JRC Response to the consultation on

A framework for spectrum sharing

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KEY POINTS

- JRC welcomes the opportunity to respond to this consultation.
- JRC agrees that spectrum is a valuable resource, and securing its optimal use is key to delivering significant benefits for UK citizens and consumers.
- JRC highlights that the stable supply of electricity is an essential resource for the delivery of almost all goods and / or services to UK citizens and consumers. As a result, the European Utilities Telecoms Council (EUTC) highlights that an increasing amount of radio spectrum[1] is / will be needed to manage the growing Utility Operations Smart Grid system(s).
- JRC notes Ofcom's objective to ensure the appropriate spectrum is available to meet demand from both new and existing uses and minimise the scope for spectrum to remain underutilised. It is therefore hoped that Ofcom will recognise the importance of the UK-wide supply of electricity and facilitate the availability of spectrum for new and existing Utility Operations systems.
- JRC highlights that, in any temporarily unused channels, it regularly shares its spectrum with PMSE typically within limited geographical areas, and other users within extended geographical areas.
- JRC notes that Ofcom could 'include information on actual use (rather than authorisations)'.
    - JRC is therefore very concerned that Ofcom may publish information that could jeopardise the safety and security of the UK's critical national infrastructure (CNI), and seeks assurance from Ofcom that this will not be published.
    - JRC highlights that systems may be installed for resilience and / or emergency use only. Spectrum monitoring may therefore suggest that the channel is unused / under-used and erroneously be targeted for sharing.
    - JRC suggests that identifying ‘actual use’ may be appropriate for public sector spectrum but not private sector spectrum. This is because, for commercial operators, market economics are supposed to encourage sharing when it is in the financial interest of the parties concerned. Or does Ofcom wish to declare ‘market failure’ for spectrum?
    - JRC suggests that it should be up to the licensee to decide if they wish to explore sharing options. Perhaps Ofcom could create a Spectrum Sharing Register for licensees considering sharing?

1 http://eutc.org/sites/default/files/public/UTC_Public_files/EUTC%20Spectrum%20Position%20Paper.pdf

- JRC highlights that some technologies / systems may allow spectrum sharing on an interference-limited co-ordination basis whereas some technologies / systems may require noise-limited co-ordination.
- JRC highlights that some broadband technologies appear to cause interference to much wider adjacent spectrum than narrow band technologies, for example 1.5 times outside their licensed bandwidth, e.g. +/- 6 MHz. (See the proposals and responses to Ofcom's Supplementary Down Link (SDL) Con Doc[2] as an example.) It may not therefore be possible to authorise wideband technologies to operate adjacent to narrowband channels without their significant geographic separation.
- JRC suggests that the Auctions heading should be expanded to Auctions and Awards. This may enable spectrum distribution to be based on the socio-economic value of use rather than merely which bidder has the deepest pockets and makes the most credible sharing claims.

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

Consultation Questions

Question 1:
1a) Do you have any comments on the barriers to increased sharing that we have identified above?

Availability of information:
JRC notes that Ofcom could 'include information on actual use (rather than authorisations)'.

JRC is very concerned that Ofcom may publish information that could jeopardise the safety and security of the UK's critical national infrastructure (CNI), and seeks assurance from Ofcom that this will not be published.

JRC highlights that utility systems may be installed for resilience and / or emergency use only. Spectrum monitoring may therefore suggest that the channel is unused / under-used and it may erroneously be targeted for compulsory sharing.

JRC suggests that identifying ‘actual use’ may be appropriate for public sector spectrum but not private sector spectrum. This is because, for commercial operators, market economics are supposed to encourage sharing when it is in the financial interest of the parties concerned. Or does Ofcom wish to declare ‘market failure’ for spectrum?

JRC suggests that it should be up to the licensee to decide whether they wish to explore sharing options.

JRC therefore suggests that Ofcom creates a Spectrum Sharing Register for licensees considering sharing and thereby easily identify opportunities for sharing.

Market Barriers - Transaction costs:
JRC highlights that, in any temporarily unused channels, it regularly shares its spectrum with PMSE, typically within limited geographical areas, and other users within varying geographical areas. JRC strives to keep these short-term spectrum access authorisation costs realistic but these costs may appear prohibitive / excessive for some applicants when compared to the annual cost of a licence for similar narrow-band spectrum. JRC is working to reduce these costs.

