JRC Response to the Ofcom Strategic-Review-of-UHF-Band-1-and-Band-2-410-to-470-MHz

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KEY POINTS

- JRC welcomes the review of UHF spectrum and the opportunity to respond to this consultation.
- JRC indicates that the bandwidth requirements of its UHF systems will increase within the medium or long term future. Primarily, there is a requirement to increase its current data rates from 9.6 kbit/s in 12.5 kHz narrow band channels to 64 kbit/s in 25 kHz narrow band channels and ultimately to even wider bandwidth systems with Mbit/s capabilities.
- JRC considers the Public Sector Spectrum Release (PSSR) programme could be used to assist with mitigating interference issues, relieve spectrum pressure in the 450-470 MHz band and facilitate the introduction of wideband private data networks.
- Within some European countries, critical infrastructure utility operations already have access to sufficient 400 MHz Band spectrum (typically within 450 to 470 MHz) to operate their Smart Grid systems
- In line with our European neighbours, it will be very helpful if Ofcom can make available sufficiently more spectrum for the resilient machine to machine (RM2M) systems used to control of the UK's growing critical infrastructure utilities' Smart Grid(s), e.g. 2 x 3 MHz within the 380 to 470 MHz Band.
- JRC believes therefore that our neighbours should be co-ordinating their broadband systems to 1% time, not 10% time (See Annex 5 of the CM Agreement). This arrangement should reduce the interference issues to the east and south-east of England. Additionally, Belgium and The Netherlands should be co-ordinating to the International boundary line that runs midway between the UK and those countries' coastlines and, if applicable, not to the UK coastline.
- JRC agrees with the proposals to:
  - add channels to Simple UK and Simple Site licences;
  - increase the sharing factor from two to four;
  - increase the noise floor by 6 dB in the planning criteria for VHF Band I and VHF Low Band; and
  - amend the UHF channel plan configuration to more common duplex spacings.

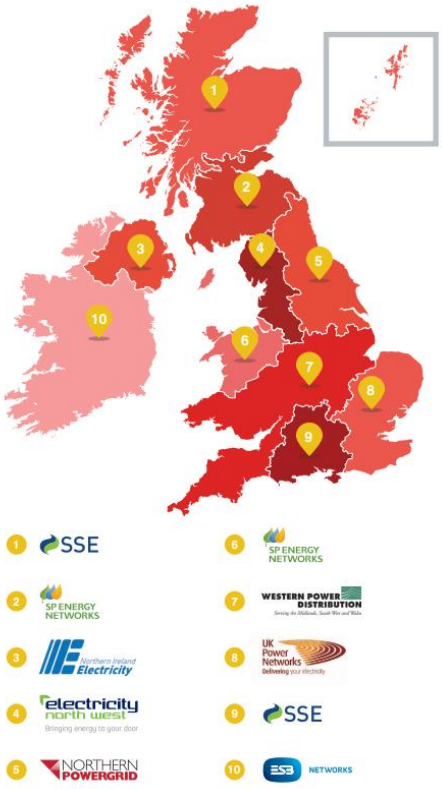
Consultation questions and JRC's responses

Question 1: Do you agree with our assessment of the trends in current and future demand in the band?

JRC highlights that there is a requirement for an increase in bandwidths for the UHF Band channels used for the control of the electricity grid systems.

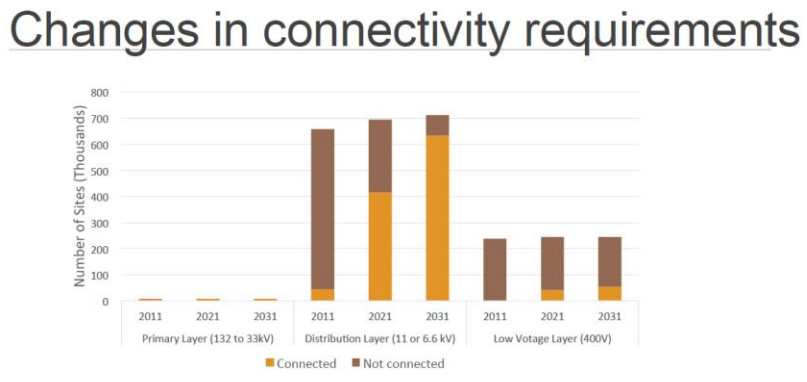
Reference Section 3.2: JRC indicates that the bandwidth requirements of its UHF systems will increase within the medium or long term future.

