Call for Input: Potential Spectrum Bands to Support Utilities Sector Transformation

Cellnex UK Response

September 2023

Overview of Cellnex UK

Cellnex Group

This response is submitted by Cellnex UK (link), part of Cellnex Group (link) which:

- Supports over 420 million mobile connections across Europe
- Operates >110,000 mobile sites today, which will grow to >130,000 by 2030
- Is Europe's leading neutral host mobile infrastructure provider, covering 12 countries: Austria, Denmark, France, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, Switzerland and the UK
- Provides mobile infrastructure services, private and mission-critical networks, distributed antenna systems and small cells, and smart/IoT and innovative services
- Operates sixteen mission critical networks in Spain for emergency bodies to ensure public safety
- Has deployed forty private networks across Europe for enterprise applications
- Had an annual turnover of €3.5bn in 2022
- Is listed on the main sustainability indices, and evaluated by highly reputable international analysts such as CDP, Sustainalytics, FTSE4Good, MSCI and Standard Ethics

Where possible, we have sought to provide international examples from the wider Cellnex Group in our response.

Cellnex UK

We are the trusted partner of all the major UK mobile network operators, hundreds of private businesses, the emergency services, as well as the UK Government, specifically Cellnex UK:

- Is the UK's leading independent wireless connectivity infrastructure company
- Operates >9,000 mobile sites today, which will grow to >13,000 by 2031
- Has deployed over 1,000 small cells to date
- Is a provider of private networks in campus and indoor environments
- Is an indoor mobile coverage provider, most notably in the Etihad stadium in Manchester
- Is deploying contiguous mobile coverage and capacity along the 81km Brighton to London Mainline and three major stations
- Has won three DCMS 5G competitions, working collaboratively with universities and start-ups to deliver 5G innovation
- Employs around 300 people across four major UK locations – Reading, Manchester, Scotland and Leamington Spa
- Has invested £6.1bn in the UK since 2016

Basis of Response

Cellnex UK welcomes this Call For Input and that Ofcom has recognised the urgent need for release of sub 1 GHz spectrum to enable deployment of critical control capability via wireless technology for the UK's utilities sector.

We have commented on this consultation on the basis of being an operator of scale macro site infrastructure in the UK, a provider of mission critical networks in Spain and an active network operator for an MNO in Poland.

Terminology: We use the term Distributed Systems Operator ('DSO') to describe the current 7 Distributed Network Operators who operate across 15 regions of the UK on the basis of their forecast evolutionary path to systems operation.

Question 1: Have we correctly identified the key changes in the utilities sector that could lead to additional spectrum requirements?

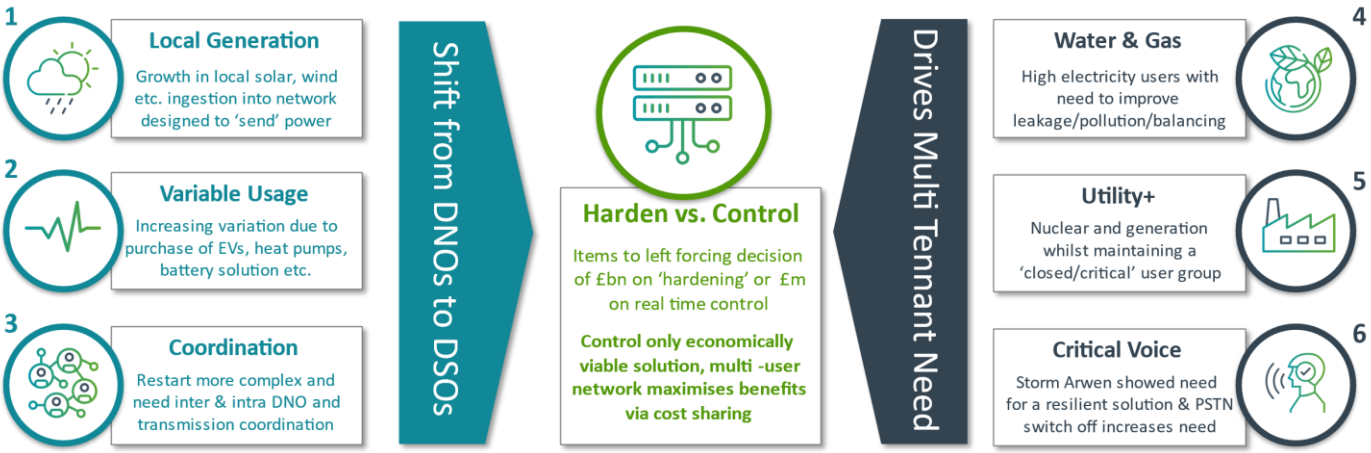

Figure 1 – UK Utilities Sector Changes and Consequences

Transition from Distributed Network Operators ('DNO') to Distributed Service Operators ('DSO')

