the Cloud and the Internet of Things.

http://www.nokia.com || http://networks.nokia.com

9 Sensus

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29 August 2017

Dear Sirs,

Re: Response to ComReg's Consultation on Proposed Release of the 410-415.5 / 420-425.5 MHz sub-band. ComReg 17/67 of 31/07/2017.

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 17/67.

Q.1 Do you agree with ComReg's analysis of potential uses outlined above? If not, please provide supporting evidence for your view.

A.1 Yes. Sensus agree with ComReg that the use of this spectrum is ideally suited for Smart Metering and Smart Grid communications networks. Specifically, a licensed spectrum would be much more suitable to a national utility requiring a highly reliable and technology enhanced solution, rather than what unlicensed spectrum offer. We agree with the advantages outlined in point 23 of the consultation documentation on the advantages licensed spectrum offer over unlicensed spectrum. We also agree with ComReg that it would be advantageous to award this spectrum on a technology neutral basis.

Q.2 Do you have any suggestions for additional potential uses? Please provide reasons and evidence to support a potential use case.

A.2 Not at this time, but we believe the approach being considered by ComReg is the correct one and allows interested parties an opportunity to outline their potential use requirements. From the level of interest shown to consultation 15/131 Q1 2016, there would seem to enough suitable spectrum available.

Q.3 Do you agree with ComReg's proposal for national licences? Please provide reasons and supporting evidence for your answer.

A.3 Yes. We strongly believe that there would need to be a national licence available, specifically for Smart Metering and Smart Grid networks, as potential networks may be rolled out regionally but will be will be national in scale. National licenses result in highly desirable uniformity when deploying smart metering and smart grid network elements to achieve universal coverage. Inevitably, sub-optimal results arise when frequency allocations are cleaved along regional, county, or municipal boundaries because the locations of some smart metering and smart grid network elements will inevitably fall along the boundaries. Differing frequencies across these boundaries will constrain network performance and redundancy.

Although ComReg did not ask for comments on Point 49 of the consultation, we believe it is very important for a licensee to be able either (1) to provide services to a third party who purchases and retains title to transceivers used in conjunction with such services, without the need for the third party to apply to ComReg for its own license or to register its transceivers with ComReg or (2) to grant rights of use to a third party under a commercial arrangement between the licensee and the third party without the need for the third party to apply to ComReg for its own license or to register its transceivers with ComReg.

Q.4 Is 2 x 500 kHz an appropriate lot size? Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users? Please provide reasons and supporting evidence for your answer.

A.4 Yes, 2 x 500 KHz placed into 11 lots is appropriate. Based on successful deployments of Sensus' FlexNet products in other countries including the UK's Smart Metering programme for GB, we are absolutely confident that requirements for nation-wide smart metering in Ireland for electricity can be met by one lot and that the requirements for nation-wide smart grid in Ireland for electricity can be met by a second lot, should there be a desire to keep smart metering separate from smart grid.

Q.5 What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? Please provide reasons and supporting evidence for your answer.

A.5 See answer to Q.4. The nature of smart metering and smart grid is to require a fixed amount of bandwidth in a particular geographical unit. Allocating insufficient spectrum would frustrate the intent of deploying smart metering or smart grid.

Q.6 Do you agree with ComReg's proposal on channel bandwidth? Provide reasons and supporting evidence for your answer.

A.6 Yes, the approach proposed is the correct approach in our opinion. This type of approach will mean that licence holders are not limited by a potential constraint while their technology supports smaller bandwidths. Channelization is best left to the discretion of the licensee because it provides maximum flexibility to accomplish the objectives of deployment. Smart metering and smart grid systems operating near 400 MHz typically use a mix of channel widths.

Although ComReg did not solicit views on guard bands and EIRP, we agree with the positions proposed by ComReg with the proviso that all systems using this spectrum should comply with relevant standards for out-of-band emissions.

Q.7 Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements.

A.7 We would propose a 20 year licence duration. The assets of telecommunications for utilities such as electricity typically have 15 to 20 year life span. Likewise, smart meters are generally designed for such lifespans. One of the major considerations of this sector is the large volume of devices / assets deployed and the costs associated with exchanging millions of devices – not merely the costs to acquire replacements, but the costs to install them. In most cases the cost of a "truck roll" to replace a network element such as a meter are higher than the cost of the meter itself. There is anecdotal evidence for the cost of truck rolls to exceed €100 million. Replacing all meters because of the premature expiry of a spectrum license would impose a high financial burden upon the utility, their customers, or the State.

