Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title: Strategic Review of UHF Spectrum at 420-470 MHz (UHF bands 1 and 2)

To (Ofcom contact): Kevin Delaney

Name of respondent: Johan Jobér

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CONFIDENTIALITY

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

Nothing	O	Name/contact details/job title	☐
Whole response	☐	Organisation	☐
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If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the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)?

DECLARATION

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Name Johan Jobér Signed [signature]

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?

We think that the perceived need for "BR Sector" users is primarily due to lack of services and coverage from the main cellular operators that can be more effectively addressed by our proposal outlined on page 4- below. BR Sector licenses also often have low spectrum utilisiation. Our proposal to issue a license for multiservice network would increase the spectrum efficiency and also, the available spectrum for any BR users that still need their own frequencies.

We do not really agree that the emerging need is limited. On the contrary, the need for the kind of resilient multiservice network outlined in our proposal is rapidly increasing for Internet of Things, Public Safety, Security, and Smart Energy Grids, and Vehicles that all need good coverage of the type offered by this frequency band

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?

See Answer to Question 1 above and comments below.

In responding to Questions 1 and 2, please provide any supporting evidence for your position with respect to your specific sector(s):

a) business radio (please specify if your response represents a specific subset of the BR sector, such as the utilities or transport industries)

The need is evidenced by the perceived lack of suffient service for these users in the current cellular networks.

b) public sector users (i.e the ES, DH and MoD)

These have a problem with broadband and multimedia services not available in TETRA. And in particular, it gets too expensive to deploy new dedicated networks with high standby capacity if they are dedicated for these users that only need the capabilities occasionally – but then with priority.

g) licence exempt users, including users of short range devices

We think the 1800 MHz band and other bands can serve this purpose.

h) potential new user of the band

See our proposal for multiservice network below that can also benefit e.g. the public to a much greater extent than the current uses of the band.

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.

No, we think that in particular since the UK has quite restrictive regulations for cellular mast heights and the poor diffraction properties of higher frequency systems, the 400 MHz bands would add an important coverage component if it could be made available to the public in rural areas. See also appendix 3 showing how the 400 MHz band is suitable for umbrella cells.

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 minimizing interference?

No. In Denmark we made a special agreement with a paging operator in Germany. But overall, nothing that could not easily be resolved.

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.

See our proposal below, but in particular we propose to allow TDD in the 406-430 MHz band where feasible and to promote this as a general direction in Europe.

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?

As outlined in our proposal, say 2-4 MHz of TDD bandwidth could be sufficient to start the defragmentation and then additional spectrum is released when they can be moved to this spectrum thus accumulating maybe 5-10 MHz of contiguous spectrum within 406-470 MHz for a multiservice network nationwide over time.

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

See our proposal. Requirements on a licensee in a beauty or auction situation could be to include requirements to open the network to service providers, offer all the listed services, and with a certain minimum coverage.

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?

We would be happy to provide more details of our proposal and plans for the UK in a meeting at your earliest convenience.

Suggested use of the 410-470 MHz Bands

<u>About us</u>
Wirefree Communications Limited currently operates a small CDMA 410 MHz FDD network in Ireland with a permission from the regulator to introduce TDD in the same band. A sister company in Denmark also holds a 410 MHz license with a permission to use it for TDD. We are looking at the prospects for deploying networks also in the UK when we upgrade the networks in Ireland and Denmark to multiservice TDD networks. This could be a good chance to improve the spectrum utilization in the UK and defragement the band. The owners of Wirefree have earlier introduced the 450 MHz networks in several other countries in Northern Europe, but have lost ownership control of these.

With this consultation response, we also want to announce our interest for launching services in the UK would we be given such an opportunity.

<u>Background</u>
The cellular industry has for many years focused on higher frequencies due to the shortage of 400 MHz UHF frequencies and often consumer oriented products. This has led to a tremendous success for consumer oriented services. However, this consumer orientation has also left rural areas and professional users underserved although they are the ones most dependent on these radio-based services for even basic needs.

Rural and professional users are therefore often left with old and/or expensive services that fail to meet their demands. Furthermore, with the introduction of Smart Energy Grids and other solutions like dynamic road toll systems, dynamic traffic control, self driving cars and other Internet of Things applications, there will be an increasing need for cost-effective communication networks with good coverage.

The absence of cost-efficient and capable services in public networks for professional and emergency radio communication services has led to a situation where the 410-470 MHz band is in high demand for a range of dedicated applications, creating further shortage of spectrum in a vicious circle since many of the dedicated licenses are not used efficiently.