The key changes as we see them are as set out below:

- *Generation:* Significantly higher amounts of generation directly ingested into local distribution networks coupled with increased variability in generation from renewable energy sources like wind and solar
- Consumption: Increased consumption via uptake of electric vehicles, heat pumps and battery storage solutions, creating higher peak demand and variable flows and driven by government policy to phase out petrol/diesel vehicles and gas boilers in homes
- *Restart Coordination*: Restart of the network will require coordination, and likely automation of activity, between a much greater number of parties as compared to the legacy supply chain where largescale generation flowed through the transmission network into the distribution layer

This ultimately results in a shift from uni-directional flow of electricity (i.e. from grid to consumer) to bi-directional (i.e. grid to consumer and consumer to grid) at a local level which results in a set of operational requirements that the UK's distribution networks are not designed to deliver.

The industry has to therefore decide whether to (i) harden local networks to cope with the increased variability in generation and consumption or (ii) add control/protection into the network to enable re-use of existing infrastructure, with anecdotal cost estimates for (i) of £bn vs. £m for (ii); only hardening networks still doesn't solve the issue of coordination for restart.

As a result the only viable solution is a dedicated communications network(s) for the electricity sector; but as described below the economics and environmental impact of these network(s) could be significantly increased if they were multi-tenanted and utilised by all the utilities.

Wider Utilities Requirements Drive Multi-Tenant Opportunity

- *Water & Gas:* These sectors consume a large amount of electricity (at least 3% of UK total)[1] so a key focus is reducing consumption via increased efficiency from better monitoring, control and optimised operational decision making; these capabilities are also required to achieve more stringent leakage and pollution control (water) and local balancing (gas) targets

[1] https://www.wwdmag.com/utility-management/article/33002997/the-uk-water-industry-leads-the-way-to-net-zero

- *Utilities Plus*: Campus environments (e.g. onshore generation facilities such as wind and nuclear) will have considerable communications requirements, including monitoring, control and voice applications, whilst these could be delivered by a local private network there could be significant economies of scale by using a wider area network regarding security, resilience and common equipment/standards.
- *Critical Voice:* Storm Arwen highlighted the need for "power resilient field communications"[2] as public mobile network sites typically do not have power backup for a more than a few hours, in addition the switch off of non-powered PSTN and other services typically used by utilities (e.g. 2G, 3G, Airwave etc.) further adds to this requirement.

Summary

Cellnex UK agrees with Ofcom that the primary requirement for allocation of spectrum to the utilities sector is from the electricity distribution networks, however usage of this spectrum by other utilities would maximise the economic benefit of a dedicated network(s).

Ofcom should consider the needs of the whole utilities sector when making decisions regarding spectrum allocation.

1.1. Use Cases

Cellnex UK broadly agrees with Ofcom's overview of the use cases, however we would place them in the following five categories:

a) Real Time Critical Control ('RTCC')

This is the primary use case supporting the need for dedicated spectrum and associated wireless network(s). The requirement is for 'near instant, prioritised and guaranteed message success' with no risk of network congestion or delay with performance guaranteed by SLAs. This cannot be delivered by the public networks. Two examples of electricity distribution assets now requiring RTCC capability are:

- Substations, for primary ones wireless RTCC likely to be a backup/failsafe communications method, distribution ones (which are the majority) wireless RTSS will be the dominant communications network
- Pole mounted transformers, wireless RTCC will be main communications network for nearly all

The total number of assets captured by the above is in the hundreds of thousands and they are often located in remote areas where service delivery by public or non-wireless technologies would be uneconomic; as detailed by the JRC in its 2021 study[3].

The need for RTCC is also likely to emerge in the water and gas sectors, focused initially on pumping stations and valve switching for water and automated action to balance the network in real time for gas, with further RTTC use cases likely to emerge via regulation to reduce pollution (water) and achieve net zero targets (both sectors).

