JRC Response to the Call for Inputs on the Strategic Review of UHF Spectrum 420 to 470 MHz UHF Bands 1 and 2

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KEY POINTS

- JRC welcomes the review of UHF spectrum and the opportunity to respond to this consultation.
- JRC agrees that there is congestion within the UHF 1 and 2 bands for private users, but that government use of the 400 MHz UHF spectrum is less intensive than private use, generating an opportunity for public spectrum holders to share more of their spectrum in the national interest.
- JRC suggests that the inability for more UHF assignments to be licensed in some areas could be erroneously considered as a stable demand for spectrum.
- 'Continental interference' in the UHF band needs to be explored more fully to determine which services are most severely affected and in which geographic areas to devise options for mitigating the effect, if possible without disrupting use of the spectrum by those users and in those areas which do not experience problems.
- JRC believes it may be possible to alleviate the worst effects of 'continental interference' and spectrum congestion without wholesale UHF band re-alignment.
- JRC believes that Ofcom must audit use of the whole UHF band 380-470 MHz, including government spectrum holdings to determine not simply the designated use, but the intensity with which the spectrum is actually being used in order to determine what spectrum can be shared between government and private users.
- JRC suggests that the term Machine-to-Machine (M2M) should be interpreted widely and not technology specific.
- JRC highlights that utilities have been operating Resilient Machine to Machine (RM2M) systems for over 50 years, but development of intelligent utility networks is generating a global demand for 2 x 3 MHz of harmonised spectrum in the 400 MHz band to be allocated to 'Utility Operations'.
- Utilities require access to more spectrum in bands below 1 GHz if they are to fulfil their regulatory obligations to maintain secure and sustainable supplies of electricity, gas and water; and to restore supplies in a timely manner when those supplies are interrupted for any reason.

Consultation questions and JRC's responses

Question 1: Do you agree with Aegis's conclusions on congestion of current use of 420-470 MHz spectrum? Are there any other signs or areas of congestion that Aegis have not identified from their review?

JRC agrees with Aegis's conclusion that business radio channels within the 450-470 MHz UHF band are congested in a few dense urban areas and becoming congested in many urban areas. JRC understands, however, that the true level of congestion isn't as severe as Ofcom's licensing database predicts. JRC therefore supports Ofcom's intention to amend its licensing software so as to enable proposed base stations to be assigned more densely, and therefore more efficiently, than the current algorithm allows.

JRC also agrees that the utilities are expected to need 2 x 3 MHz of UHF spectrum. Ideally, this spectrum will be harmonised across Europe.

JRC suggests that the requirement for additional access to 420-470 MHz spectrum, and therefore the potential for increased congestion, may result if Ofcom closes ~25% (6 MHz) of the 1.4 GHz fixed links band in favour of using it as a guard-band for mobile phone supplementary downlink (SDL) systems[1]. Utilities use the 1.4 GHz band for links that are likely to be impacted and may need to be migrated. If so, 420-470 MHz channels may be the most suitable alternative for the impacted low data rate 1.4 GHz links. (NB: in its response[2] to the SDL Con Doc, JRC suggested that the upper 5 MHz SDL channel be used for most of the proposed 6 MHz guard-band. This should significantly reduce the number of impacted 1.4 GHz links and the potential for some to be migrated to 420-470 MHz.)

JRC believes that the problem of congestion in the bands between 380 and 470 MHz is exacerbated because government spectrum holding are not being used intensively, preventing expansion of business radio systems. JRC suspects that if this government held spectrum could be shared effectively with private use, congestion problems in the band could largely be overcome.

JRC comment regarding Section 4.10:

JRC notes the following Ofcom statement within Section 4.10:

'*Machine-to-machine (M2M)*: no current demand beyond scanning telemetry for the utilities, as M2M applications are generally served by public mobile networks or by LE SRDs in harmonised bands elsewhere.'

JRC suggests that caution should be observed when referring to M2M systems in different fora because of the often technology-limited and / or misleading definitions that can appear more as marketing labels for the technology being discussed and / or promoted.