Multiservice networks require somewhat larger bandwidths than typical PMR licenses and other dedicated networks. On the other hand, there are now also TDD technologies that improve the flexibility in allocating and using spectrum for up- and downlink. Our proposal is therefore to focus allocations in e.g. the 410-430 MHz band for TDD spectrum in chunks of at least 2-5 MHz, with permission for the licensee to aggregate additional spectrum by convincing neighboring and other spectrum holders to abandon the spectrum to the licensee in return for equal or better service, monetary compensation, etc.

<u>About the frequency band</u>
OFCOM has focused its consultation on 420-470 MHz due to the allocation situation in the UK, but in many other countries in Europe, it is more relevant to look at 406-470 or at least 410-470 MHz so our comments cover this entire band.

The 410-470 MHz band has the advantage that it can be used for national wireless services, and also urban services for special needs such as e.g. private security, public safety etc. For emergency services, the large cell sizes are an advantage to secure sufficient capacity and electrical power backup for public safety applications. (too expensive to maintain a high capacity and backup generators in a large number of small cells). The public and emergency services can be combined by giving priority to emergency uses, and opening the national network to national roaming such that all interested service providers have the right to roaming onto the network (mandated by EU telecom regulations anyway). To combine different user groups and applications on the same spectrum improves the spectrum utilization due to the statistical distribution of traffic – not everybody and every application need to use the spectrum all the time in up-and downlink.

Another advantage of this frequency band is that it is suitable for large umbrella cells from high masts/buildings with specially secured power supply with generators. Higher frequency bands have less diffraction and thus make umbrella cells less reliable as a coverage complement and fallback.

This frequency band is thus highly attractive for a variety of uses, but that does not correspond so well to its currently very fragmented and thus inefficient usage.

<u>Multiservice networks</u>
The following services need to use the frequency band:

- Mobile telephones and wireless broadband with coverage superior to that offered by higher frequency operators.
- Machine-Machine communication with power efficient modules
- Push-to-talk (PMR-like) with good performance

The network should support:

- Dual-use in the sense that private, government, public safety and possibly military use on the same network to share the costs among these "niche" user groups. This does not exclude other dedicated networks, but the more traffic that can be well served by a multiservice network, the better the spectrum utilization and the lower the energy and network costs.
- Priority and Quality classes to reflect the importance of accessing service and bandwidth in different kinds of overload situations
- Use of umbrella cells from broadcast towers, mountaintops or similar that provides basic service over wide areas even in the case of long-term power outages.
- National infrastructure such as high masts, transmission, etc. shall as much as possible be re-used to minimize the cost for building a new towers and transmission lines.
- Any commercial operator is welcome to be a re-seller of services based on the National Wireless Grid as a service provider for non-priority services.
- Separation of Virtual IP networks for different user groups on the same physical network.
- Widest possible coverage

<u>Proposal</u>
To start to defragment a band requires some offloading "space", just like defragmenting a hard drive requires some space where small file segments are moved to create larger and larger contiguous blocks. In this case with radio frequencies, unlike ha hard disk defragmentation, and due to improved spectrum utilization, the total frequency usage will decrease as a result of a defragmentation for the same amount of traffic.

If the functional and other requirements listed above are placed on a new licensee with some spectrum within this range, there is potential to start de-fragmenting the entire 406-470 MHz band since current users from accross this band could be convinced to use the new service because it will be better. It is important that any license is technology neutral and that TDD is allowed for maximum flexibility.