Currently, there is an immediate requirement to increase current data rates from 9.6 kbit/s in 12.5 kHz narrow band channels to 64 kbit/s in 25 kHz in some applications. Additionally, the option to operate 150 / 200 kHz wide band systems and, perhaps, 1.25 / 1.4 MHz broadband systems may also be required. (When considering alternative technologies, it should be noted that an upload data rate of 154 kbit/s in a 50 kHz channel, e.g. compliant with ETSI EN 300 392, is considered more spectrally efficient than 144 kbit/s in a 200 kHz using NB-LTE technology.)



UK Electricity Distribution areas (map courtesy of ENA)

Looking further into the future, reflecting legally binding climate change obligations on UK government, the requirement for data is anticipated to grow rapidly in both points-of-presence as more renewable sources of generation are connected to electricity distribution networks and demand management develops; associated with increasing data rates for connections as distribution networks develop into more dynamic infrastructure requiring real-time control. Data rates and architectures for this environment are still subject to conjecture, but an increase in the number of connections to 100,000 per electricity regional licence with associated peak data requirements in the back-haul network up to 50 Mbit/s are predicted.



A. Hulme, V. Sennes, "DNO - Smart Grid Communications Requirements", Energy Networks Association, 20th Dec 2011. [Online] Available: http://www.energynetworks.org/assets/files/electricity/engineering/telecoms/eitc/restricted/Reference%20Doc/Telent.pdf

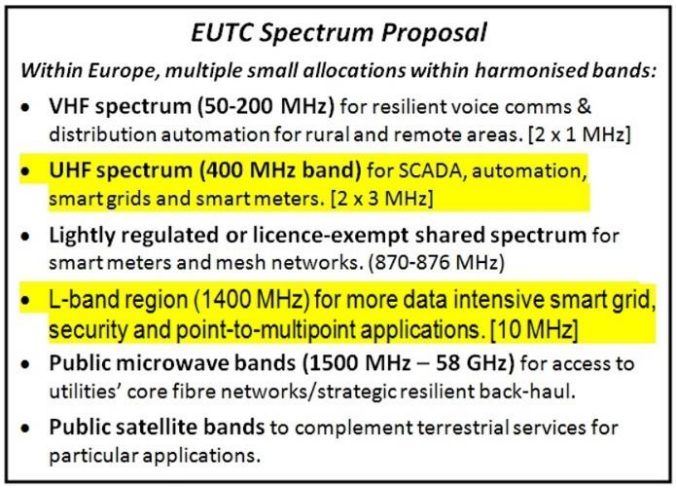
Reference Section 2.5: JRC is pleased to note that this review does not consider any changes to the spectrum management of the 2 x 1 MHz scanning telemetry band (457.5 to 458.5 MHz paired with 463.0 to 464 MHz) allocation.

JRC highlights that business radio channels licensed by JRC within the 410 to 470 MHz band are also used for resilient machine to machine (RM2M) systems, e.g. supervision, control, and data acquisition (SCADA) systems. These additional channels are equally important to the smooth running of the UK's critical infrastructure[1] utility operations despite sometimes being used for purposes other than scanning telemetry systems.