RTCC is also required for electricity network restart, noting the sequencing and complexity of network restoration is continually increasing due to the changes in the electricity generation and distribution environment detailed above. Deployment of common technologies, systems and standards (e.g. 3GPP wireless network(s)) will be critical to ensure successful execution of these restoration process in a timely and assured manner across multiple organisations.

b) *Secure Monitoring - Supporting Near-Real Time Decision Making*

This use case is responsible for the majority of new forecast connections, with total connected assets likely to exceed one million, in the electricity sector we expect the focus to be on monitoring of traditionally non-time critical assets such as:

- Overhead lines

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1081116/storm-arwen-review-final-report.pdf see page 16
[3] https://www.jrc.co.uk/Plugin/Publications/assets/pdf/ICT-Economic-rationale-for-enabling-Smart.pdf

- Lower voltage assets (e.g. LV feeders)
- Link boxes

Within the water and gas sectors sensors related to metrics such as pressure, flow rates, pollution levels and asset maintenance status need to be connected and are likely to increase in both number and geographic dispersal.

Whilst pure monitoring could be achieved using commercial networks (e.g. NB-IoT) the volume and criticality of this information for near real time decision making, potentially automation support using artificial intelligence tools, is forecast to increase significantly. The totality of information collected will increase to a point where a detailed all-encompassing picture of a DSOs network is obtained and unauthorised access to this data would present a serious security risk to the UK.

As a result this use case will require a communications solution which has high availability, guaranteed message success, end to end security and strong resilience; these are not currently the primary design principles and operational success criteria of public networks.

c) Operational Voice

As detailed above, voice coverage for field teams is critical for successful utilities operation, notably in times of emergency when public networks, which lack power backup beyond a short time period, will typically have failed. Currently utilities employ a range of private solutions (e.g. PMR, Airwave etc.) when the public mobile networks fail due to a lack of power or outages. They also leverage them when public networks – which focus on population rather than geographic coverage – do not have service to reliably support locations where they regularly operate.

As Storm Arwen illustrated there needs to be a resilient network available in times of extended power outage – which in the future could include electricity network restart requiring coordination between DSOs and also National Grid. Today's mix and match of solutions does not meet this requirement and the risk of a lack of interoperability will be exacerbated following PSTN switch off if an uncoordinated approach is taken by each industry participant.

A resilient wide area private network built to 3GPP standards with appropriate interconnections between DSOs (or via single national/regional network) could be leveraged to provide enduring voice coverage during both BAU and disaster recovery situations.

d) Non-Operational Data Provision

We envisage that this use case (e.g. broadband connectivity to a remote site for use by operational or business support personnel for non-operation critical tasks) will largely be satisfied by public networks (e.g. connectivity services from fixed and mobile providers).

However as noted above public networks predominantly focus on population coverage and as a result it may not be possible to procure an economic public data service in a number of geographically remote locations. The wide area private network could be utilised to achieve this and improve the economics of wider utility operation; however this should not be seen as the primary driver for dedicated spectrum release but rather a potential positive externality.

e) Advanced/Future Operational Requirements

The utilities sector continues to evolve its use of technology to create both operational efficiencies and a safer working environment, example emerging use cases include:

- High/Ultra definition CCTV to ensure a location's integrity and worker safety, noting use of artificial intelligence might be leveraged in the future to take preventative action (e.g. substation shutdown in the case of an intruder)
- Remote/robotic control to enable operational activity to occur in high risk environments without the need for the power outages required when undertaken by humans, for example use of autonomous drones for cable inspection and robotic activity within sub stations
- Remote assistance to enable field staff to utilise expertise of specialists located in an another area using Augmented Reality technology
- Supporting construction activity for new utility infrastructure, for example enabling use of digital twins on site and automated construction vehicles/activity
- Domestic demand side response (DSR) to enable control of household devices e.g. batteries, EVs, smart appliances etc to support balancing the network as well as time of use tariffs

These use cases, whilst nascent and experimental today, may well become critical in the future, notably they are likely to drive significantly greater bandwidth requirement than the others described above.

Behind Meter Activity

Cellnex UK agrees that 'behind the meter' applications will continue to utilise existing public communications networks and hence do not contribute to this requirement for spectrum release; the criticality of these applications is significantly lower than those discussed above and if included would undermine the integrity and benefits of a dedicated critical control network.