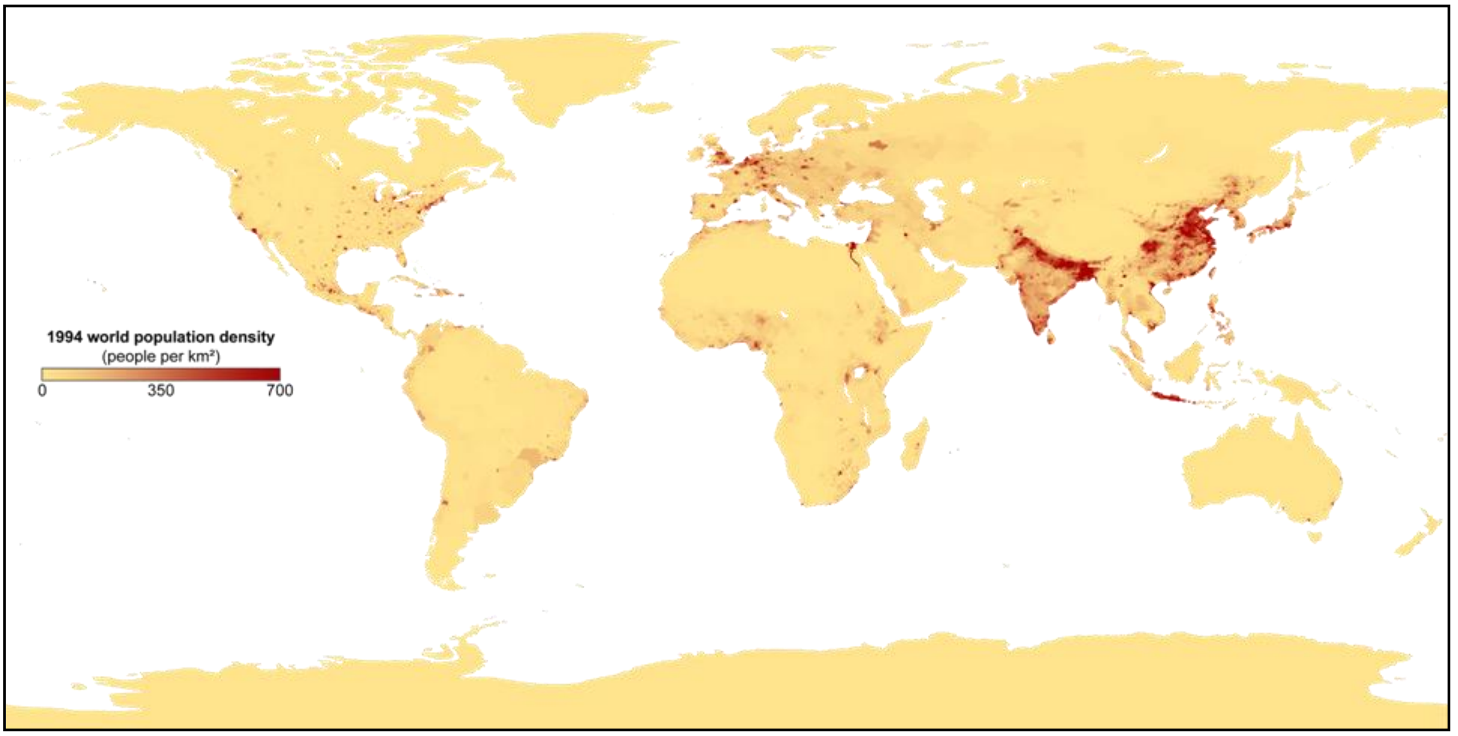
In order to start to de-fragment the spectrum, we therefore believe regulators could encourage progress by issuing technology neutral licenses of sufficient bandwidth to allow multi-service functionality using FDD or TDD technologies in the 410-470 MHz band. One approach is to first target usage of e.g. part of (406)410-430 MHz for TDD (where we believe it may be easiest to find spectrum in the UK) and in a later stage also freeing up 450-470 MHz for FDD or TDD IMT or wireless broadband services.

The regulators in the Republic of Ireland and in Denmark have for example already issued TDD licenses in the 410-430 MHz bands for 3-8 MHz so there should be nothing preventing such a step in principle if a suitable spectrum can be identified.