Reference Section 3.3: JRC was aware that '*The RSPG considered that an exclusive designation of spectrum to smart energy grids/meters is not necessary.*' However, this view is not shared by utilities themselves in many European countries who subscribe to the common European vision of spectrum for smart grid and smart meter operations, as exemplified by the European Utility Telecom Council (EUTC) Spectrum Proposal illustrated below. In addition, within many European countries, critical infrastructure utility operations already have access to sufficient 400 MHz Band spectrum (typically within 450 to 470 MHz) to operate their Smart Grid systems, including:

- Hungary – MVMnet
- Austria – Argonet
- Germany – 450connect
- Netherlands – Utility Connect
- Finland – Ukko
- Sweden – NET1
- Norway – NET1

For similar reasons to our European neighbours, JRC believes an allocation of 2 x 3 MHz of spectrum needs to be identified in the 400 MHz region to facilitate migration of the UK's electricity networks from their legacy state into flexible and dynamic networks capable of meeting the requirements being placed upon them.



Reference Section 3.16: the RSPG 'Draft Opinion on the Spectrum Aspects of the Internet-of-things (IoT) including M2M' consultation has clarified that ''*IoT refers to the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data*'. JRC highlights that in general, utilities prefer to isolate their operational networks from the public internet as part of their security process. Although not a guarantee of security, isolation from the public internet gives much greater protection for the control of critical infrastructure utility operations and facilitates enhanced protection and resilience.

[1] Critical National Infrastructure as defined in: *http://www.cpni.gov.uk/documents/publications/undated_pubs/1001002-guide_to_telecomms_resilience_v4.pdf*

Reference Section 3.16: JRC currently manages approximately 10,000 UHF telemetry links in UHF spectrum. This is expected to increase to about 100,000 links to enable electricity Smart Grid operation, although not necessarily all within the UHF spectrum to enhance resilience.

JRC also observes that correlating numbers of IoT/M2M devices with spectrum requirements can be misleading. It is important to observe a distinction between devices which transmit continuously and those which transmit only occasionally.

Classic utility scanning telemetry stations which transmit their vital data to central control points every minute so that control algorithms can manage the network dynamically with data which is at most one minute old. Conversely, remote switches may simply report the position of their contact switches when they change, or once per day under steady state conditions. Conversely, teleprotection circuits, the most demanding application may require comparison of real time values in millisecond periods over a wide area. Basing spectrum requirements based on numbers of connected devices can thus be misleading.

Reference Sections 3.18 - 3.20: JRC concurs with the view that 400 MHz spectrum is a low priority for **public** mobile data. However, the evidence revealing only limited demand for private wideband data networks should not be cause for concern. The amount of spectrum which could be devoted to wideband private networks in the 400 MHz region is limited in any case (hence the lack of interest from public operators), so the fact that there may only be a few interested parties enables the limited supply of spectrum to match the limited demand.

Question 2: Do you agree with our assessment that the risk of continental interference is limited to the east and south east of the UK during periods of atmospheric lifts?

The majority of reported continental interference cases have historically related to the East and South-East of England, but may be changing. 2016 has seen more interference into utility radio systems than for many years. This may be a statistical aberration, or a longer term trend caused by climate change affecting weather patterns over the English Channel and North Sea.

JRC notes that there has also been intermittent narrow-band interference from France into South-West England, and additionally, there has been occasional narrow-band interference, probably from the oil rigs, into North-East England.

JRC suggests that consideration should also be given to intermittent interference sources from Republic of Ireland (RoI) to the West, especially along the Northern Ireland / RoI border. It may be helpful in the future for utilities to operate in similar spectrum north and south of the border and co-ordinate directly to simplify the process as their physical infrastructure is already interconnected in several cases.

It must be observed that for conventional –push-to-talk PMR services and similar non-critical services, continental interference is more of a nuisance than major problem. Historically, interference events have often been observed in the early morning hours (2-7am) when many PMR services are little used. For utilities operating 24/7, communications failures evening during the early hours of the morning are noticed and may have an operational impact.

Reference Section 3.35: it should be possible to model the interference scenarios caused during atmospheric lifts by using 1% time predictions.

Reference Section 3.36: considering HCM Agreement, Annex 5, Determination of the interference field strength in the Land Mobile Service, Section 1.3 (see http://hcm.bundesnetzagentur.de/vertrag/englisch/E_word14B.zip):
'The interference field strength at the receiving location shall be determined using the propagation curves given in Annex 4.