An example was published[3] by ETSI on 18 November 2014:

> "Any Machine to Machine application, whether it be a tablet, eReader, personal health monitoring device or a smart utility meter, relies on a hardware module that provides 2G, 3G or 4G connectivity"

1 http://stakeholders.ofcom.org.uk/consultations/licence-variation-1.4ghz/

2 http://stakeholders.ofcom.org.uk/binaries/consultations/licence-variation-1.4ghz/responses/Joint_Radio_Company_Ltd.pdf

3 http://www.etsi.org/news-events/news/844-2014-11-news-etsi-issues-new-specification-for-embedded-communication-modules-for-machine-to-machine-communications

JRC recommends the following Engineering definition for Machine to Machine (M2M) systems:

> 'Any existing or future fibre, wired, wireless, or combination of technologies that enable connected devices to exchange information and perform actions without the manual assistance of humans'.

The Engineering definition above also reflects the necessarily Resilient Machine To Machine (RM2M) systems that the utilities have been operating for the past 50-years.

Question 2: Do you agree with Aegis's conclusions on the future demand and use of 420-470 MHz spectrum over the next ten years? Are there any other future uses or areas for future demand that Aegis have not identified from their review?

<u>Utility need for spectrum</u>

Area of the country blacked out for an extended period as part of a government simulation of a wide-area loss of electrical power.

Utility requirements for additional spectrum in the 380-470 MHz band will increase over the next ten years. This is not only to manage the networks effectively and more intensively, but to restore supplies when services are interrupted for any reason. The recent Government workshop 'Exercise Hopkinson' which simulated a long term power outage to a large geographic region illustrated the absolutely vital need for resilient communications able to withstand several days loss of mains power.[4] The workshop demonstrated that resilient communications are vital for the electricity industry to restore services as fast as possible: resilient VHF and UHF communications are essential for this restoration.[5]

The electricity industry notes that that their services are especially vital to society, as recognised by Ofcom's own consultation on the possibility of allocating a three digit for an electricity emergency helpline representing a significant use of a scarce resource, namely a three digit number of which only 14 are available for general allocation.

The drive for utilities to self-provide their own operational telecommunications is motivated by the fact that utility regulators impose severe penalties on utilities for failure of their services whereas there is no corresponding regulatory penalty on telecoms operators to deliver and restore services when they are interrupted. This presumably reflects a government view that utility services have a higher social value than telecom services, and to be consistent, this should be reflected in spectrum allocation policies.

The utilities have demands for spectrum for applications which differentiate them from many others which are likely to grow in the future rather than diminish, including:

- Air-Ground-Air communications for real time data, possibly including video due to the increasing use of helicopters for inspection and power restoration.[6]
- The potential for drones to be deployed to inspect assets in inaccessible areas.

[4] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/386626/E3C_Annual_Report_2014.pdf
[5] http://ipsc.jrc.ec.europa.eu/fileadmin/repository/sta/SpaceWeatherWorkshop/Session-5_Felton.pdf
[6] http://www.westernpower.co.uk/Services/Helicopter-Unit.aspx

- CCTV for inspection of tunnels for efficiency purposes, or where it is unsafe for personnel to operate.

Other demands

JRC would like to highlight that the static number of UHF1 licences between 2010 and 2014 does not necessarily mean that the demand has been static. It may be that the band is relatively saturated in the limited geographic areas where UHF1 spectrum is available or that those areas are not where there would be an increasing demand for UHF1 spectrum if it were available for licensing.

Likewise, it is understood that there are typically no free UHF2 channels in the London area. This results in any suddenly available channel being quickly reassigned. This continual saturation / congestion of licensed channels could give the impression that the demand for UHF2 spectrum in, say, London is static.

JRC further notes that some spectrum users have migrated from technically assigned UHF1 / UHF2 licenses to area defined licenses. Whilst it is necessary for UHF1 area defined licensees to inform Ofcom of the location of the related systems, in order to meet the co-ordination requirements with Fylingdales, (so the number of UHF1 assignments will be known by Ofcom) this is not the case for UHF2 area defined licensees. This UHF2 area defined licence scenario could give the impression that there has been a relative reduction in UHF2 assignments whereas those assignments are now being self-managed by the licensees.

The observations above lead JRC to suggest that there could be a higher demand for UHF1 and UHF2 spectrum than the Aegis report details.