Technological Challenges:
JRC considers that the technological challenges are the most significant. This is highlighted by Ofcom’s recent decision to allow eight 5 MHz channels of broadband systems to be operated adjacent to existing systems operating in the 1.4 GHz band. The problem could have been significantly ameliorated if Ofcom had have taken the advice to designate the 5 MHz channel(s) adjacent to the existing systems as guard bands.

1b) Which are the most significant and why?

See Technological challenges, above.

1c) Are there others we should take into account?

JRC highlights that, as referred to in Technological Challenges, above, Ofcom acknowledged in its Consultation document that, without a guard band, there may be harmful interference to the existing adjacent 1.4 GHz users, but released all eight channels anyway. (That decision may impact hundreds of 1.4 GHz fixed links systems.)

JRC is therefore very concerned that Ofcom may again ignore the advice of existing licensees. If so, there may be a very real risk that existing and future licensees may perceive that no spectrum will be safe from interference. This could seriously reduce the value of spectrum.

JRC therefore recommends that Ofcom gives a definite reassurance that it will not ignore evidence-based interference concerns of its licensees in the future.

Question 2:
Have you experienced or are you experiencing the effects of these barriers?
If so, in what circumstances and with what impact?

Uncertainty about the future:

JRC is seeking access to 2 x 3 MHz of 400 MHz UHF spectrum for use by Utility Operations Networks (UON). In doing so, whilst there may be sharing opportunities available, there has been sustained resistance to share currently unused / under-used spectrum because the spectrum owner(s) fear that their long-term access to it may be lost.

This lack of spectrum means that JRC has to continue to seek out and licence individual 12.5 kHz channels as they become available. Sometimes suitable spectrum is so scarce in an area that JRC is forced to licence spectrum on a short-term only basis; with no guarantee that the subsequently installed system will continue to have access to the same channel after the short-term, e.g. 6-months, period expires.

The lack of contiguous 400 MHz UHF spectrum means that the utilities can't roll-out the higher data rate systems, e.g. 64 kbit/s, which it is expecting to need for the management and control of Smart Grids.

Likewise, considering the interference problems identified above, the utilities are hesitant to roll-out further 1.4 GHz backhaul links for fear that these will also suffer harmful interference. Or, worse, the 1.4 GHz band be given up for more, say, 5 MHz channel systems.

Question 3:
3a) Are the categories of information set out in paragraph 5.5 the right ones?

3a.i) Provision of information on spectrum use:

JRC recommends caution when considering including 'Information on actual use, not just what is authorised'.

Publishing 'actual use' may be appropriate for the public sector, but is inappropriate for the private sector (unless the spectrum has usage obligations in the licence).

Publishing actual use of commercially licensed spectrum would be inappropriate for a number of reasons:

- Safety and security of, inter alia, critical national infrastructure (CNI);
- Radio services may be back-up or resilient paths, and therefore only used when the primary route fails; or contingency communications which only transmit intensively under fault conditions. The spectrum therefore appears to be empty and unused when monitored;
- Market sensitive (may affect a plc's share price if precise roll-out details are published by Ofcom and this conflicts with their information to shareholders); and
- Commercially sensitive (in negotiations, one does not wish to reveal details of current spectrum usage).

It should be up to the licensee to decide if they wish to explore sharing options. For public sector spectrum holders, there may need to be an incentive by publishing usage data; but for commercial operators, market economics are supposed to encourage sharing when it is in the financial interest of the parties concerned. Or does Ofcom wish to declare 'market failure' for spectrum?

JRC suggests that it should be up to the licensee to decide whether they wish to explore sharing options.

JRC therefore suggests that Ofcom creates a Spectrum Sharing Register for licensees considering sharing and thereby easily identify opportunities for sharing.

3a.ii) Information on actual interference:
JRC notes that Ofcom's licensing system currently uses a less than optimal coverage prediction algorithm and terrain data, e.g. for Business Radio licensing. Whilst this arrangement may be suitable for licensing purposes it may not be sufficiently accurate for accurate interference predictions.

3b) Are there any areas here that you think we should prioritise?

JRC suggests that Ofcom prioritises the establishment of:

- the actual use of public sector spectrum; and
- a licensing method that will enable a public sector spectrum owner to sub-let spectrum without fear of their losing access to it over the long-term.

JRC suggests that Ofcom also assesses which spectrum users are an essential supplier for the delivery of almost all goods and / or services to UK citizens and consumers, and consider giving those suppliers appropriate priority with their spectrum requirements. (Hint: you till it is.)