1.2. Network Features

The use cases detailed above would result in the following relative demands on a private wide area network, noting the absolute requirements around latency, availability and site power backup will be considerably greater than those provided by current public wireless networks:

Use Case	Bandwidth	Latency	Availability	# of Devices	Comms Site Power Backup	Dual Site Serve
a) Real Time Critical Control						Yes
b) Secure Monitoring						Potentially
c) Operational Voice						No
d) Non Operational Data						No
e) Advanced/Future				TBC		Potentially

Figure 2- Use Case Network Requirements

As detailed on the previous page:

- *Bandwidth:* Individual connection requirements are generally moderate to low across use cases, however overall demand will increase as the volume of connected assets increases
- *Latency:* This is a key performance metric for the sector linked to both health & safety and system performance/stability requirements and advanced use cases e.g. robotics and AR/VR
- *Availability:* Requirements here are considerably greater than public networks and will need to be supported by resilient power, dual site serve and potentially transmission diversity from hub sites
- *Comms Site Power Backup:* Industry consensus is forming around the need for a wireless service to have a 72 hour backup, noting the JRC concluded that adding required power resilience to existing public networks is likely to be extremely challenging[4].
- *Dual Site Serve:* Critical for use case (a) where message success/assurance is paramount

Beyond this there are a number of further features that will be required, notably critical national infrastructure level end-to-end security and in the case of a multi-utility solution closed user groups to enable system separation.

A number of the requirements outlined above are also helpfully described in Western Power Distribution's (now National Grid Energy Distribution) telecoms strategy from 2021[5].

Ofcom should pursue spectrum release for the utilities as a matter of urgency given the criticality of use cases above and private critical control wireless networks being the only viable method to meet these.

1.3. Geographic Overlap

Due to the way the UK electricity, gas and water markets have evolved, as compared to some European countries, there is limited geographic overlap. However as detailed below a multi-tenanted network is immediately viable in Scotland and Northern Ireland due to 100% geographic overlap between market participants:

Nation	Water/Gas/Elec Geographic Overlap	Companies	Regulators
Scotland	✓	4	2
Northern Ireland	✓	5	1
England	✗	32	2
Wales	✗	8	2

Figure 3 - Geographic Opportunities and Challenges

As a result a neutral host could provide a network for all participants or conversely one of the utilities could take the lead in these two nations; as seen already in Ireland and potential in the future for Northern Ireland, please see our answer to Question 6 for further details.

Conversely the need for a neutral host network in England and Wales is arguably greater as absent of geographic overlap there is potential for the non-leading utilities to face considerable complexity. For example if electricity distribution took the lead then water companies could have to contract with multiple companies across their geographic area, potentially each with different technical solutions, to meet their needs.

[4] https://www.jrc.co.uk/Plugin/Publications/assets/pdf/ICT-Operational-Control-of-Mission.pdf
[5] https://www.nationalgrid.co.uk/downloads-view-reciteme/334996 - see Page 8

Across all nations, potentially with the exception of Northern Ireland, the mis-alignment of regulators and regulatory periods also needs to be resolved as currently there is no economic incentive for a lead utility company to plan for, nor be rewarded for, serving the needs of others.

Ofcom should take note of the above geographic/market dynamics in its decision making process regarding allocation of spectrum, looking to decouple decisions on a nation basis where this will lead to quicker allocation of spectrum.

Question 2: What alternative communication solutions might play a role in meeting the future operational communication needs of the utilities sector, alongside or instead of additional spectrum for a private network?

Today a number of solutions are used by utilities, as detailed in the consultation document (e.g. fibre, broadband, PSTN, 2G/3G/4G, IoT, satellite etc.). Going forward Cellnex UK forecasts that .

As detailed in our response to the previous question the 'critical' requirements of utilities communications need is forecast to increase dramatically. We believe it will only be economically viable to meet this growth via a private wide area network ('PWAN'), hence the proportion of the total solution provided by wireless is likely to increase significantly, we note here the economic analysis undertaken by the JRC into different technology types[6].

Below we outline the potential alternatives, notably fixed and public wireless networks, regarding their ability to meet the critical elements of the total operational communication requirements of utilities.

2.1. Fixed Connectivity

To date fixed connectivity has been the primary method of connecting electricity distribution assets (e.g. primary substations) to date, which has been economically feasible due to the low number of connections required predominantly within urban or suburban environments.

Deployment of fibre into rural population areas as part of commercial broadband programmes will increase the number of locations where it is economic to provide fixed connectivity, but these deployments are unlikely to economically serve the large proportion of utilities infrastructure which is not located near households.