Of course, this higher demand may easily be subsumed as a result of Ofcom's planned upgrading of its licensing process software where the channels for adjacent stations may be assigned more closely / efficiently.

Question 3: Do you agree with Aegis's conclusions that there is not yet any UK demand for wideband services in the 450-470 MHz band (which could for example, be used to improve rural mobile coverage)? Please provide any supporting evidence for your position.

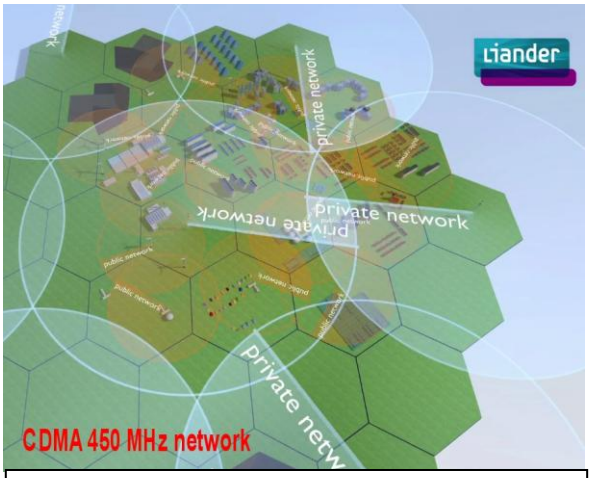
JRC agrees that not only is there no UK demand for public wideband or broadband, 'mobile phone' services in the 450-470 MHz band, but that there is unlikely ever to be such a demand in densely populated countries with mature markets such as the UK. Even if the whole of the 450-470 MHz band where to be reallocated to mobile operators, the band has insufficient capacity to compete with services in higher bands, and the parts of the land mass where 400 MHz might be attractive do not contain enough users to support commercially viable public networks. In addition, it is unlikely that there will be sufficient consumer demand to attract mass consumer products because of the physical size of components in handsets at 400 MHz compared to higher frequency bands.

The commercial case for public networks in 450-470 MHz will be further diminished once the 700 MHz band has been released for public mobile operators services as this will erode propagation benefits to be derived from the 400 MHz band over existing mobile phone spectrum.

This understanding is supported by the recent Ofcom 'IFPG WGD(15)004: UK Brief 1.1 (Ofcom)' document. A table within this document highlights that the 'Current status of potential candidate bands being considered under WRC-15 Agenda item 1.1' does not include spectrum within 420 to 470 MHz.

JRC advises that the European Utilities Telecom Council[7], on behalf of European Utility Operations, has identified a need for, and is seeking, 2 x 3 MHz of contiguous UHF spectrum within the 410 to 470 MHz band. (Whilst existing UK UHF Utility Operations systems currently use typically 12.5 kHz channels, the requested 2 x 3 MHz blocks will enable wide-band systems to be deployed.)

The 400 MHz bands are especially attractive to utilities as they already have resilient radio sites covering most of the UK, so to a first approximation, this infrastructure can be used as a basis for wideband CDMA/WiMax/LTE networks.



Private wideband network in 450-470 MHz spectrum for utility operations in the Netherlands

Although there may also be demand for use of the 400 MHz band for Fixed Wireless Access (FWA) for rural broadband, this would be unwise use of a scarce and valuable resource, and only deliver short term benefits. FWA in the 400 MHz band will not be capable of supporting the Government's desire for widely available 'superfast broadband', whereas the higher frequencies, such as 3.5 GHz and above have much greater capacity to deliver these services.

Question 4: Have you experienced degradation in your systems' performance which you consider to be caused by continental interference in the last 12 months? If yes, what approach did you take towards managing and minimising interference?

Please provide any supporting evidence which explains the frequency (of occurrence), impact, duration, time, location and cause (whether suspected or investigated) of the interference with respect to your specific sector(s).

JRC highlights that the general problem of international interference to high-sited systems within East and South-East UK requires extra care when designing Utility Operations systems.

One method used to combat continental interference is to use horizontally polarised antennas. These can reduce the vertically polarised interfering signals by up to 15dB, although in practice over typical long distance paths, this reduces to about 6dB. NB: traditional base station to mobile systems do not use horizontal polarisation so they are likely to suffer the full effects of the interference.