Q.8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

A.8 We agree with the "Market Mechanisms" and agree with the approach outlined in point 79 of the consultation, where an auction would only arise if demand exceeds supply. We would also state that multiple lots of 2 x 500kHz should be available to the same applicant if the need is justified. We observe, however, that certain uses of spectrum (smart metering and smart grid being only one such use) have a national significance and that an unmoderated market might result in the absorption of all available spectrum by telecommunications operators selling services to the general public, thereby frustrating the uses that have national significance.

Q.9 What are your views on ComReg's current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award? Please provide reasons and supporting evidence for your answer.

A.9 We would suggest that the mechanisms used to calculating licences be based on the spectrum channels assigned and make them available on a national basis for the licence holder to determine their most efficient use. We agree that the points raised on point 83 of the consultation should be considered for how a minimum price will be set, and would also ask ComReg to consider what way pricing has been constructed for other national licences in similar bands, such as Digital Trunking and consider this mechanism for this requirement also. In particular we express caution that pricing mechanisms predicated upon a count of network elements in the calculation of fees will inevitably disadvantage the deployment of smart metering and smart grid systems, in which the number of endpoints will be in the hundreds of thousands or millions even though each individual element produces a very low volume of traffic.

Conclusion

Sensus commend ComReg for this consultation and encourage ComReg to proceed quickly to a draft decision on these matters.

Yours sincerely,

Charles Till
Vice President, Selected Markets, EMEA and Asia Pacific
For and on behalf of Sensus UK Systems Ltd.

10 Sigma Wireless

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Mr Patrick Bolton
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Email: marketframeworkconsult@comreg.ie

30th August 2017

Reference: Response to Consultation on Proposed Release of the 410-415.5 / 420-525.5 MHz sub-band. ComReg Document 17/67

Dear Patrick

Sigma Wireless Communications Ltd (Sigma) welcome the opportunity to respond to this consultation. Sigma are a leading supplier of advanced radio communications solutions to professional, utility and public safety users in Ireland. Our technology partner Sensus have pre-qualified for the upcoming ESB Networks smart metering tender with Sigma being as an entity to be relied upon. 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.

We believe the spectrum under consideration within this consultation 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 using the same spectrum in the North of England and Scotland smart metering 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 communications networks uniformly for both urban and rural communities, while meeting the twin objectives of spectral efficiency and value for money.

In responding to this consultation, please find our answers to the questions raised below:

Q.1 Do you agree with ComReg's analysis of potential uses outlined above? If not, please provide supporting evidence for your view.

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A.1 Yes. Sigma agree with ComReg that the use of this spectrum is ideally suited for Smart Metering and Smart Grid communications networks. Specifically, a licensed spectrum would be much more suitable to a national utility requiring a highly reliable and technology enhanced solution, rather than what unlicensed spectrum offer. We agree with the advantages outlined in point 23 of the consultation documentation on the advantages licensed spectrum offer over unlicensed spectrum. We also agree with ComReg that it would be advantageous to award this spectrum on a technology neutral basis.

Q.2 Do you have any suggestions for additional potential uses? Please provide reasons and evidence to support a potential use case.

A.2 Not at this time, but we believe the approach being considered by ComReg is the correct one and allows interested parties an opportunity to outline their potential use requirements. From the level of interest shown to consultation 15/131 Q1 2016, there would seem to enough suitable spectrum available.

Q.3 Do you agree with ComReg's proposal for national licences? Please provide reasons and supporting evidence for your answer.

A.3 Yes. We strongly believe that there would need to be a national licence available, specifically for Smart Metering and Smart Grid networks, as potential networks may be rolled out regionally but will be will be national in scale. National licenses result in highly desirable uniformity when deploying smart metering and smart grid network elements to achieve universal coverage. Inevitably, sub-optimal results arise when frequency allocations are cleaved along regional, county, or municipal boundaries because the locations of some smart metering and smart grid network elements will inevitably fall along the boundaries. Differing frequencies across these boundaries will constrain network performance and redundancy.

