

making communications work for everyone

Your response

Question	Your response
Question 1: Have we correctly identified the key changes in the utilities sector that could lead to additional spectrum requirements?	Confidential? – No The consultation correctly identifies the key factors that are driving increased demand by the utilities sector.
	As the sector undergoes substantial digitalization and grid enhancements, the role of enhanced communication capabilities becomes critical for ensuring efficient network management and rapid response during emergencies - maximising the effectiveness and efficiency of business operations. Private network designs align well with the sector's demand for dedicated, resilient, and data centric communication solutions.
	Deployment of critical communications systems is highly complex, and a phased approach to transitioning any system is strongly recommended. New and existing systems must operate in parallel for long

	periods of time to allow for smooth
	implementation. The existing
	communications systems of the utilities
	while now communications notworks are
	while new communications networks are
	deproyed to support evolving applications
	and changes to network architecture. The
	selection of new frequency band(s) based
	on leveraging existing intrastructure is
	important but should not override the
	need to ensure seamless transition of
	legacy to new systems, nor present risk of
	coexistence and interference. The
	process of selecting new frequency bands
	for utility operations should also give
	strong consideration to avoiding undue
	disruption to other users currently using
	the band for other applications, and
	should not ignore similar needs by other
	users that require increased access to
	dedicated spectrum for their private
	mobile networks. The complexities
	associated with migrating spectrum
	bands of legacy systems should deter
	Utcom from mandating migration of
	existing systems or implementing new
	bands plans that impact a large number of
	existing users under the agenda of
	regional narmonisation.
Question 2: What alternative	Confidential? – No
play a role in meeting the future	While there are other communications
operational communication needs of the utilities sector, alongside or	options for addressing some of the needs
instead of additional spectrum for a	presented by the utility sector, none are as
private network?	effective in offering a comprehensive
	solution as private networks.

In addition to private broadband networks, alternative communication solutions could include a mix of legacy digital business radio networks, scanning telemetry, public mobile networks, satellite connectivity for remote sites that can not be directly serviced by networks, shared private networks, and hybrid networks combining wired and wireless technologies. While these alternatives may be able to provide some utilities providers' applications, they will not be able to holistically replace private networks due to security, privacy, latency, etc., concerns.

Shared private networks, which leverage existing infrastructure shared among multiple users, present an interesting avenue for optimization and costefficiency. This approach has logistical challenges as it requires that all participating utilities agree to a common architecture, governance, integration and migration plan. It also raises risks of multiplying the impact of network failures or cyber attacks compared to the situation where each utility operates its own private and closed networks. From our experience in other markets, setting a common migration path for utilities has proven not to be an easy task. Complexities and dependencies in applications, systems and connectivity requirements combined

	with varying budget and resource planning constraints could impact the execution timeline.
	Considering the pace of technological advancements, it's crucial to maintain an adaptable approach that accommodates emerging solutions. Exploring partnerships and collaborations with specialised communication service providers could offer cost-effective alternatives that align with the utilities sector's operational demands and optimally address the sector's communication requirements while balancing costs and efficiency. As stated earlier, the choice of the frequency band should avoid complex migration or revocation and replanning requirements. Utilities providers are typically resource and budget constrained and rely on proven and robust radiocommunication technologies that remain operational for many years.
Question 3: Are there any other spectrum bands we should consider for use by utilities?	Confidential? – No Motorola Solutions (MSI) recommends that Ofcom consider mid-band spectrum options between 3-6 GHz.
	By examining existing allocations and mid-band spectrum options, exploring shared access and dynamic allocation, coordinating with satellite services, international harmonisation, and considering other emerging technologies,

Ofcom can ensure a robust and forwardlooking approach to spectrum allocation that best serves the utilities sector's transformation and modernization goals.

The ITU Working Party 5A continues to develop a working document towards a draft new report on utilities radio communications. It includes a benchmark on spectrum used or planned in a number of countries and examples of bands to be considered which could be useful to Ofcom once it is finalised.