Appendices

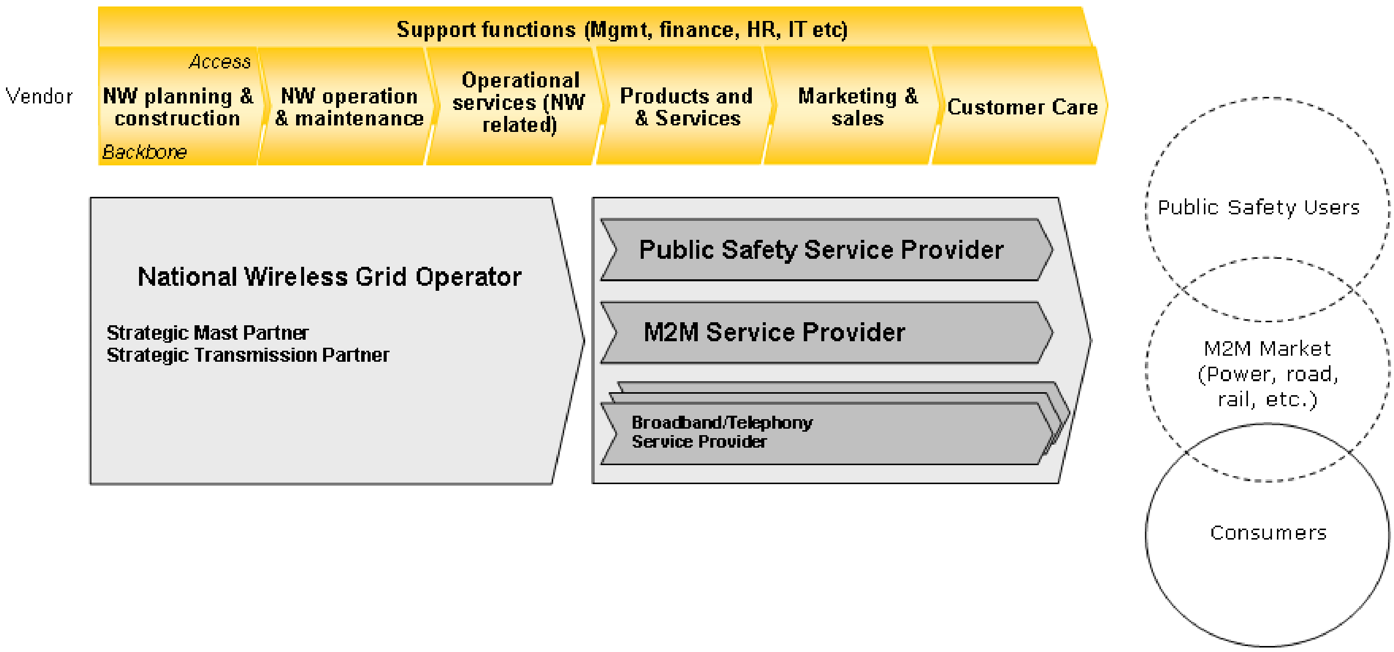
APPENDIX 1 – The world is mostly rural
APPENDIX 2– Example of service provider structure
APPENDIX 3 – Migrating Coverage for scalability, smooth service migration, and resilience
APPENDIX 4 – Wikipedia: Smart Grid (Extract)

APPENDIX 1 – The world is mostly rural



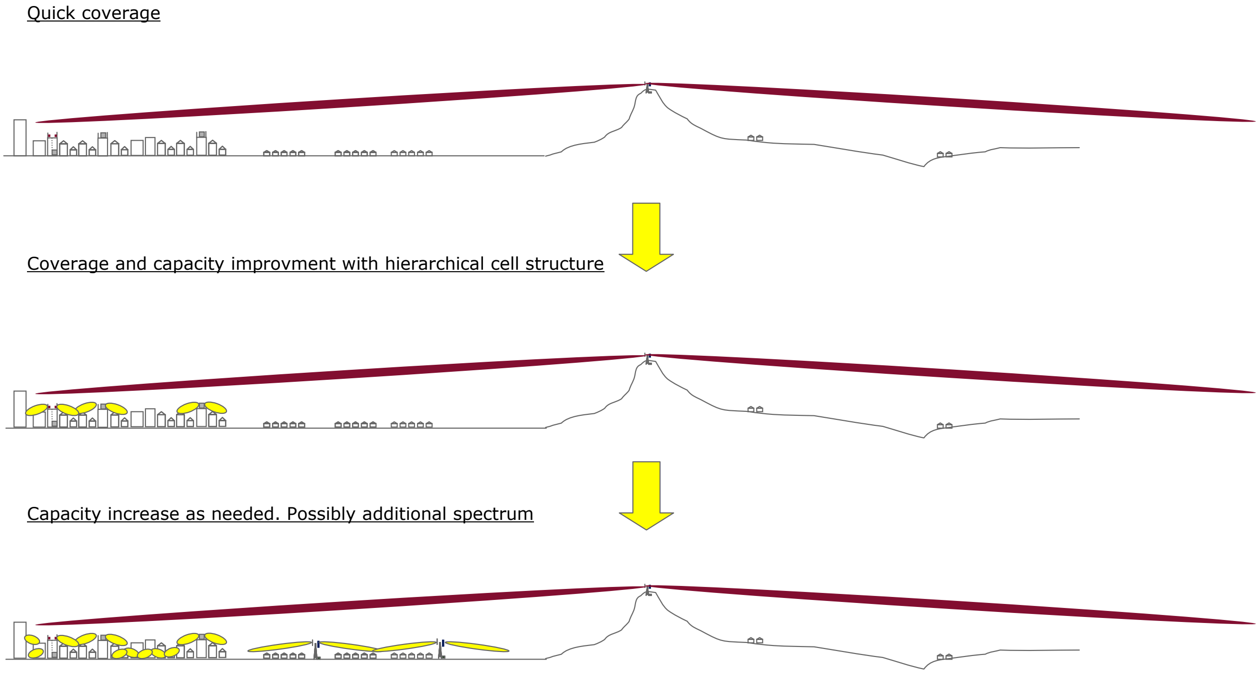
Most countries have large rural areas not suitable for high frequency systems but without sufficient customer base to support a multitude of networks for different needs. This means that mainstream technologies are likely to support the multiservice network idea in the 400 MHz band. Image source: NASA (http://visibleearth.nasa.gov/view_rec.php?id=116)