Cellnex UK believes that wireless is best placed to pick up the requirement to extend connectivity deeper into utility networks and support the significant increase in the number of connected locations in geographically dispersed and remote locations.

2.2. Other Solutions

As noted above with the exception of *Real Time Critical Control ('RTTC')* some of the other uses cases could be satisfied by use of public networks, however the rapidly growing performance and security requirements of the utilities sector mean that this solution could quickly become unviable or undesirable.

For very remote locations satellite connectivity might be utilised for non RTCC requirements to achieve 100% connectivity of a particular asset class, however for RTTC applications we do not believe even with forecast developments that satellite will be able to achieve likely DSO requirements.

Ofcom should pursue spectrum release for utilities as a matter of urgency given the criticality of use cases above and private critical control wireless networks being the only viable method to meet these.

[6] https://www.jrc.co.uk/Plugin/Publications/assets/pdf/ICT-Economic-rationale-for-enabling-Smart.pdf

Question 3: Are there any other spectrum bands we should consider for use by utilities?

Cellnex UK does not believe there are other spectrum bands, other than those detailed in this call for input, that are viable for release for utilities (i) within required timescales and/or (ii) with sufficient bandwidth to meet near and future requirements and/or (iii) harmonised internationally so that associated network and end user equipment economies of scale are accessed.

Ofcom should target urgent release of 700 MHz in Great Britain and Northern Ireland, confirm quickly if release of 400 MHz in Northern Ireland is viable, alongside commencing parallel work to reconfigure the 450 MHz band to enable additional release in this band in the mid-term.

Question 4: Do you have any comments on the three bandwidths we have considered that might be necessary to support a private network for utilities? Please reference our capacity analysis in annex 7 where relevant.

Equipment vendors and the utilities are better placed than Cellnex UK to comment on the specific parameter and assumptions detailed in Annex 7; Cellnex UK notes the following related points:

Analysis needs to be undertaken of likely total utility requirement to determine overall spectrum requirements (i.e. forecast number of connected assets per use case type x individual use case bandwidth requirements) complemented by information or informed assumptions about geographic spread; this will enable the total requirement, ideally by UK nation, to be calculated.

4.1 Ensuring a Long Term Solution

Cellnex UK believes that at least 2 x 3 MHz will be required in the near term with a required for additional bandwidth of 2 x 5 MHz or 10 MHz TDD to be released shortly after given the increase in use case type described above and forecast connection volume increase; noting our point above regarding the need for further analysis.

There are techniques that can be leveraged if the quantum of total spectrum release is lower than requirement (i.e. greater spectrum re-use via network densification) but these will drive considerable costs (e.g. higher site counts) into a network which via its 'critical users only' requirement has a ceiling on the number of users and eventual endpoints.

4.2 Timescales for Release

Ofcom notes in 3.7 of the CFI that "if there are no existing users, a band may be available within 5 years once it has been confirmed as a band we will focus on, but is likely to take longer if there are existing users". Given these extremely long timescales (i.e. if above eventuates then potential release for utilities would be 2028+ even for bands with no existing users today) it is critical that the longer term needs of the sector are taking into account now.

Cellnex UK believe Ofcom will need to target release of enough spectrum to support utilities requirements for at least the next 10 years via this current release programme, the elongated timescales for release driving a need to 'over provide now just in case'. This runs counter to maximisation of spectrum for economic benefit in the short term, but given the significant investment in the radio network, associated connected devices and operational transformation the utilities sector will need certainty that the wireless solution can scale in-line with its demands.

Given release timescales Ofcom needs to put in place a spectrum strategy that deliver near term requirements but also provides certainty of further release if initial allocations are not sufficient for mid-term requirements.

Question 5: Do you have any comments on our approach to examining each potential candidate spectrum band, including the factors relevant to assessing suitability, and the capacity and coverage analysis provided in annexes 7 and 8?

Cellnex UK believes that Ofcom needs to take an approach which recognises the criticality of using 3GPP harmonised spectrum and prioritise bands where release can be achieved rapidly.

5.1. Suitability: 3GPP Harmonisation as Qualifying Factor

For solutions to be economically viable and deployable within the required timescales they need to be supported by a regional or ideally global ecosystem for both network equipment and endpoint hardware. Feedback from our work with utilities indicates a strong preference to deploy a solution based upon 4G with a clear upgrade path to 5G. They also note the growing prevalence of 450 MHz deployment for utilities throughout Europe – which will result in integration activity occurring with common utility sector control and monitoring equipment in this band which the UK could leverage.