The candidate bands identified by Ofcom are either already heavily used by utilities and other private business radio users, are reserved for PPDR (Public Protection and Disaster Relief), or have limited ecosystem and support as well as bandwidth to cater for flexible deployment models that enable separate or multiple non-shared private utilities networks.

It is important that the functionality of legacy systems is not impacted while new data-centric services are being deployed in parallel. While MSI does not have a specific band to recommend to Ofcom at this stage, we urge Ofcom to consider all the available bands, including those under study for identification for mobile broadband and those that have not been awarded yet to commercial carriers. 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.

Confidential? No

<u>Bandwidth</u>

The three bandwidths under consideration, namely 1.4 MHz, 3 MHz, and 5 MHz, represent essential building blocks for meeting the utilities sector's communication requirements based on cellular technologies. In addition, 200 kHz channels can also be considered for NB-IoT type communications suitable for utility applications where video data speeds are not required or where video is offloaded onto local area networks. As Ofcom rightly emphasises, the minimum bandwidth needed for a private network in this context has not yet been definitively determined due to the various factors influencing communication demands and network architecture. Nonetheless, the detailed analysis provided in Annex 7 sheds light on the potential capacity and capabilities of these bandwidths, offering valuable insights for decision-making.

Capacity and Services:

Ofcom's capacity analysis highlights that even the smallest bandwidth of 2x1.4 MHz can support a significant number of data connections and voice calls, demonstrating its utility for essential operational communication needs. This underscores the adaptability of the bandwidth options to provide a range of communication services that the utilities

sector requires. It is noteworthy that while all bandwidths can accommodate numerous data connections and voice calls, the provision of video services might be more challenging across larger cell sizes that provide access to more links and users. The distinctions between fixed and mobile video services, and realtime and evidence-based video, are important considerations, as video plays a crucial role in remote monitoring and field operations. Realtime mobile and bodyworn video across verticals including in the utilities work space could create much larger spectrum requirements than those supporting Industrial IoT and smart grids data applications, or that are assumed in Annex 7 or can be supported even on the 5 MHz channel bandwidth that is available in the 400/450 MHz bands. Such requirements could be also planned and addressed via commercial network operators or within local area networks or by providing dedicated spectrum in higher bands, including mid-band spectrum below 6GHz, where sufficient bandwidth can be assigned for utilities. In addition, utilities intending to offload video and heavy data rates applications can consider spectrum under shared access I or local access licences that enable the shared use of spectrum that is already licensed on a national basis to mobile network operators, in locations where a particular frequency is not being used.

Flexibility and Evolution:

The consideration of multiple bandwidth options not only reflects the versatility required by the utilities sector but also allows for potential scalability and future expansion. While the initial communication demands may be met by the lower end of the bandwidth spectrum, the ability to seamlessly scale up to larger bandwidths in response to evolving requirements and technological advancements is a key factor to ensure long-term viability. The fact that some bands are highly congested with existing narrowband and varying types of users, makes their suitability for wider channel bandwidth less desirable and the implementation for new (wideband) communication systems more complex.

Equipment Ecosystem and Harmonization: Ofcom's focus on the harmonisation and equipment ecosystem associated with each bandwidth is crucial. International alignment and standardisation are essential for ensuring a robust supply of compatible devices, driving down equipment costs and accelerating deployment. The availability of an established equipment ecosystem can significantly contribute to the successful implementation of a private network for utilities, enabling cost-effective access to necessary infrastructure.

Most of the bands proposed for consideration with the possible exception of the 700 MHz Band 28 are not widely supported by commercially available devices of different form factors or widely deployed to achieve strong economies of scale. MSI recommends that Ofcom avoid repurposing the 410 MHz and the 450 MHz bands for new networks due to the large existing user base, including utilities. With more than 49,000 licences issued for narrowband business radio users in the 410-470 MHz bands, repurposing would cause great disruption and high costs for a large segment of enterprise users, including utilities



Source. Ofcom Wireless Telegraphy Register July 2023

MSI commends Ofcom's thorough analysis and transparent approach in evaluating the bandwidth options for a private network to support the utilities sector. The methodology, which considers capacity, services, flexibility, and harmonisation, provides a comprehensive foundation for informed decision-making.