APPENDIX 2– Example of service provider structure



A multitude of service providers specialized at different customer segments, products or bundling with complementary products. Some may be the current operators of public safety networks or public cellular operators. Each Service Provider may be granted different levels of access to priority and security classes. The National Wireless Grid Operator services in this illustration would be easiest to provide with some spectrum in the 406-470 MHz range.

APPENDIX 3 – Migrating Coverage for scalability, smooth service migration, and resilience



Coverage and capacity in the cities is gradually improved. At a power failure, when the city sites may run out of power, at least priority subscriptions continue to work in the (presumably) overloaded umbrella cell which is normally using a high broadcasting type site. This concept requires sufficient spectrum for the umbrella and city sites to operate at different frequencies and thus frequency efficiency is crucial. At least the umbrella cell should operate in the 406-470MHz band to allow a good coverage. Higher frequencies gets too easily shaded by buildings and hills making too many "coverage holes" in the "umbrella".

APPENDIX 4 – Smart Grid (Extract from Wikipedia)

A **smart grid** delivers electricity from suppliers to consumers using digital technology with two-way communications to control appliances at consumers' homes to save energy, reduce cost and increase reliability and transparency. It overlays the electrical grid with an information and net metering system.

Such a modernized electricity network is being promoted by many governments as a way of addressing energy independence, global warming and emergency resilience issues. Smart meters may be part of a smart grid, but alone do not constitute a smart grid.

The smart grid is made possible by applying sensing, measurement and control devices with two-way communications to electricity production, transmission, distribution and consumption parts of the power grid that communicate information about grid condition to system users, operators and automated devices, making it possible to dynamically respond to changes in grid condition.

A smart grid includes an intelligent monitoring system that keeps track of all electricity flowing in the system. It also incorporates the use of superconductive transmission lines for less power loss[*dubious – discuss*], as well as the capability of integrating renewable electricity such as solar and wind. When power is least expensive the user can allow the smart grid to turn on selected home appliances such as washing machines or factory processes that can run at arbitrary hours. At peak times it could turn off selected appliances to reduce demand.

Similar proposals include *smart electric grid*, *smart power grid*, *intelligent grid* (or *intelligrid*), *FutureGrid*, and the more modern *intergrid* and *intragrid*.

Goals [edit]

In principle, the smart grid is a simple upgrade of 20th century power grids which generally "broadcast" power from a few central power generators to a large number of users, to instead be capable of routing power in more optimal ways to respond to a very wide range of conditions, and to charge a premium to those that use energy during peak hours.

Respond to many conditions in supply and demand [edit]

The events to which a smart grid, broadly stated, could respond, occur anywhere in the power generation, distribution and demand chain. Events may occur generally in the environment, e.g., clouds blocking the sun and reducing the amount of solar power or a very hot day requiring increased use of air conditioning. They could occur commercially in the power supply market, e.g., customers change their use of energy as prices are set to reduce energy use during high peak demand. Events might also occur locally on the distribution grid, e.g., an MV transformer fails, requiring a temporary shutdown of one distribution line. Finally these events might occur in the home, e.g., everyone leaves for work, putting various devices into hibernation, and data ceases to flow to an IPTV. Each event motivates a change to power flow.

Latency of the data flow is a major concern, with some early smart meter architectures allowing actually as long as 24 hours delay in receiving the data, preventing any possible reaction by either supplying or demanding devices.[1]

Provision megabits, control power with kilobits, sell the rest [edit]

The amount of data required to perform monitoring and switching your appliances off automatically is very small compared with that already reaching even remote homes to support voice, security, Internet and TV services. Many smart grid bandwidth upgrades are paid for by over-provisioning to also support consumer services, and subsidizing the communications with energy-related services or subsidizing the energy-related services, such as higher rates during peak hours, with communications. This is particularly true where governments run both sets of services as a public monopoly, e.g. in India. Because power and communications companies are generally separate commercial enterprises in North America and Europe, it has required considerable government and large-vendor effort to encourage various enterprises to cooperate. Some, like Cisco, see opportunity in

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