Qualifying Factors narrow the list of viable candidates Ofcom should consider to 400/450/700/1900 MHz

5.2. Suitability: Two Preferential Factors

No Pre-Determined Vertical Specific Use Across Europe

The 1900 MHz band is harmonised for GSMR and hence we believe allocating this to utilities would be erroneous and put the UK rail sector in a disadvantageous position compared to the result of Europe, alongside the fact that utilities across Europe are not seeking to deploy in this band.

Timescale for Release

As per our answer to Question 1, utilities require urgent access to spectrum to achieve regulatory and wider societal objectives, as a result bands which can be released sooner should be prioritised by Ofcom. This would suggest that 700 MHz (Great Britain and Northern Ireland) and 400 MHz (Northern Ireland) should be pursued now. However given the wider need to reorganise the 450 MHz, see our answer to Questions 7 and 8, we believe 450 MHz should also be pursued in parallel and released as a secondary band after at least 700 MHz (Great Britain and Northern Ireland) and potentially also 400 MHz (Northern Ireland) to support forecast use case and volume growth.

Preferential Factors narrow the list of viable candidates Ofcom should consider to 400/450/700 MHz

5.3. Capacity and Coverage Analysis

We broadly agree with Ofcom's approach however we note the following points:

- The 450 MHz advantage compared to 700 MHz is still significant in hilly terrain where a large number of utilities assets are likely to be located, a c.13% improvement will materially reduce site count when scaled to a national level
- In our response to Question 11 and above we note that 1900 MHz is not a suitable candidate band for utilities, the coverage analysis also supports this conclusion
- We agree that finding a solution that enables a 3 dB increase in power within the 700 MHz should be pursued vigorously by Ofcom given the material impact this will have on site count, noting an increase in terminal height will only be possible for specific use cases (i.e. fixed assets) and not possible at all locations for a variety of practical reasons.

Question 6: Do you have any comments on our overview of the 400 MHz band in NI? Please consider the specific factors we have discussed in your response.

Cellnex UK is supportive of allocation of this spectrum for use by utilities in Northern Ireland. If Ofcom decides to proceed we would suggest a separate path is followed compared to the rest of the UK to enable earlier release, network deployment and realisation of benefits. This would be similar to proposed independent approach for spectrum in Northern Ireland for emergency service use, as detailed in the Ofcom consultation S*pectrum for the Police Service of Northern Ireland*.

6.1. [✂]

6.2. Geographic Alignment

As noted in our answer to Question 1 in Northern Ireland there is an exact geographic overlap of electricity DSO, gas and water networks; noting the only other place this is found in the rest of the UK is Scotland, albeit with 4 parties rather than the 5 found in Northern Ireland. However unlike Scotland these three utilities are all regulated by the same body in Northern Ireland, namely the Utility Regulator.

The combination of these two factors significantly increases the economic and environmental benefit of deploying a multi-tenanted critical control network as well as the potential for its commercial realisation. Cellnex UK has presented its capability to host and/or deploy neutral host networks to the NISP working group led by NIE and is supportive of the group's overall aims.

Ofcom should seek to determine at speed if release of 2 x 3 MHz is achievable via discussions with the two licence holders, namely PSNI and Arqiva/Airwave.

If so, and given the factors detailed above (i.e. strong multi utility potential), Ofcom should then determine if 2 x 5 MHz could be achieved via agreement with the MOD and also relocation of what we would assume is a small number of PMSE and Business Radio users in Northern Ireland; this would then guarantee capacity for further use cases and provide a total solution for Northern Ireland.

Question 7: Do you have any comments on our overview of the 450 MHz band in GB and NI? Please consider the specific factors we have discussed (including the coexistence analysis in annex 9) in your response.

Cellnex UK believes this is the most compelling band for utilities usage under the circumstances found in most countries, based on the following characteristics:

a) Favourable coverage propagation and associated reduced site count

b) Sufficient spectrum to support near and medium term use cases

c) Global ecosystem support for hardware and end point integration via 3GPP alignment

d) No pre-existing locked industry vertical use case (e.g. FRMCS in 1900 MHz)

e) Ability to release within reasonably short timescales

However, we note the unique set of challenges Ofcom faces in achieving (b) and (e) and alignment of the band plan to (c) due to the history of how this band has developed in the UK. As a result we believe this positions it behind the 700 MHz in terms of being able to support initial utility requirements within required timescales; however it should be pursued with vigour as a second utilities sector allocation post 700 MHz as we detailed in our answer to Question 8.