	The exploration of various bandwidths, coupled with the detailed capacity analysis, positions Ofcom to make a well- informed determination that aligns with the evolving needs of the utilities sector and advances its transformation. The final solution is likely to be that more than one band is required to meet future needs of operating a common network. One scenario could result in identifying one frequency band that would accommodate a wide-area network, and another band to accommodate local-area networks supporting real time mobile video requirements within the utility's facilities.
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?	Confidential? No Ofcom's commitment to considering a range of factors relevant to assessing suitability, as outlined in Annexes 7 and 8, is commendable and provides valuable insights for informed decision-making.
	Of particular significance is Ofcom's exploration of coverage implications based on frequency bands. The recognition that radio signals at lower frequencies can offer broader coverage areas underscores the strategic advantage such bands can offer for deployment efficiency and cost- effectiveness.
	Ofcom's observation that a slight increase

in transmit power at 700 MHz could achieve coverage comparable or more coverage to that of the 450 MHz band is an important consideration that underscores the potential of the 700 MHz band.

With respect to the 700 MHz PPDR band, the fact that this band is not currently in use is not an indicator on the development of the ecosystem or that the device ecosystem suitable for PPDR or utilities is underdeveloped. The 3+3 MHz blocks are part of the 700MHz 2 x 45 MHz LTE band 28 duplex B. Even when devices are not certified to operate in the 3 MHz blocks, the RF chipsets support it by hardware as this is required for all band 28 devices that operate the full 2x45 MHz. In the United Kingdom a 2 x 30 MHz is licensed to carriers and a 2 x 3 MHz is reserved to PPDR. In principle all devices that support band 28 must be able to operate across the full frequency range as they roam to other networks operating across the full 2 x 45 MHz. That capability might not be supported in software or certified in CEPT countries unless it is required or allocated for PPDR or other use.

The existence of an equipment ecosystem that aligns with the utilities sector's needs is a critical factor in ensuring successful and cost-effective deployment of a private network. This fact, coupled with the

	potential for this band to cater to the sector's coverage requirements, presents a strong case for its consideration provided emergency services do not have reasonable concerns about sharing with utilities.
	Ofcom's transparent and detailed methodology establishes a solid framework for a comprehensive evaluation of spectrum options and their associated implications. Nonetheless, MSI urges Ofcom to be ever mindful of underestimating the complexity of managing co-existence, and the risk of forced revocation and increasing potential interference.
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.	Confidential? No The heavy use globally of the 400 MHz band for private and business narrowband mobile radio continues resulting in smaller potential for broadband single channel private networks. In addition, to facilitate access to wider channels, there is need to coordinate with existing users/owners of the spectrum, including: (1) coordinating with with the Police Service of Northern Ireland (PSNI) for the lower 2x2 MHz pair; and (2) establishing interference protection agreements with existing users outside NI
	(<i>i.e.</i> , Airwave in England, Wales & Scotland); and

(3) establishing interference protection agreements with existing licensees (Arqiva/Airwave) for the upper 2x2 MHz pair.

Establishing strict protection criteria for 400 MHz narrowband systems from broadband networks would be required. That would affect any new infrastructure design and increase new base station equipment and deployment costs as a result. There is also a need to work with the Ministry of Defence (MOD) to address arrangements for the protection of Fylingdales radar and other MOD uses. While seemingly offering slightly lower site build costs (slightly lower number of sites), the timeline for access is dependent on shared usage or cessation of current PSNI use as well as the interference protection requirements mentioned above. Of com should consider different interests and promote competition and efficient spectrum use while protecting users from interference.

The existing assignments for Arqiva/Airwave and use by MOD and PSNI could result in restricted geographic deployment and reduced power limits to this band for utilities as well as prolonged time frames for implementation.