3c) Are there other types of information that we should be improving?

JRC typically plans its systems for maximum spectrum efficiency. This can result in transmitter effective radiated powers (ERPs) of milli-watts (mW). These types of low-power systems require closely controlled noise-limited interference co-ordination.

As an example, JRC advises that there could be issues with listen-before-transmit (LBT) systems operating within fixed links spectrum and other systems that are typically designed to meet noise-limited interference co-ordination requirements, e.g. the wanted signal at the receiver, via its elevated position antenna, will only be a predefined number of dB above the noise floor. Whilst this will be a low signal strength, the licensed / wanted system will have been designed to receive a sufficient signal for it to communicate. If, however, a nearby listen-before-transmit (LBT) system is located indoors it may not receive sufficient / any signal to recognise that the spectrum is already occupied. This could result in harmful interference at that address and neighbouring properties.

JRC therefore suggests that spectrum in which noise-interference co-ordinated systems are deployed should not be used for systems with other types of co-ordination methodologies, e.g. interference-limited co-ordinated systems.

Question 4:
4a) Do you think the information about spectrum characteristics described in paragraph 5.9 would be useful?

The proposed information may be useful for some potential sharers. JRC highlights, however, that its systems typically operate within closely controlled radio interference environments. This usually entails its being the only spectrum licensee within a wide geographical area. Ofcom's identifying which unused channels are available on a UK-wide basis, or at least within 50km x 50km very low undue interference level blocks, would also be very useful.

4b) What information would need to be included as a minimum to make it useful?

JRC suggests that it would be useful to know which spectrum, by geographical area, is being used for 6.25 / 12.5 / 25 kHz narrow band communications and which spectrum is being used for wideband and broadband communications.

This may enable potential sharers to establish whether the spectrum may be operating in a high co- / adjacent-channel undue interference level environment, and may need interference-limited co-ordination and / or wide geographic separation, and which spectrum may be operating in a low co- / adjacent-channel undue interference level environment, and may only need noise-limited co-ordination.

Question 5:
5a) Have we identified the relevant market enablers, or are there others we should take into account?

JRC suggests that the Auctions heading should be expanded to Auctions and Awards. This may enable spectrum distribution to be based on the socio-economic value of use rather than merely which bidder has the deepest pockets and / or makes the most credible claims regarding sharing.

5b) For each one, what is the potential for it to facilitate sharing and what are the downsides?

Spectrum trading and leasing:
JRC sees spectrum leasing as the simplest method of spectrum sharing for Utility Operations because it enables private negotiations with the incumbent user(s) without regulatory involvement.

JRC is able to share any temporarily unused spectrum easily because its spectrum management system takes into consideration all channels that it manages and all stations / links with which it needs to co-ordinate.

Spectrum pricing:
JRC highlights that the calculation of AIP values may sometimes be flawed.

A recent Ofcom consultation suggested that the 1.4 GHz band is now more valuable because it could be used by public mobile operators. That part of the band, however, is not harmonised for public mobile use so is unlikely to be valued highly by mobile operators until it is harmonised, if ever.

As such, there is a reputation risk to Ofcom that it could be seen as attempting to artificially inflate the licence fees for the 1.4 GHz band in order to promote the migration of fixed links users from the band and / or to increase the financial benefit of the Treasury.

Auctions [and Awards]:
JRC suggests that the Auctions heading should be expanded to Auctions and Awards. This may enable spectrum distribution to be based on the socio-economic value of use rather than merely which bidder has the deepest pockets and / or makes the most credible claims regarding sharing.

5c) Are there any that you think would be particularly effective or problematic?

White Space sharing:
JRC is pleased to see that the initial white space use will be on a licensed basis. This will enable the spectrum to be recovered if the proposed sharing scenario is less effective than it is hoped.

Overlay auctions:
JRC is concerned that the 450 to 470 MHz band could suffer an overlay auction. This could result in the UK's Utility Operations losing essential access to its current 2 x 1 MHz spectrum, plus many other narrow band UHF channels, with no alternative spectrum being available in which to migrate its systems.

JRC is also concerned that LTE systems may be being considered for use between 450 to 470 MHz. If so, JRC would like to highlight that there is a second part to the often, only, quoted first part of ITU footnote 5.286AA:
'The band 450-470 MHz is identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). See Resolution 224 (Rev.WRC-07)*.
This identification does not preclude the use of this band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. (WRC-07)'

Question 6:
6a) Have we identified the relevant technology enablers, or are there others we should take into account?