- For signals with a transmitting to non-transmitting ratio of less than 1:10 and a cycle repetition time of more than 30 sec, the curves for 10 % of the time have to be applied (no continuous carrier). In other cases the 1% curves shall be used (continuous carrier).'

JRC believes therefore that our neighbours should be co-ordinating their broadband systems to 1% time, not 10% time. This arrangement should reduce the interference issues to the east and south-east of England. Additionally, Belgium and The Netherlands should be co-ordinating to the International boundary line that runs midway between the UK and those countries' coastlines and, if applicable, not to the UK coastline.

JRC believes that France currently co-ordinates its speech-type narrow band PMR systems for 10% time at the UK's coastline; and this arrangement results in minimal interference issues. It is suggested, however, that the UK insists that 1% time is used when France moves its Emergency Services to a broadband UHF system. (NB: it is understood that the HCM Agreement will soon be changing to 1% time at 3m at a neighbouring border.)

Question 3: Do you agree with our assessment that these bands could enable the implementation of our UHF policy proposals?
Question 3b: Are there any additional uses you think we should consider if this spectrum becomes available for use?

3a) JRC agrees that that the proposed changes could enable the implementation of the UHF policy proposals.

3b) JRC highlights that it will be helpful if critical infrastructure utility operations could gain access to the proposed new channels / duplex-split arrangements. This will be especially helpful when the current 9.6 kbit/s in 12.5 kHz narrow band systems upgrade to, say, 64 kbit/s in 25 kHz narrow band channels as part of the transition to electricity Smart Grid operation. For new wideband systems, typically CDMA, LTE or similar, access to new spectrum will be required to provide 1 MHz / 1.25 MHz / 1.4 MHz / 3 MHz channelization.

JRC notes that the Public Sector Spectrum Release whereby public sector spectrum might be shared with commercial users where it cannot be released may be a valuable mechanism to overcome 'continental interference' since the systems most severely impacted are geographically dispersed, and this may be compatible with sharing with public sector spectrum use.

Reference Section 3.24: It is helpful to observe developments in mainland Europe as an indicator of what might happen in the UK in the future. It is noted that the Scandinavian deployments of LTE are driven by Fixed Wireless Access (FWA) networks to provide internet connectivity to remote area, influenced by their low population density.

For the other European applications of wideband systems in the 400 MHz region, utility applications have been the main driving force. In particular, it must be noted that the 450-470 MHz deployments in the Netherlands, Germany and Austria have all been driven by the electricity sector using CDMA technology in preference to LTE.

Reference 3.39: JRC notes that '*Across NATO Europe, these bands have been made available for sharing with emergency services using TETRA or similar technology, so as to be technically compatible with ongoing military uses in this range*'.

Critical national infrastructure utility operations are seeking spectrum in which to use narrow band systems similar to TETRA. Spectrum such as 380 to 395 MHz is seen to be a good candidate for these systems if this band were to become available for use because it would ensure compatibility with the on-going military requirement in the band.

Reference Section 3.42: 'As a result of the rationalisation of ES spectrum we expect to see use of UHF Band 2 by the ES to decrease. In the near term it is anticipated that 4 MHz of non-contiguous spectrum in the 450 to 470 MHz band will become available for civil use.'

JRC requests that, before making it available for general licensing, this spectrum be considered for future Smart Grid use.

Question 4: Do you agree with our conclusion that aligning UHF Band 2 with continental Europe is not required?

Previous proposals for re-alignment of 450 to 470 MHz have been extremely costly with users expected to bear the cost. In the case of utility systems, these costs would ultimately fall to UK households and consumers, and must therefore be fully justified. Methods of mitigating 'continental interference' must be found which are cost effective, which may involve moving critical affected systems into spectrum less affected by activities in mainland Europe.

Care must also be exercised in any plan that it takes into account future developments rather than dwelling on past practices. For example, the impact of potential technologies such as Time Division Duplex (TDD) might negate the current need for standard duplex spacings.