Question 7: Do you have any comments on our overview of the	Confidential? No
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.	MSI does not support reconfiguration in the United Kingdom to align with the harmonised band plan for the 450 -470 MHz for broadband.
	The proposition of introducing a broadband channel within the 450 MHz band is undoubtedly complex, particularly in light of the existing user landscape and the diverse applications it currently supports. As per Ofcom's assessment, this spectrum is indispensable for an array of critical functions, encompassing business radio, emergency services, PMSE, scanning telemetry, and more. It is evident that each of these use cases comes with unique operational requirements and investment structures and that it's very important to maintain regulatory stability, protection and assurance for existing users.
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	Confidential: No No, MSI does not believe that there is a good case to re-examine the 450 MHz band.

plan?

Ofcom's assessment thoughtfully highlights the potential benefits of aligning with a harmonised band plan, leveraging the associated equipment ecosystem and paving the way for broadband deployment. However, these potential advantages are accompanied by the risks and complexities tied to prioritising utilities' needs over those of other private network users in the band and the risks of interference resulting from introducing broadband channels next to narrowband including those for emergency services.

One of the most prominent challenges lies in orchestrating the migration of numerous existing users to accommodate the introduction of a broadband channel. This transition is made all the more intricate due to the diverse nature of these users' operational requirements and investment timelines. Striking a balance that addresses utilities' demands without disrupting the services provided by these existing users would be exceedingly difficult. The time necessary to complete a fair transition would unduly delay the introduction of broadband networks for utilities.

It is important to acknowledge that favouring utilities interests over other private network users in the band could potentially lead to concerns and objections from these stakeholders. A transparent and inclusive dialogue is crucial to ensure that these risks are fully understood and managed effectively.

The number of users impacted by

repurposing or replanning the 450 MHz band would far exceed the 3,700 users referenced in Section 5.29 of the consultation. Ofcom's WTR database used in our analysis shows that there are close to 41,000 licences of business radio users in the 450-470 MHz including emergency services and other users.



Source Ofcom WTR

The graph above indicates a high reuse factor of frequencies used by more than 41,000 licences available for business radio applications in the 450-470 MHz band. These licences could be at risk of being forced to migrate as a result of introducing a single carrier band across the 451-456/461-466 MHz or 452.5 – 457.5 462.5–467.5 MHz bands for utilities.

Further, the introduction of a wide channel requires additional internal guardbands and RF mitigation measures that could restrict many more users in the band and limit their ability to expand their systems. When duplex arrangements are aligned in

the band, introducing a wideband channel adjacent to narrowband requires careful technical design and agreed regulatory provisions to protect incumbents. Measures include internal guardbands, mandating higher performing filter levels on the LTE base stations for improved out of band emission (OOBE) performance, defining limits on measured power on ground (PoG), design limits on sites, and defined power flux density (PFD) limits contours to protect critical/public safety and the narrowband enterprise business radio licensee. Protection requirements on broadband next to narrowband could also mean that there is unused spectrum acting as guardband which would result in unnecessary waste of spectrum in bands that are populated with users.

If such a large number of users are subjected to forced migration, the risks associated with such a process could outweigh the benefits and should be avoided. Risks include opportunity loss, critical service interruption, interference, invested capital loss, migration, integration and litigation, as well as challenges on resource management, securing substitute technologies and associated cyber and supply chain risks.

For the reasons above, MSI does not support that this band be considered for replanning at this stage and encourages Ofcom to carefully examine other bands for utilities. Protecting existing business radio users and emergency users in the 450-470 MHz and 410-430 MHz bands aligns with Ofcom's responsibilities to consider different interests and promote competition and efficient spectrum use.

Confidential? No

Section 6.4 of the consultation highlights that the 700 MHz PPDR band could include users such as the Police Service of Northern Ireland (PSNI) for their communication needs and the utilities to utilise the spectrum in a shared capacity. The possible Home Office interest in use for ancillary requirements also adds a layer of complexity to the allocation and use of this band for utilities.