Although ComReg did not ask for comments on Point 49 of the consultation, we believe it is very important for a licensee to be able either (1) to provide services to a third party who purchases and retains title to transceivers used in conjunction with such services, without the need for the third party to apply to ComReg for its own license or to register its transceivers with ComReg or (2) to grant rights of use to a third party under a commercial arrangement between the licensee and the third party without the need for the third party to apply to ComReg for its own license or to register its transceivers with ComReg.

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Q.4 Is 2 x 500 kHz an appropriate lot size? Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users? Please provide reasons and supporting evidence for your answer.

A.4 Yes, 2 x 500 KHz placed into 11 lots is appropriate. Based on successful deployments of Sensus FlexNet technology in other countries including the UK's Smart Metering programme for GB, we are absolutely confident that requirements for nation-wide smart metering in Ireland for electricity can be met by one lot and that the requirements for nation-wide smart grid in Ireland for electricity can be met by a second lot, should there be a desire to keep smart metering separate from smart grid.

Q.5 What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? Please provide reasons and supporting evidence for your answer.

A.5 See answer to Q.4. The nature of smart metering and smart grid is to require a fixed amount of bandwidth in a particular geographical unit. Allocating insufficient spectrum would frustrate the intent of deploying smart metering or smart grid.

Q.6 Do you agree with ComReg's proposal on channel bandwidth? Provide reasons and supporting evidence for your answer.

A.6 Yes, the approach proposed is the correct approach in our opinion. This type of approach will mean that licence holders are not limited by a potential constraint while their technology supports smaller bandwidths. Channelization is best left to the discretion of the licensee because it provides maximum flexibility to accomplish the objectives of deployment. Smart metering and smart grid systems operating near 400 MHz typically use a mix of channel widths.

Although ComReg did not solicit views on guard bands and EIRP, we agree with the positions proposed by ComReg with the proviso that all systems using this spectrum should comply with relevant standards for out-of-band emissions.

Q.7 Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements.

A.7 We would propose a 20 year licence duration. The assets of telecommunications for utilities such as electricity typically have 15 to 20 year life span. Likewise, smart meters are generally designed for such lifespans. One of the

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major considerations of this sector is the large volume of devices / assets deployed and the costs associated with exchanging millions of devices – not merely the costs to acquire replacements, but the costs to install them. In most cases the cost of a "truck roll" to replace a network element such as a meter are higher than the cost of the meter itself. There is anecdotal evidence for the cost of a truck roll to exceed €100 Million. Replacing all meters because of the premature expiry of a spectrum license would impose a high financial burden upon the utility, their customers, or the State.

Q.8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

A.8 We agree with the "Market Mechanisms" and agree with the approach outlined in point 79 of the consultation, where an auction would only arise if demand exceeds supply. We would also state that multiple lots of 2 x 500kHz should be available to the same applicant if the need is justified. We observe, however, that certain uses of spectrum (smart metering and smart grid being only one such use) have a national significance and that an unmoderated market might result in the absorption of all available spectrum by telecommunications operators selling services to the general public, thereby frustrating the uses that have national significance.

Q.9 What are your views on ComReg's current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award? Please provide reasons and supporting evidence for your answer.

A.9 We would suggest that the mechanisms used to calculating licences be based on the spectrum channels assigned and make them available on a national basis for the licence holder to determine their most efficient use. We agree that the points raised on point 83 of the consultation should be considered for how a minimum price will be set, and would also ask ComReg to consider what way pricing has been constructed for other national licences in similar bands, such as Digital Trunking and consider this mechanism for this requirement also. In particular we express caution that pricing mechanisms predicated upon a count of network elements in the calculation of fees will inevitably disadvantage the deployment of smart metering and smart grid systems, in which the number of endpoints will be in the hundreds of thousands or millions even though each individual element produces a very low volume of traffic.

Yours Sincerely,

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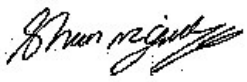

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11 Vodafone Ireland Ltd.

Mr. Patrick Bolton
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Submissions to ComReg 17/67:
Proposed Release of the 410-415.5/420-425.5 MHz sub-band

Dear sir,

Thank you for your Consultation document 17/67. At this stage we wish to comment only on one of the questions in the consultation.