Reference Section 4.5: JRC agrees that the majority of reported continental interference cases relate to the East and South-East of England. Careful consideration should also be given to intermittent interference sources from our Republic of Ireland (RoI) neighbours to the West. Especially along the Northern

Ireland / RoI border. It will be very helpful if Ofcom can agree to the critical infrastructure utility operations in Northern Ireland co-ordinating directly with their counterparts in the RoI.

Reference Section 4.6: the UK's Critical Infrastructure Utility Operations have a wealth of experience of designing, installing, operating, and maintaining their own private resilient machine to machine (RM2M) systems. These RM2M systems include interference mitigation techniques, and new methods of ameliorating the enhanced interference currently being experienced are being trialled.

Reference Section 4.7: partial re-alignment using the anticipated 4 MHz of spectrum would be very useful for critical infrastructure utility operations because it would enable the RM2M base stations to migrate to the corresponding channel orientation as our neighbours' systems.

Question 5: Do you agree with our proposal to add additional channels to the Simple UK and Simple Site licence products from spectrum within the 458.5 to 459.5 MHz band?

JRC agrees with the proposal to add additional channels to the Simple UK and Simple Site licence products.

Reference Section 4.15: JRC does not use the 458.5 to 458.95 MHz band for RM2M systems because of the interference issues of using licence exempt spectrum.

It is understood that there are some utility systems using the 458.5 to 458.95 MHz band but the interference issues have resulted in their on-going migration. On their behalf, and if applicable, it would be helpful if Ofcom could delay the use of this spectrum by Simple Site / UK licensees until the migrations are complete.

Question 6: Do you agree with our assessment that the risk of interference between Simple UK and Simple Site use and licence exempt short range devices in the 458.5 to 459.5 MHz band is low, and that any interference can be mitigated by users changing channels?

JRC does not agree with the assessment that the risk of interference between Simple UK and Simple Site use and licence exempt short range devices in the 458.5 to 459.5 MHz band is low. This is because the assessment appears to assume that the channels can be changed easily. This may not always be the case, e.g. when the equipment is fixed and / or in remote locations. Please see below.

Reference Section 4.15: it is understood that there are some non-resilient utility systems using the 458.5 to 458.95 MHz band but intermittent interference issues caused by, inter alia, nomadic systems have resulted in their on-going migration. These systems are fixed and are often situated in remote locations. Re-tuning the channels when interference occurs may not be as easy as changing channels on a handheld used by a Simple UK system operating in the same area. So, if still

applicable, it would be helpful if Ofcom could delay the use of the 458.5 to 458.95 MHz spectrum by Simple Site / UK licensees to enable enough time for the migrations to complete.

Reference Section 4.10: JRC agrees with the proposals to:

- add channels to Simple UK and Simple Site licences;
- increase the sharing factor from two to four;
- increase the noise floor by 6 dB in the planning criteria for VHF Band I and VHF Low Band; and
- amend the UHF channel plan configuration to more common duplex spacings.

Question 7: Do you agree with the proposal to initially increase the sharing criterion from two to three, and, subject to further analysis, move to four in the longer term?

JRC agrees with the proposal to increase the sharing factor from two to three, and perhaps four.

Reference Section 4.25: it is believed that the Transfinite Systems analysis included the expected decrease in coverage radius predictions after the activation of the Dense Urban option within Ofcom's licensing software. This option should over-ride the general assumption that transmitting antennas are always situated above the highest surrounding buildings even when they may be many tens of metres below those adjacent roofs. Once activated, the resulting coverage radius should be much reduced as a result of the blocking effect of the surrounding tall buildings. It is understood, however, that the prediction results did not reflect the expected significant reduction in coverage radius. It is assumed that Ofcom's licensing software was checked to ensure that this option has been written correctly.

Reference Section 4.32: JRC highlights that some channels may have been licensed for emergency communications only and this may make them appear to be unused. In such cases, it is assumed that such channels will have been licensed on an Exclusive Use basis so the increased sharing factor should now result in a decrease in channel availability on the odd occasion that it is required.