A second method is to use, where possible, directional base / scanner station antennas so that the incoming interference is in the opposite general direction from which the antenna is pointing.

A third method is to automatically add an attenuator in the receive path of the base / scanner station when interference is present. This may be achieved by having a second, co-channel, base station operating in parallel with the main base station. The negative side effect of this method is that the wanted signal will be attenuated proportionally to the interfering signal when the attenuator is switched in.

A fourth method was to permanently include an attenuator in the receiver path of the base / scanner station. This necessitates the transmitter powers of the remote / outstations to be raised proportionally to the value of the attenuator.

7 http://www.eutc.org/

It must be observed that all of these mitigation techniques result in less efficient spectrum use than would be the case if there were no interfering signals from mainland Europe.

It should be noted that the inclusion of interference amelioration measures has reduced the impact on utility radio systems which has resulted in a comparative lack of documented interference events. When severe interference events do occur, they are logged by utility control rooms, but the nature of their reporting (telemetry outstations being locked out of scanning to avoid degrading the remaining operational systems) is not amenable to compiling data for interference monitoring.

In addition, the effects of interference are mainly logged on utility control systems (NMAC), but for security reasons, these systems are not accessible from the utility enterprise IT systems, so data cannot be exported for detailed logging of interference events.

Despite using the above amelioration methods, continental interference can still be a problem for high-sited stations located east of a line drawn between Newcastle and the Isle of Wight.

JRC highlights that there was a UHF lift, caused by tropospheric ducting, on 13 March 2014 and signals were heard from the Netherlands along the South Coast, e.g. in Eastbourne.

Additionally, also in March 2014, there were several tropospheric lifts that resulted in interference to utility operations systems along the East Coast.

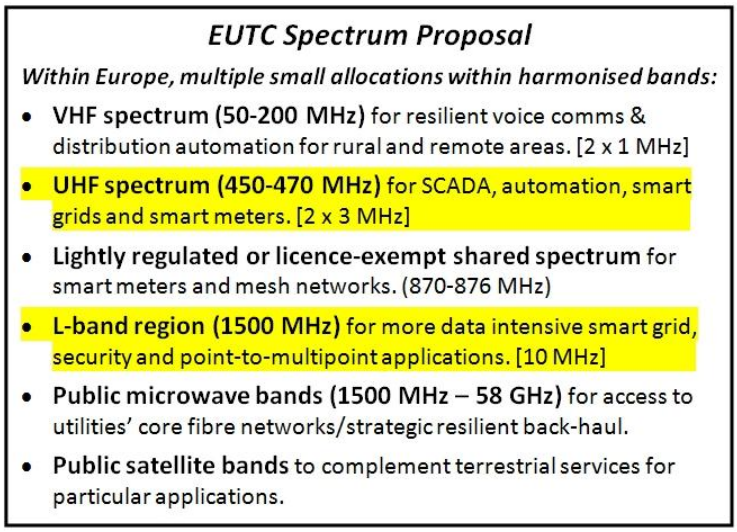
These dates may therefore be useful as a focus if Ofcom wishes to use its historical remote monitoring information to compare signal strengths from our neighbours on normal days with signals under UHF lift conditions.

Question 5: Is there additional information relevant to the configuration of the 420-470 MHz band that we should consider in developing our approach to its future management? Please provide any evidence to support your views.

Spectrum requirements intelligent utility networks:

As mentioned previously, JRC advises that the European Utilities Telecom Council[8], on behalf of Utility Operations within Europe, is seeking 2 x 3 MHz of contiguous UHF spectrum within the 410-470 MHz band. [See attached EUTC spectrum proposal.] This spectrum should enable suitably resilient smart grid systems to be installed across the whole of the UK.

Where UHF1 is not available across the whole of a country, as in the UK, the European harmonised band for utilities is likely to be within the range 450-455 MHz paired with 460-465 MHz.