Q. 8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

In line with our previous submission to ComReg's **Draft Radio Spectrum Management Strategy 2016 to 2018** we believe an auction would be the most efficient way of assigning this spectrum. Auctions should provide a level playing field for all interested parties

Given that the spectrum is currently unused an auction would be a suitable mechanism to prevent speculative acquisition and spectrum hoarding.

Regards

Eamon Farrell
Strategy and Regulation
Vodafone.

12 WHP Telecoms Ltd.

Consultation on Proposed Release of 410-415.5 MHz & 420-425.5 MHz

WHP Telecoms welcomes the opportunity to respond to Comreg's consultation on the proposed release of 410-415.5 MHz & 420-425.5 MHz. WHP Telecoms provide end to end professional consultancy and infrastructure support services to the utility, mobile and fixed operator community and as such have an interest in any strategy review which may impact ability to successfully design and deploy networks.

We are generally in support of Comreg's approach over recent years with regard to a more liberal approach to spectrum usage & management.

Evolution of the electrical transmission and distribution networks to smart energy systems is dependent on availability of resilient, robust and secure communications infrastructure and WHP Telecoms are responding to this consultation in this context which is considered both in the interest to the general good of Irish consumers and the wider Irish economy.

Insofar as our response to this consultation is concerned, we remain operator and technology neutral i.e. our responses are not intended to lend support to any organisation at the expense of another. In simple terms, we recognise that the timely availability of spectrum in suitable frequency bands is a key enabler for realising communications requirements for smart energy systems and ensuring the security and reliability of UK energy networks in the future.

It is noted that this consultation has several parallels with the 2017 Ofcom consultation on UHF bands 1 and 2 – with due consideration being required to ensure continued harmonious operation of systems between Ireland and the UK.

WHP Telecoms would be happy to meet with Comreg to discuss any of the issues in more detail.

Our answers to the nine consultation questions can be found in the paragraphs below.

Q. 1 Do you agree with ComReg's analysis of potential uses outlined above? If not, please provide supporting evidence for your view.

Yes, WHP are broadly in agreement with the potential uses outlined in the consultation. We note that PPDR services are currently provided for adequately in the 380 – 390 MHz allocation (in common with other EU states) and that any additional PPDR allocation would ideally be harmonised internationally. The upgrade to existing PPDR systems across the EU (to support video for instance) could use several different frequency bands or alternatively could be implemented in a similar fashion to the UK's solution via EE / BT. We strongly believe that the energy sector use case for the spectrum is very compelling. It has been identified by EUTC and the EU sponsored 'Energise' project that effective development of smart grids is likely to be hampered without a cost effective, fit for purpose telecommunications infrastructure. Such infrastructure is likely to be a hybrid of public and privately-owned assets (including use of private radio systems, power line carrier and cellular technology) and a key enabler will be access to additional radio spectrum in the 400 MHz band.

www.project-energise.eu

Q. 2 Do you have any suggestions for additional potential uses? Please provide reasons and evidence to support a potential use case

We believe that the most useful applications have been identified in the consultation. Other potential uses may exist but the benefits to society and the economy of these are likely to be trivial when compared to energy sector or PPDR use.

Q. 3 Do you agree with ComReg's proposal for national licences? Please provide reasons and supporting evidence for your answer.

The award of national licences would make economic sense considering the comparatively small land mass and population. To award licences on anything other than a national basis would be likely to introduce difficulties in terms of sufficient opportunity size for equipment vendors and / or the validity of any business case for a network roll out. As an example, the consultation does make mention of RF channel bandwidths of 1.4 MHz, 3MHz and 5 MHz – which are the smallest channels currently supported by 3GPP LTE technology. If a deployment of LTE technology were envisaged (for any application) then vendor support would be required – and is only likely to be economically worthwhile if sufficient volume of devices are required i.e. a nationwide deployment.