Reference Section 4.36: JRC suggests that GPS polling will typically be used in two circumstances. The first will be within an extended on-site system, e.g. with a radius of up to 5km, so that the locations of handheld radios may be tracked. The second will be within a wide-area system, e.g. with a radius of up to 30 km, so that the locations of the mobile radios may be tracked.

Perhaps Ofcom could consider mandating the typical polling rate of these two types of systems. For example, a moving mobile used in a wide-area system is likely to travel much further within a given time period than a moving handheld / mobile within an extended on-site system. It may therefore be beneficial to mandate the polling rates for extended on-site systems and wide-area systems.

Question 8: Do you agree with our proposal to change the planning levels we use in our modelling by reducing [increasing] both the RSL and unwanted levels by 12 dB for VHF Band 1 and VHF Low band?

JRC agrees with the proposal to increase the planning levels for both the RSL and unwanted levels by 12 dB for VHF Band 1 and VHF Low Band.

Question 9: Do you agree with our assessment that moving towards more common duplex spacings will increase spectrum efficiency?

JRC suggests that the rationalised range of duplex spacings should take into consideration the conflicting requirements of narrow spacings, to enable narrow band antennas, and wide spacings to enable sufficient duplexer separation.

Reference Section 4.46: The expected release of 4 MHz of Emergency Services spectrum will be concentrated within the 450 to 453 MHz band. Ideally, for harmonisation purposes, this will be paired with 460 to 463 MHz.

Unfortunately, many of the Suppliers Light Licence channels are within 460 to 463 MHz. (This consultation does not appear to suggest additional or replacement channels for any disruption to Suppliers Light Licences.) So, alternatively, it could be paired with 464 to 467 MHz.

Ultimately, pairing 450 to 453 MHz with 464 to 467 MHz might fulfil the utility requirement for 2 x 3 MHz of spectrum required for critical infrastructure utility operations Smart Grids.

As part of Ofcom's intention to reduce the number of duplex spacings, JRC suggests that a migration plan could be developed whereby impacted existing licensed systems are given a migration channel in addition to their existing channel. Each migration could then be planned to occur on an ad-hoc basis. Potential migration dates could be scheduled to occur, perhaps, on any day when the radio system maintenance company attends on a routine basis. This should minimise the migration cost to only the extra time spent on site.

Question 10a: Do you agree with our proposed activities for improving stakeholder guidance?
Question 10b: Are there further steps you think Ofcom could take to ensure stakeholders and licensees can make an informed decision when considering their licensing needs?

10a) JRC is concerned that changing correct technical terminology to terminology that reflects phrases more commonly used by licensees may become confusing. (For example, changing the correct term of Down-fire antenna to the generic term of Paging antenna.) It may be better to add explanations, within brackets (or via a '?' icon and hyper-link), within the relevant sentences.

JRC agrees that the definition of undue interference should be made clearer to licensees. This should also include the expected / planned signal levels of distant interference that may be expected on an Exclusive Use channel. (NB: modern radio equipment is typically much more sensitive than the relevant ETSI Standard requires. This can result in perceived significant interference even when the incoming signal strength is below the planned -116 dBm unwanted / maximum interference level.)

JRC agrees that an on-line heat map showing where the areas of the UK that are most likely to result in Technically Assigned applications rejections (both Exclusive Use and Shared Use requests) should be produced.

JRC also agrees that Ofcom provides more detailed guidance to applicants to optimise the opportunity for gaining access to spectrum in an area. This may be a simple as copying-and-pasting parts of the national co-ordination section of Ofcom's National and International Co-ordination Guidance Information Sheet.

10b) JRC suggests that, as part of the licence issue process, subsequent complainants should be made aware that any interference received as a result of a station not being installed in line with the licence terms and conditions could result in station closure and prosecution.

Likewise, it should also be made clear that applicants who make false licence applications, e.g. for an indoor antenna system when they know that a roof antenna will be used, or for a shared use channel when they know that a channel will be occupied for a significant duration throughout the day, may also be subject to station closure and / or prosecution.