If this were agreed in the UK, this should enable the UK Power Utility Operations to migrate from its current 2 x 1 MHz of UHF2 spectrum. This migration should ultimately

8 http://www.eutc.org/

facilitate any UHF realignment requirement, but UK utilities would prefer access to a non-harmonised block of 2x3 MHz of spectrum in the near term if access to the harmonised block was unlikely before 2020.

However, if the ultimate solution were to be a Time Division Duplex (TDD) solution using technologies such as LTE or WiMax, this would most likely negate the need for band re-alignment as currently conceived.

As now, the 2 x 3 MHz could be self-managed by JRC for utility and critical national infrastructure use. This will ensure that the spectrum will be managed as efficiently as possible and within the terms and conditions agreed with Ofcom.

The requirement for radio spectrum to support intelligent utility networks is recognised in Article 8.2 of the European Radio Spectrum Policy Programme (RSPP). This is now being taken forward in some global regions as a proposal to the ITU World Radio Conference in November (WRC-15) for 'Utility Operations' to be placed on the Agenda of the subsequent World Radio Conference in 2019 (WRC-19) with the intention of recognition of the need for harmonised utility radio spectrum on a global basis. The target for such global harmonisation is likely to be within the range 380-470 MHz initially.

Costs of UHF band re-alignment:

Before any wholesale re-alignment of the UHF spectrum is undertaken in the UK, a detailed cost-benefit analysis must be undertaken, segmented to demonstrate the cost-benefit to specific sectors, for example:

- Private Business Radio Users currently affected by 'continental interference'
- Private Business Radio Users NOT affected by 'continental interference'
- Utility Telemetry Systems currently affected by 'continental interference'
- Utility Telemetry Systems NOT affected by 'continental interference'
- PMSE users
- Home Office users
- Ministry of defence users
- Other users currently affected by 'continental interference'
- Other users NOT affected by 'continental interference'

If the UK realigns the spectrum but the Republic of Ireland does not, the current interference problems will move from the East coast of the UK to the West; the analysis should also include:

- Outcome if the Republic of Ireland remains on their current band plans.
- Costs and benefits to the Republic of Ireland if they realign as well (to be undertaken in collaboration with the government of the Irish Republic).

Attached at Annex 1 is an outline of the budgetary cost to electricity and gas distribution companies of realigning their current telemetry systems in the UK. Although a rough approximation, the costs are derived from current re-equipment programmes for UHF SCADA replacement extrapolated to cover the whole of the UK. This estimates the cost of realigning to UK energy utilities of £80 million.

This cost estimate does not include any allowance for premature write-off of existing equipment before the end of its depreciated asset life.

For a typical utility, this transformation process is a 3 year cycle from initiation to completion. No allowance is made for the situation where all utilities might be required

to migrate their UHF SCADA systems at the same time, creating increased demand for scarce resources which might increase costs. [A situation known as 'fishing in the same pond'.]

Question 6: Do you agree with the potential solutions Aegis have proposed for managing the 420-470 MHz band to both meet the continued growth in congestion and demand from incumbent spectrum users, and to facilitate the deployment of wideband technologies?

Are there any other solutions which you consider we should examine that Aegis have not identified from their review?

Please provide any evidence to support your position and reference each solution in your response as appropriate.

JRC fully supports the reconfiguring of Ofcom's licensing software so as to enable PMR systems to be assigned significantly closer than is currently possible. (It is understood that the current assignment restrictions were necessary because of the limitations of computer processing speed when the licensing software was originally created.)

JRC believes that, except for PMR systems using down-fire antennas (and thereby incurring a low fee), licensing fees have minimal effect on which band or channel width is chosen by the user. JRC therefore suggests that the current doubling of fees for an Exclusive Channel compared with a Shared Channel is a sufficient incentive to use spectrum efficiently.

JRC strongly suggests that, except for systems using IR2008[9] compliant equipment, the licence fees should be based on the true bandwidth occupied, e.g. 12.5 kHz, rather than the proportion of a second that a channel is occupied during operation, e.g. 12.5 kHz for 50% time (aka 6.25 kHz equivalence).

In addition to business critical usage, JRC strongly supports the prioritisation of spectrum access for Mission Critical applications, e.g. the reliable supply of electricity throughout the UK. (This electricity enables, inter alia, other transmission systems to deliver their services, e.g. transport, broadcasting, point of sales, and mobile phones.)