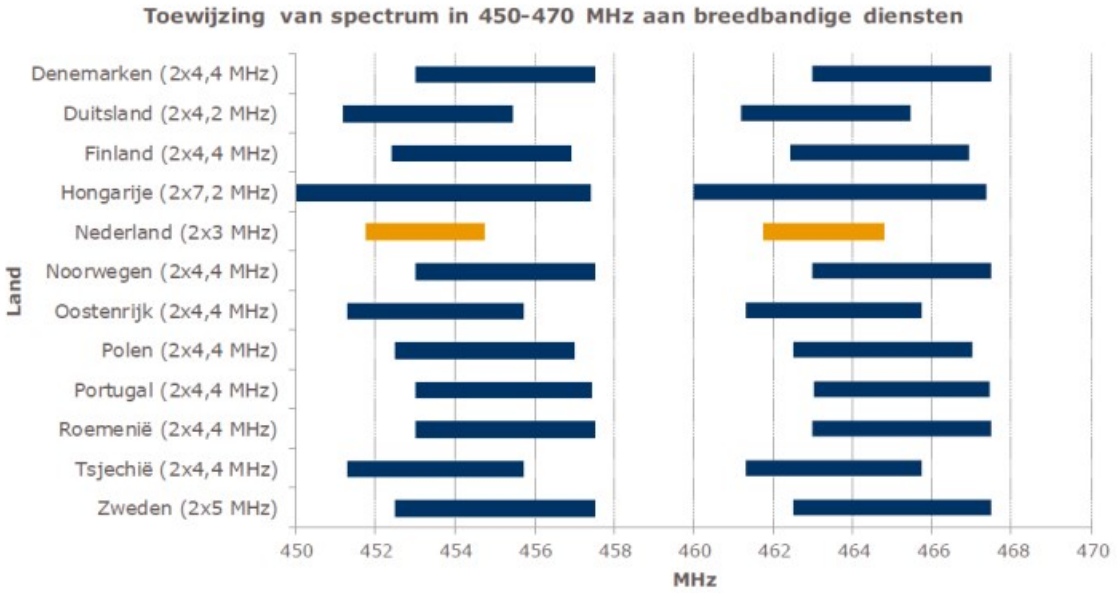
Q. 4 Is 2 x 500 kHz an appropriate lot size? Are there larger lot sizes that are equally preferable and suitable to all technologies and potential users? Please provide reasons and supporting evidence for your answer.

This size of allocation (500 kHz) is both useful and useable for many technology solutions including DMR, Narrow band UHF radio (12.5, 25 & 50 kHz), Wimax and so on. However, if support for wider bandwidth systems is desired (e.g. CDMA or LTE) then a wider bandwidth would be required. For instance (and as noted in the response to Q 3 above), the minimum RF bandwidth to support LTE technology is currently 1.4 MHz. this would require the allocation of a minimum of 3 contiguous 500 kHz slots (possibly 4 depending on guard band arrangements). In order to give all potential users and technology an opportunity to be deployed successfully, we suggest that 500 kHz blocks are an option but with a process by which potential users co-ordinate effectively to ensure that those requiring several contiguous blocks don't get allocated separate blocks with single lots in between, which would effectively sterilise allocation and inadvertently block the use of wide band systems. Smart grid concepts continue to evolve, with the number of connected locations and bandwidths required set to increase by several orders of magnitude. For this reason, it is essential that any system has flexibility and low incremental cost of expansion (in devices and bandwidth) to facilitates the developing smart grid architectures.

Q. 5 What is the requisite amount of spectrum required for each of the potential uses as set out in Chapter 2? Is there a risk of the spectrum not being used to deliver the preferred service (or left completely unused) if a licensee is assigned less than the amount they require? Please provide reasons and supporting evidence for your answer.

In the context of utility applications, it has been established over several years by EUTC that a minimum 2 x 3 MHz allocation is desirable to facilitate sufficient roll out of smart grid telecommunications infrastructure across numerous European States. This size of allocation is believed to be sufficient to provide connectivity through a mixture of technologies, be they narrow band (DMR, PMR etc), 'medium' bandwidth (such as Wimax 802.16 s) or wideband such as LTE & CDMA. The figure below indicates the amount of 400 MHz spectrum allocated to utility companies in twelve European nations

(in 450-470 MHz range). Through several other consultations, it has been established, due to Ireland and UK band misalignment with the rest of the EU and highly fragmented nature of the existing band, that 450-470 MHz isn't particularly well suited for increased usage in Ireland and the UK. However, the potential to allocate a similar sized block in 410-415.5 MHz & 420425.5 MHz offers the opportunity for Ireland to benefit from similar advances in smart grid communications technology to other European countries and avoid the problems associated with 450-470 MHz. The Czech Republic and mainland UK also face a similar challenge.