7.1. International 450 MHz Allocation for Utilities

We note the following international allocations, and crucially their associated neutral host/multi utility approach to network deployments:

Germany

- 451 MHz – 455.74 MHz paired with 461 MHz – 465.74 MHz = 2 x 4.74 MHz
- 450connect GmbH will deploy an LTE technology (4G and 5G) based network for digitalizing German energy and water utilities as well as other critical infrastructures

Poland

- 452.5 MHz - 457.5 MHz and 462.5 - 467.5 MHz = 2 x 5 MHz
- Polska Grupa Energetyczna will deploy for a range of use cases across energy and water

Question 8: Do you consider that changes in the spectrum environment for the 450 MHz band mean that there is a case for re-examining whether this band should be reconfigured in the UK to align with the harmonised band plan?

Cellnex UK believes there is a strong case for a full replan of the 450 MHz band to align with the harmonised band plan. We note the growing issue of interference in the south and south east of the UK as the most compelling reason for this to be undertaken. This is strongly supported by the growing release of 2 x 5 MHz for utilities in this band, as evidenced by activity in Europe and the international vendor ecosystem forming around this band.

We note Ofcom's view that a full replan is an extensive exercise and our support of this is qualified by the assumption that the 700 MHz (Great Britain and Northern Ireland) will be released in a timely manner. If this does not occur in this timeframe then Ofcom would need to undertake a partial replan which achieves at least 2 x 3 MHz of 'immediate' release and a clear medium term path to 2 x 5 MHz to meet utilities requirements.

Ofcom should commit to a full replan of the 450 MHz provided it is able to release 700 MHz (Great Britain and Northern Ireland) to required utilities timescales.

Question 9: Do you have any comments on our overview of the 700 MHz band in GB and NI? Please consider the specific factors we have discussed in your response.

We noted in our response to Question 7 we believe there are five key features of the 450 MHz band which made it the optimal choice for utilities in normal circumstances; but that in the UK three of these were currently compromised. As a result we believe Ofcom should prioritise release of the 700 MHz in Great Britain & Northern Ireland as the pioneer band for utilities with a secondary later release in 450 MHz, noting this is a compromise but the least worst compromise compared to other options within the CFI, as illustrated below:

Nation	450 MHz in UK	700 MHz	Notes
Favourable coverage propagation and site counts			Gap could be closed via power increase and other techniques
Sufficient spectrum to support near and mid-term use cases			2 x 3 MHz in 700 MHz vs. 2 x 5 MHz in 450 MHz achievable in the mid-term via replanning
Global ecosystem and utilities integration			Utilities integration low for 700 MHz but is a 3GPP band so standard RAN kit and radio pads can be leveraged
No pre-existing locked in vertical use case			-
Ability to release within required timescales			Due to current composition of 450 MHz band in UK

Figure 4 – Relative Comparison of 450 Mhz vs. 700 MHz in the UK

Ofcom should prioritise release of 700 MHz for utilities use in Great Britain and Northern Ireland

9.1. Use by PSNI and Emergency Services

We noted our support for allocation of this band for critical networks in Northern Ireland in our response to the *Spectrum for the Police Service of Northern Ireland* consultation. We believe that a single multi-tenanted critical data network could be deployed for Northern Ireland in 700 MHz; with the ability to deliver against the requirements of both PSNI and the Utilities sector.

In an ideal world this would be complemented by release of 410 – 415 MHz in Northern Ireland but as per our response to Question 6 we note this would involve alignment and agreement with multiple existing spectrum licence holders.

Cellnex UK does not support allocation of 700 MHz for emergency service use in Great Britain on the basis that:

(i) it is the only viable band for utilities that Ofcom has identified that can be released within required timescales

(ii) the use of a 3GPP based ESN solution in Great Britain means there is a variety of spectrum options to add additional capacity to this network when it becomes fully operational (i.e. this is not a band identified as dedicated for Public Protection and Disaster Recovery ('PPDR') usage)

Question 10: Do you have any comments on our overview of the 800/900 MHz band in NI? Please consider the specific factors we have discussed in your response.