JRC does not suggest any additional enablers.

6b) For each one, what is the potential for it to facilitate sharing and what are the downsides?

JRC suggests that each of them may be feasible to facilitate sharing.

6c) Are there any that you think would be particularly effective or problematic?

JRC advises that there could be issues with Carrier Sense Multiple Access (CSMA) systems operating within white space and other spectrum. For example, at the boundary of broadcast service area, a TV antenna mounted at 7m may enable a sufficient signal to be received. Conversely, at the same address, the CSMA system may be located indoors and positioned much lower so it may not receive sufficient / any signal to recognise that the spectrum is occupied. This could result in harmful interference at that address and neighbouring properties.

6d) What, if any, role should Ofcom play in helping to develop them?

JRC recommends that Ofcom should participate sufficiently within any national and / or international negotiations so as to ensure that subsequent UK policy decisions wouldn't result in a 'good' solution that is ideal for, say, 80% of the stakeholders but unacceptable for the remaining 20%. A ratio of 95:5 may be seen as an acceptable 'good' solution.

Question 7:
7a) Do you have any comments on the authorisation tools that we have identified above?

Information requirements:
JRC notes that Ofcom could 'include information on actual use (rather than authorisations)'. JRC is therefore very concerned that Ofcom may publish information that could jeopardise the safety and security of the UK's critical national infrastructure (CNI), and seeks assurance from Ofcom that this will not be published.

JRC suggests that broadband spectrum that is licensed but unused, or has only token use / coverage, in remote rural areas could be shared with other users. JRC recognises, however, that it may not be possible for noise-limited interference utility systems to co-exist with geographically adjacent and / or spectrally adjacent broadband systems.

Tiered access:

JRC highlights that its systems typically need to be instant / priority access so sharing spectrum with other users with equal access rights may be an issue.

7b) Are there others we should take into account?

JRC suggests that, with the ever-increasing amount of spectrum being allocated for public mobile use, there should be increased narrow band 12.5 kHz channels allocated for, say, Light Licensed Simple Site and Simple UK systems and PMR446-type systems. These allocations should ensure that narrow band private mobile radio (PMR) / Business Radio systems will always be available for those that depend on them; albeit with the potential for harmful interference when sharing within these scenarios.

7c) For each one, what is the potential for it to facilitate sharing and what are the downsides?

JRC suggests that each of them may be feasible to facilitate sharing.

7d) Are there any that you think would be particularly effective or problematic?

JRC believes that may licensees will prefer not to divulge their geographical spectrum use for the reasons given above.

Question 8:
8a) Are the characteristics of use we have identified sensible and sufficient to provide a high level indication of sharing potential?

Whilst the proposed characteristics of use may be sensible, please see 8b, below.

8b) Are there other factors that we should expect to take into account?

High-level technical characteristics:
JRC recommends including transmit mask characteristics, receiver sensitivity, receiver rejection, and other characteristics that highlight how spectrally efficient within its licensed channel width a system is. For example, see the interference problems resulting from the recently agreed 8 x 5 MHz channels in the 1.4 GHz band into the adjacent noise-limited interference planned fixed links networks.

8c) Are there any factors that you consider to be particularly significant?

JRC is pleased to note that Ofcom recognises that there is no ‘one size fits all’ solution.
JRC suggests that broadband technologies / systems should not be given automatic preference over narrow band technologies / systems. For example, see the 8 x 5 MHz channels in the 1.4 GHz band comments above.

8d) Are there any which we should attach less weight to?

JRC suggests that Ofcom gives consideration to every technical characteristic before considering mixing noise-limited systems with interference-limited systems.

Background

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.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:	A framework for Spectrum Sharing
To (Ofcom contact):	sharing.framework@ofcom.org.uk
Name of respondent:	Adrian Grilli
Representing (self or organisation/s):	The Joint Radio Company Ltd (JRC)
Address (if not received by email):	as received by email

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why:

Nothing:	☑	Name/contact details/job title:	*Nick Woollard, Project Manager*
Whole response:		Organisation:	*JRC*
Part of the response:		If there is no separate annex, which parts?	

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?
JRC would prefer the contents of the annex to remain confidential until otherwise agreed.

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

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Name Adrian Grilli Signed (if hard copy)