Reference Section 4.49: JRC suggests that the two types of on-site system should be considered. The first type being the most simple system with only one base station antenna and handheld mobiles within, say, a 1km radius. (Perhaps systems in dense urban areas, e.g. with an expected 500m radius, should have a down-fire antenna assigned as standard with an alternative antenna only being accepted on a case-by-case basis.) The second type of on-site system being for larger on-site / campus systems with, perhaps, interconnected base stations situated at several locations within, say, the 5km radius of the system.

Further, in order for their not being confused with short-range devices (SRDs), it may be a good idea not to refer to on-site systems, with up to 5 km coverage, as short-range (although perhaps this could reflect a phrase commonly used by non-technical licensees).

Reference Section 4.50: it is believed that the Transfinite Systems analysis, mentioned previously, included the expected decrease in coverage radius predictions after the activation of the Dense Urban option within Ofcom's licensing software. This option should over-ride the general assumption that transmitting antennas are always situated above the highest surrounding buildings even when they may be many tens of metres below those adjacent roofs. Once activated, the resulting coverage radius should be much reduced as a result of the blocking effect

of the surrounding tall buildings. It is understood, however, that the prediction results did not reflect the expected significant reduction in coverage radius. It is assumed that Ofcom's licensing software was checked to ensure that this option has been written correctly.

Additionally, it is understood that some software propagation packages have difficulties modelling down-fire antennas. For a 6dB down-fire antenna, it should be as simple as inputting Harmonised Calculation Method (HCM) Antenna Code 000ND00 for the horizontal pattern, 600TA05 for the vertical pattern, and -90 degrees for the electrical tilt angle. Unfortunately, some propagation packages do not model these antennas correctly in the first instance and / or do not reload them properly when they are downloaded from the central stations database.

Further, it may be useful to use terrain and clutter data with a much finer granularity than is currently used for Business Radio licensing within London and other dense urban areas.

Reference Section 4.52: although there can be improvements in spectrum efficiency by using digital systems, e.g. assuming both 6.25 kHz equivalent channels are being used simultaneously within a 12.5 kHz channel, there remain occasions when instant and clear voice analogue communications are essential.

Question 11: Are there any other policy options you think we should consider to make use of UHF 1 and 2 more efficient?

JRC suggests that Ofcom considers the benefits of mandating the use of Down-fire antennas for on-site systems within dense urban areas where the expected working radius is =< 500m.

JRC highlights that almost all products and services, which are offered to the UK's citizens and consumers rely directly or indirectly on the stable provision of electricity and / or gas (gas is used to generate typically 50%[2] of the UK's electricity) by the UK's Critical Infrastructure Utility Operations.

JRC highlights that its in-house radio system planning expertise has enabled it to assign ~10,000 resilient machine to machine (RM2M) scanning telemetry radio links across the UK within its allocation of self-managed channels in the current 2 x 1 MHz of 400 MHz UHF Band spectrum that was allocated by Ofcom's predecessor in 1985 for utility operations use. This expertise also enables it to plan RM2M point-to-point fixed links within normal 12.5 kHz narrow band PMR channels without causing or suffering interference to adjacent users.

The introduction of Smart Grids will require approximately ten times more radio links, e.g. to almost every local 11kV sub-station and all large distributed generation sites. Indeed, the ever increasing roll-out of distributed generation, e.g. wind turbines, is putting an increasing strain on keeping the existing grid stable. JRC therefore highlights that critical infrastructure utilities are seeking additional 400 MHz Band (380 to 470 MHz) spectrum in which to operate the future electricity Smart Grid systems.

[2] Gas is used to generate typically 50% of the UK's electricity (Source: Grid Carbon)

It would therefore be ideal if Ofcom will consider allocating 2 x 3 MHz of spectrum in the 400 MHz region to critical infrastructure utility operations so that it may migrate and update its current 9.6 kbit/s in 12.5 kHz narrow band[3] channels to, say, 64 kbit/s in 25 kHz narrow band channels for the Smart Grid, and ultimately, possibly wideband systems.