As per our response to *Spectrum for the Police Service of Northern Ireland* Cellnex UK believes the optimal use of this spectrum in Northern Ireland would be for Railway Mobile Radio ('RMR'),

In our response we noted Ofcom's observation that 876 – 880 MHz and 921 – 925 MHz is not used for GSM-R in Northern Ireland like the rest of the UK. However, the Future Railway Mobile Communication System (FRMCS) is likely to be standardised across Europe in the near term in this band, ideally with an expansion to 2 x 5 MHz bandwidth, alongside allocation of at least 1900 – 1910 MHz.

Hence allocation of this band for another use in Northern Ireland may prevent/inhibit technically or economically this critical next generation safety and control technology being deployed across Northern Ireland's railway network.

We also note there is unlikely to be a scale vendor ecosystem to support economic deployment and operation in the near and medium term – see our answer to Question 5 for further details.

Ofcom should not seek to allocate the 876 – 880 MHz and 921 – 925 MHz to utilities in Northern Ireland.

Question 11: Do you have any comments on our overview of the 1900 MHz band in GB and NI? Please consider the specific factors we have discussed in your response.

As per our response to *Exploring Future Use of the Unpaired 2100 MHz (1900 - 1920 MHz) Spectrum* Cellnex UK believes the optimal use of this spectrum is to support FRMCS deployment across the railway industry as:

- The need to run GSM-R and FRMCS in parallel requires additional spectrum to be allocated for Railway Mobile Radio ('RMR')
- 1900 MHz – 1910 MHz has been harmonised by CEPT for RMR; hence a European wide ecosystem of testing, equipment, deployment and other associated services will emerge delivering significant economies of scale
- If the UK were to select an alternative spectrum band to deploy RMR it would incur considerable economic and operational disadvantages

In addition there are potential future requirement for higher capacity safety critical applications (e.g. live CCTV feeds from Level Crossings to trains) which may require up to 20 MHz of contiguous spectrum. Fortuitously in the UK this could be achieved by allocation of 1900 – 1920 MHz to FMRCS ensuring a 'future proofed' outcome and spectrum roadmap for the UK rail industry over the next 20 years.

11.1 Usage by Utilities

As per our response to *Exploring Future Use of the Unpaired 2100 MHz (1900 - 1920 MHz) Spectrum* Cellnex UK believes that whilst use of this spectrum by utilities would be more optimal that its current non-use, we believe that usage by the rail industry would be more optimal than that of utilities.

In addition as outlined in our answers to the other questions in this consultation we believe allocation of sub 1 GHz spectrum is needed given the requirement from utilities for extensive nationwide geographic coverage via economic macro site counts; this would not be compatible with use of the 1900 MHz as the primary coverage band.

Allocation of the 1910 MHz – 1920 MHz to utilities could be considered as an additional capacity layer which complements a sub 1 GHz allocation, whilst still preserving the 1900 MHz – 1910 MHz for FRMCS, but as per above this risks constraining the development of future rail use cases.

However we also note that deployment has not occurred in this band to date, as a result there is unlikely be a scale vendor ecosystem to support economic deployment and operation in the near and medium term – see our answer to question 5 for further details.

Ofcom should not seek to allocate the 1900 MHz – 1910 MHz to utilities and should consider very carefully whether to allocate 1910 MHz – 1920 MHz to a non-rail use case given the potential longer term requirements of the UK rail sector.

Question 12: Which band(s) do you consider we should examine further with a view to developing consultation proposals to enable their use in a private network, if this were needed? Please reference the factors we have considered where appropriate and provide separate answers for GB and NI if relevant.

As per our answers to prior questions Cellnex UK believes Ofcom should urgently consult on release of the following band:

- 700 MHz for Great Britain and Northern Ireland

Ofcom should then determine if it is viable to release the following band:

- 400 MHz for Northern Ireland

Whilst in parallel commencing activity for a full replan of the 450 MHz band, which is also required due to a number of non-utilities factors; targeting allocation of 2 x 5 MHz of spectrum in this band for utilities, matching the growing allocation of spectrum in this band to utilities across Europe.

Ofcom should target urgent release of 700 MHz in Great Britain and Northern Ireland, confirm quickly if release of 400 MHz in Northern Ireland is viable, alongside commencing parallel work to reconfigure the 450 MHz band to enable additional release in this band in the mid-term.