With regard to higher bandwidth PPDR applications, these will ultimately supported by LTE based technologies operating either in higher frequency bands operated by commercial operators (as per ESN network in the UK) or by reusing the existing 380-395 MHz allocations to support LTE (or possibly a hybrid of both). There are a number of ETSI working groups (including FM54) currently investigating the use of LTE systems in this frequency range alongside existing narrow band systems. If PPDR services were to be deployed in the frequencies under consideration, then the likely choice of LTE would dictate minimum channel sizes of 1.4, 3 or 5 MHz. However, these allocations could be made within existing PPDR spectrum without the need to move towards 410 and 420 MHz.

Q. 6 Do you agree with ComReg's proposal on channel bandwidth? Provide reasons and supporting evidence for your answer.

We agree that a flexible approach to channel bandwidth is the best approach, allowing users to utilise their pair(s) of 500 kHz in whatever way they wish (subject to interference co-ordination). This approach is in line with the concept of 'Spectrum Usage Rights' rather than the historical 'command and control' approach, which could unintentionally constrain the implementation of new technology. Spectrum usage rights can be defined in such a way as to allow flexible use (in terms of technology, modulation, antenna etc) subject to boundary conditions normally defined as a power spectral density at a given height above ground at a geographic boundary. Furthermore, to allocate channel sizes of less than 500 kHz (say 25 kHz) is likely to increase the administrative burden of spectrum release on the regulator and / or band manager, with associated cost implications.

Q. 7 Considering the likely technologies that will be deployed in this spectrum, please provide information on the asset life of the network elements.

The assets which are likely to make use of the spectrum (especially smart grids) are anticipated to be connected with significant infrastructure investment programmes with lifespans of several decades. Security of tenure of underlying spectrum is essential if use is to be made of the spectrum asset.

Investment cycles of Utility companies are significantly longer than those of other sectors and as such an initial minimum period of 15 or 20 years should be considered, coupled with extended notice periods in the event that spectrum has to be re-allocated in the future. Upgrades to PPDR systems also involve very significant investment and potential disruption to their users and would benefit from similarly long license periods.

Q. 8 What are your views on the most appropriate assignment mechanism for rights of use in the 400 MHz band? How does this mechanism encourage the efficient use and ensure the effective management of the radio spectrum? Please provide reasons and supporting evidence for your answer.

The use of market mechanisms (auctions) is a very effective way of ensuring maximum benefit from spectrum and ensuring that only serious market players are involved (with guaranteed network roll outs and coverage obligations – especially in the mobile sector). For example, there is a very clear and direct connection between investment in spectrum and infrastructure by a mobile operator and its ability to generate revenue from subscribers. However, with the type of services being considered for deployment in the 400 MHz band (PPDR and Smart Grids) the connection between investment in spectrum and revenues being generated is less clear. For instance, the associated economic value and societal benefit of an electricity utility being able to deliver 10 Euro worth of electricity massively exceeds the value of the energy itself, as does the ability of an emergency service being able to effectively manage resource at a major disaster.

We do not think it probable that a situation will arise where demand outstrips supply in the 400 MHz band and so the normal market forces approach may not function as expected (or at all). Due to limited demand, an auction could lead to many allocations being awarded at the reserve price – generating little revenue for the treasury and possibly seeing those allocations left unused.

Given the potential importance to critical national infrastructure of the spectrum under consideration, an administrative assignment may be more appropriate than an auction in this instance.

(It is noteworthy that in several of the countries identified in the table accompanying the answer to Question 5 it was necessary for the regulator and / or other government departments to complete the assignment exercise outside of the auction processes which have become the accepted norm over the last 10-15 years.)

Q. 9 What are your views on ComReg's current approach to setting fees/minimum prices and the factors that inform the level at which a minimum price is set in an award? Please provide reasons and supporting evidence for your answer.

We consider that the points made in section 83 of Comreg's consultation are valid. Prospective purchasers of the spectrum are unlikely to be generating significant revenues by directly operating and selling services utilising the allocations – they are more likely to be utilising the spectrum to provide an assured communications fabric to control and operate gas, water and electricity infrastructure. The cost of deploying such networks is significant and any large initial license fee could act as a disincentive and barrier to progress to a deployment. On the other hand, a fee set too low would invite interest from purely speculative bidders and could result in valuable spectrum then lying

fallow for many years (there are multiple examples of this occurring in many countries within the EU and further afield).

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