JRC has considered that the cost of 2 x 3 MHz of spectrum in the 400 MHz band based on AIP would be in the region of £2.4 million per year, equating to £234k/DNO license area per year if all DNOs subscribed. Bearing in mind that in 2014, analysis commissioned by SmartGrid GB suggests an estimated potential £13 billion of Gross Value Added, and £5 billion of potential exports to 2050; and 8,000 to 9,000 jobs to 2030 associated with smart grids, an investment of £2.4 million per year by the utility sector to secure access to suitable spectrum to facilitate delivery of this vision would be not be inappropriate.

On pricing for this spectrum, JRC has reflected on the need to secure 'value for money' for gas and electricity consumers. The energy sector therefore would need to be convinced that the above spectrum valuation does not represent expenditure in excess of the market rate. JRC notes in the Ofcom consultation that:

> *"As outlined in our Mobile Data Strategy16 (MDS) there was limited interest expressed by stakeholders in the prospect of using UHF Band 2 for public mobile networks in the long term. Consequently, we re-assessed the band as low priority for mobile data. In our MDS update17 we deprioritised UHF Band 2 as a candidate for public mobile use.*
>
> *3.19 We have received some expressions of interest in the potential for deploying private wideband and broadband communications network for businesses. Stakeholders have told us that they prefer to have access to private networks that offer a greater degree of certainty (generally within the user's control) with regard to quality of service and coverage, compared with public mobile services.*
>
> *3.20 Although some users have expressed interest in private wideband/broadband type systems, we have not yet seen a push towards practical implementation. The RSPG report did note that, "LTE seems to be a technology that can evolve to meet all or part of PMR needs with channel bandwidths of, for example, 1.4 MHz, 3 MHz, 5 MHz or 10 MHz but that it is difficult to estimate any possible new spectrum needs or the future market demand for these applications."*
>
> *3.21 In response to the CFI Motorola commented that it had not seen any significant demand in the market for wideband services."*

JRC observes that in most countries where regulators have sought to auction or otherwise sell spectrum in the 400 MHz band, most attempts have been unsuccessful. The main success has been where utilities become the ultimate user (notably Netherlands, Germany and Austria), and although the commercial

[3] Narrow band: 6.25 / 12.5 / 25 kHz bandwidth channels. Not to be confused with 200 kHz, so called, narrow band LTE public mobile systems. (NB: this consultation correctly uses the radio communications definition for 200 kHz as wideband.)

arrangements have not been published, we are given to understand that the price per MHz is not excessive. In the UK, there has only been one commercial test of the market value of spectrum in the 400 MHz region and result was significantly less than AIP. This leads us to the conclusion that the current AIP is towards the top end of any true market rate for the spectrum, and that should this spectrum be released to utilities for smart grid applications, UK electricity and gas consumers should be protected from exposure to speculative bidding and hoarding of spectrum by only paying the appropriate economic cost of the spectrum, UK citizens and consumers benefitting from the socio-economic benefits thus realised. 'Use it or lose it clauses' appear to have been effective in other countries in encouraging spectrum owners not using their assets to negotiate access to the spectrum on fair and reasonable terms.

It should be noted that the average future private spectrum requirements for Critical Infrastructure Utility Operations Networks, including Smart Grids, is likely to be equivalent to only ~1.5 percent of the 1,200 MHz of spectrum identified for public mobile / IMT systems in the European Radio Spectrum Policy Programme.

Joint Radio Company (JRC)

JRC 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 also represents gas and electricity interests to government on radio issues.

JRC manages blocks of VHF and UHF spectrum for Private Business Radio applications, telemetry & tele-control services and network operations. JRC created and manages a national cellular plan for co-ordinating frequency assignments for a number of large radio networks in the UK.

JRC also manages a significant number of 1.4 GHz links and is keen for their protection and the on-going access to this band.

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

JRC's Scanning Telemetry Service is used by radio-based System 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 works with the Energy Networks Association's Future Energy Networks Groups assessing the ICT implications of Smart Networks, Smart Grids, and Smart Meters.