The 700 MHz PPDR band represents a significant development that facilitates cross-border and international coordination. The harmonised technical conditions for this band within CEPT have paved the way for planned PPDR network deployments across Europe. The harmonisation of the 700 MHz PPDR band proposed by Ofcom for use by utilities is unique as in other countries there is a 5+5 MHz below Band 28 (698-703 MHz paired with 753-758 MHz) available for PPDR in addition to the upper 700 MHz PPDR

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.

band. Together they constitute a wider flexibility for implementing PPDR broadband in CEPT member states. Since in the United Kingdom the remainder of the block is assigned a supplementary downlink SDL to EE (formerly "Everything Everywhere") service provider, the lower 700 MHz 5+5 MHz block below (band 68) is not available for PPDR purposes. The limits on the use of the upper 3+3 MHz 700 MHz PPDR frequencies is a notable aspect. The anticipated development of the ESN network and PSNI plans for the 700MHz PPDR could be a crucial determinant for the feasibility of utilities utilising these bands alone or jointly with PPDR. Separately, the 700 MHz PPDR (3+3 MHz) under consideration is supported by a large number of ruggedized devices and infrastructure ecosystem providers. This is an integral feature of band 28 duplex B which is supported in hardware by all band 28 LTE devices.

Coexistence Constraints:

The assessment of coexistence constraints in the 700 MHz PPDR band, both co-channel and adjacent, is vital for ensuring efficient spectrum use. The potential for interference from SDL transmissions, particularly in urban areas, requires careful consideration. The distinction between potential interference from PPDR handset transmissions to SDL reception and interference from SDL base station transmissions to PPDR base station receivers is a significant factor that needs to be addressed. The exploration of options to mitigate these interference risks is commendable and will be essential for ensuring smooth coexistence and a better decision on the suitability of this band for PPDR and for Utilities.

Enabling Use for Utilities:

Mitigating the risk of interference from SDL to utilities base stations is a critical step for enabling the use of the 700 MHz 3+3 MHz band. Collaboration between prospective utilities users and the SDL band licensee (currently EE), and the adjacent channels by EE and 3 (Three) service providers, to manage this risk through technical and commercial arrangements is essential. Ofcom should facilitate this collaboration. Additionally, the development of a suitable equipment ecosystem tailored for utilities use will play a crucial role in determining the viability of this band for utilities sector transformation. The potential for competing demand among different users highlights the importance of efficient spectrum allocation and sharing arrangements.

Cost Considerations:

The overview appropriately outlines the distinguishing cost factors associated

with deploying a private network for utilities in the 700 MHz PPDR band. However, if power limits in the 700 MHz are increased from 0-3 dB, the Ofcom study indicates similar if not better coverage in the 700 MHz compared to 450 MHz. While the use of the 700 MHz band for utilities is not harmonised, the 3+3 MHz in 700 MHz PPDR is part of the 700 MHz band 28 tuning range. The infrastructure and device ecosystem for 700 MHz Band 28 is more than mature and is superior to that in the 450 MHz. As indicated in OFCOM's analysis, the number of available devices supporting 700 MHz band 28 is already in the order of 5,000 devices (ref. to Sec. 6.6). From a base station and infrastructure perspective, the band has been deployed by commercial carriers and in specialised networks much more than the 450 MHz band. As such the cost benefit of economies of scale of infrastructure and subscriber device ecosystem in 700 MHz blocks (even in the 3+3 MHz) makes 700 MHz superior to 450 MHz.

In conclusion, the overview provides a comprehensive understanding of the key factors related to the 700 MHz PPDR band's potential for utilities sector transformation. The ecosystem in the 410 MHz (band 87) or the 450 MHz (Bands 21 & 72) continues to be slow and underdeveloped especially for handheld

	smart device form factor. The existing ecosystem in band 28 is far more mature. Critical aspects that will shape the effective utilisation of this band include the careful consideration of coexistence challenges, the relatively large support for the wideband which would facilitate rapid development of a suitable equipment ecosystem, and the resolution of competing demands. A thorough analysis of costs and benefits, alongside stakeholder consultation, will be crucial for informed decision-making in the allocation and utilisation of the 700 MHz PPDR band for the utilities sector.
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.	Confidential? No No Comments
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.	Confidential? No No Comments
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.	Confidential? No No Comments