JRC agrees with the need to accommodate new services in the longer term. This is because the electricity industry will be obliged by the European Commission Smart Grid Mandate (M/490)[10] to provide enhanced efficiency in day-to-day grid operation. This will require an enhanced radio system to monitor and control the Smart Grid system. This enhanced radio system may require wideband capabilities.

JRC highlights that UK utility operators need to keep their options open as to which technologies may be used for the smart grid. Some regional operators may see wideband PMR as the most efficient method for their area whilst others may see, inter alia, resilient machine to machine (RM2M) systems as most efficient. NB: resilient machine to machine (RM2M) systems should not be confused with standard machine to machine (M2M) systems. The latter perhaps being supplied within licence exempt spectrum or over mobile phone systems.

JRC notes Ofcom's comment that continental interference only impacts some users, eg those in geographical areas adjacent to our European neighbours. For potentially impacted users, JRC recommends Ofcom's National & International Co-ordination Information Sheet[11] as the first stop when planning a radio system that may be susceptible to continental interference.

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9 http://stakeholders.ofcom.org.uk/spectrum/technical/interface-requirements/

10 http://ec.europa.eu/energy/gas_electricity/smartgrids/doc/2011_03_01_mandate_m490_en.pdf

11 http://licensing.ofcom.org.uk/binaries/spectrum/business-radio/technical-information/international.pdf

JRC highlights that some solution providers have suggested that their particular system is / will be the answer to all future utility communications and or smart grid needs. JRC recommends that caution should be shown to claims made by solution providers who can't meet the essential requirements of utility operations systems, e.g. best practice resilience[12] and priority access.

Question 7: Do you have any further comments relevant to how we might manage spectrum between 420-470 MHz?

Until Ofcom has fully scrutinised use of spectrum by government users in the band 380-470 MHz, it would be premature to devise solutions solely for business radio users.

JRC believes that there are more imaginative sharing options possible between private and government users than have been explored previously. The re-farming option which clears spectrum completely before auctioning as a large block sterilises spectrum unnecessarily for decades to the great detriment of the UK nationally should be avoided if at all possible.

JRC believes that if an allocation were made to utilities of 2x3 MHz of UHF spectrum for intelligent utility networks and critical national infrastructure users based on existing band plans, creative spectrum engineering solutions could be developed to largely overcome the current problems of 'continental interference' without the disruption of wholesale band realignment.

There are a number of successful examples of innovative spectrum sharing arrangements used in the past upon which Ofcom could draw, for example:

- The sharing of the analogue mobile phone system 'TACS' with 'ETACS' in MoD spectrum.[13]
- The sharing of utility and non-utility scanning telemetry channels overseen by the Telecommunications Association of the UK Water Industries (TAUWI).[14]

Question 8: Do you have any comments on our proposed programme of work, the outcomes from which we will use to inform future decisions on how we manage the 420-470 MHz band?

Are there any additional areas you consider we should explore?

Understanding the extent of interference from the continent:

JRC suggests that Ofcom confirms that our European neighbours are co-ordinating their systems according to the Harmonised Calculation Method (HCM) Agreement[15] including the correct percentages of time (e.g. 1% time for continuous digital transmissions) and to the correct boundary (e.g. midway between the coastlines of the UK and the Netherlands / Belgium).

Monitoring growth in demand and congestion:

JRC highlights that experience suggests that, whilst UHF band operation may be preferred, many system suppliers are aware that the UHF bands are congested in dense urban areas and this can lead to those suppliers recommending the use of VHF bands equipment in those areas without first seeking an assignment in the UHF bands.

12 http://www.cpni.gov.uk/documents/publications/undated_pubs/1001002-guide_to_telecomms_resilience_v4.pdf

13 http://en.wikipedia.org/wiki/Total_Access_Communication_System

14 http://www.tauwi.co.uk/simple.cfm?page_id=39

15 http://hcm.bundesnetzagentur.de/http/englisch/verwaltung/index_europakarte.htm

An allowance for these non-UHF requests should therefore be taken in to consideration when predicting the demand for UHF spectrum.

Understanding the potential for new use:

JRC is pleased to see that a table within the recent Ofcom 'IFPG WGD(15)004: UK Brief 1.1 (Ofcom)' document highlights that the 'Current status of potential candidate bands being considered under WRC-15 Agenda item 1.1' does not include spectrum within 420 to 470 MHz.

However, Ofcom should endeavour to obtain views of the UK's near neighbours – France, Netherlands, Belgium and Ireland in particular – to understand their current and intended future use of the UHF bands 380-470 MHz before finalizing any UK strategy.

Licensing algorithms:

JRC understands that when Ofcom undertook a review of its Business Radio licensing software a while ago that activating the Short Urban / Sub-urban Paths function didn't solve the problem of systems with antennas located below the clutter in dense urban environments over-predicting their coverage areas. JRC therefore suggests that the correct operation of this software function is investigated and confirmed as part of the upgrading of the Business Radio licensing software.

ANNEX 1: UTILITY COSTS FOR UHF BAND REALIGNMENT IN 2004

TYPICAL COSTS FOR A UTILITY REPLACING WIDE-AREA UHF TELEMETRY SYSTEM (2014)

Radio - Remote Sites Costs per Site

Item	Category	Supplier	£	Comments
Site Survey	Resource	Supplier	437	Assumes 2 surveys a day, figures shows half day
Site Survey	Resource	Utility	200	Assumes 2 surveys a day, figures shows half day
Equipment	Hardware	Supplier	1018	Radio and router + fixings
Design	Resource	Supplier	1088	Each site requires detailed design pack creating, appraising
Design	Resource	Utility	250	Each site requires detailed design pack initiating, signing-off
Install	Resource	Supplier	1241	Assumes 2 installs a day, figures shows half day
Install	Resource	Utility	250	Assumes 2 installs a day, figures shows half day
Management and Governance	Resource	Utility	150	Assumes % volume of total based on volume of UHF sites
	Total Remote Co		**4634**	

Radio - Core Network Total Costs (including Reference network to validate prior to installation)

Item	Category	Supplier	£	Comments
Core Management, Governance	Resource	Supplier	1284	Assumes 25% of total based on volume of UHF sites
Core Design	Resource	Supplier	1000	Assumes 25% of total based on volume of UHF sites
Core Hardware	Hardware	Supplier	532	Assumes 25% of total based on volume of UHF sites
Core Install	Resource	Supplier	1120	Assumes 25% of total based on volume of UHF sites
IS management and Governance	Resource	Utility	660	Assumes 25% of total based on volume of UHF sites
	Total Core Cost		**4596**	

Radio - Corporate overhead

Item	Category	Supp/NG	£	Comments
Strategy, Requirement & procureme	Resource	Utility	2000	

Total per site = Remote + Core	**£11,230**	

NOTE: Hilltops not included in the site transform cost: each hilltop would cost approximately £10,000 to transform.

Total Hilltop cost: **£16,596**

	No of outstations	No of hilltops	Cost for outstations	Cost for hilltops
Gas	934	226		
Electricity	5234	449		
SUB TOTALS	6168	675	£69,266,640	£11,202,300
GRAND TOTAL			**£80,468,940**	

The Joint Radio Company Ltd (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 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 co-ordinating frequency assignments for a number of 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 throughout the country. These networks provide comprehensive geographical coverage to support the 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 manages the microwave licenses for the majority of UK gas and electricity transmission and distribution businesses. JRC protects these microwave links and the above UHF telemetry links from potential interference from wind turbines, and advises wind farm developers on mitigation methods to avoid interference with all forms of radio communication services.

JRC also undertakes radio consultancy work associated with critical national infrastructure radio services, and participates in European and international regulatory consultation groups.

JRC works with the Energy Networks Association's Future Energy Networks Groups assessing ICT implications of Smart Networks, Smart Grids & Smart Meters. Internationally, JRC supports or participates with global utility telecoms organisations under the umbrella of the Global Utility Telecom Council:

- US Utility Telecom Council (UTC)
- European Utility Telecom Council (EUTC)
- Latin American Utility Telecom Council (UTCAL)
- Canadian Utility Telecom Council (UTCC)
- African Utility Telecom Council (AUTC)

ENDS