Your response

Question 3: Are there any other spectrum bands we should consider for use by utilities?	Confidential? – N We believe it is essential that any band to be considered for use by utilities is a 3GPP band as standardisation will have notable impacts on implementation timeline, scalability, and cost efficiency. We welcome the fact that Ofcom proposal is based on 3GPP bands, both B31 and B28 below 1 GHz. We are aware of the potential release of the 380-385 MHz and 390-395 MHz paired spectrum in GB which is currently used for emergency services operated by Airwave using TETRA specification. Also, we are cognisant of the 3GPP preliminary work on identifying this band for mission critical 4G/LTE and 5G services. Spectrum released and standardised as 3GPP band will only open the door to this range as another option but even then, there will still be uncertainty in terms of equipment available for Private LTE deployments. Based on the experience on 3GPP bands 87 and 88 this might be a >10 years scenario; this means that utilities cannot afford to meet immediate needs of digitalisation.
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? –N As identified in the ETSI report *ETSI TR103 492* [1], a minimum 2x3 MHz bandwidth in frequency bands below 1 GHz is required for Smart Grid services and applications. Different field tests and proof of concepts of Private LTE for electric utilities use cases carried out in the last years in the UK (i.e. WPD tests in Taunton and Portishead) and in continental Europe (i.e. Iberdrola tests in Spain [2]) have proven that a minimum of 2x3 MHz FDD or 5 MHz TDD is sufficient to comply with the performance requirements of basic, medium and high level traffic profile applications (including Distribution Automation, Network Management and Advanced Metering Services). According to Iberdrola tests, a 5 MHz TDD channel could solve the following performance requirements: • Uplink Throughput >=1 Mbps (Application layer) • Latency <=50 ms • Availability >=99.8% Capacity was enhanced with a multi-sector and MIMO 2x2 antenna configuration. Results of the tests showed a maximum downlink

	throughput of 4 Mbps with asymmetrical uplink results reflecting the configuration of the TDD channel. Security and video surveillance or other applications requiring video streaming were not tested in Iberdrola's pilot deployment. Desktop analysis such as the one carried out by Ofcom in Annex 7 show that 2x3 MHz FDD or 5 MHz TDD will be insufficient to support multiple video applications broadly deployed in Smart Grid assets served by a single cell. As a comment on Ofcom capacity analysis in Annex 7, multi-sector and MIMO configuration should be considered as an option to boost capacity. In terms of latency, Private LTE tests have indicated that, though observed latency is not suitable for tele-protection or inter-tripping of the network, it can provide acceptable latency performance for SCADA, automation, LV monitoring, voice and data transfer. Looking into the scalability of Private LTE towards 5G and potential future use cases, we consider that a minimum of 5 MHz bandwidth should be allocated as this is the minimum viable channel option to deploy 5G technology. [1]*ETSITR103 492* *https://www.etsi.org/deliver/etsi_tr/103400_103499/103492/01.01.01_60/tr_103492v010101p.pdf* [2] *Private LTE Field tests and Results for Smart Grid services*
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? – N We believe Ofcom's approach validating the adequacy of the bands is adequate however we can comment further on coverage and capacity based on our experience and knowledge on Private LTE for utility's use cases. The results of the Private LTE field tests carried out by Iberdrola in Spain over 3GPP B38 TDD (2.6GHz 5MHz) have proven that performance in terms of throughput and latency is strictly related to coverage level. This fact allows utilities to plan deployment of smart grid assets in a deterministic way based on coverage level. Minimum performance required at cell edge will give us the coverage radius that will be used as a reference for RF planning in the different frequency bands. Ofcom's approach of analysing coverage solely based on the downlink path (eNodeB to User Equipment (UE)) could be improved by a further analysis of the uplink path (UE to eNodeB) just because the UE is typically subject to further constraints in terms of EIRP (Effective Isotropic Radiated Power, which is transmission power including antenna gain and cable loss). The conditions of use of the allocated band should consider both eNodeB and UE. The comparison done by Ofcom between bands 700 and 450 MHz proposing an increase in base station transmission power and antenna height could be equally applied to 450 MHz which would also increase coverage levels reducing the Total Cost of Ownership (TCO). However, increasing transmission power might not be possible due to constraints in the regulatory conditions of the bands, increasing antenna heights cannot be taken for granted either.

	Sub-1 GHz bands provide a wider coverage; this means that fewer eNodeBs are required to cover the same geographical area which results in a more cost-effective deployment. SPEN has a number of hilltop sites with vertical infrastructure currently used for Private Narrowband radio (UHF/VHF Point-to-Multipoint digital radio) that could be repurposed as eNodeB locations for Private LTE deployment. If the frequency band allocation is closer to the current scanning telemetry UHF bands, the investment in hilltop sites and vertical infrastructure can be kept under reasonable margins. As per Iberdrola Private LTE field tests on 3GPP B38 (2.6 GHz), optimal and acceptable coverage levels (Optimal with Reference Signal Received Power (RSRP) >= -85 dBm; Acceptable -105 <=RSRP< -85 dBm and Low -120 <=RSRP< -105 dBm) will result in a consistent latency result compliant with Basic and Medium traffic profiles for Automation and Network Management (average latency<100 ms). However, RAN (Radio Access Network) conditions dramatically impact latency in harsh coverage conditions (RSRP below –110 dBm), increasing it up to 5 times. Capacity limit in terms of maximum number of users under a specific traffic profile for 5 MHz TDD channel could not be tested in the field however desktop analysis, such as the one done by Ofcom in Annex 7 of the CFI document, prove that it is related to coverage conditions. As a comment on Ofcom capacity analysis in Annex 7, multi-sector and MIMO configuration should be considered as an option to boost capacity. Full performance requirements (including latency) at cell edge should be considered as part of the capacity analysis.
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? – N Taking into account that ESB in the Republic of Ireland are currently using the 400 MHz for Private LTE it could be very complex to deploy a Private LTE network in Northern Ireland over the same band. Network segregation will be required from the cyber security and regulation perspective which will require additional technical coordination. We also note the challenges and risks associated with Arqiva/ Airwave/ Motorola and Police Service of 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.	Confidential? – N We believe Ofcom's approach is sensible. We note the challenges with the heavy and inefficient use of the band, and we encourage Ofcom to consider the changes to spectrum environment since 2017 and to assess the extent to which the band is currently used. We would like to highlight the significant benefits that could materialise from the alignment of this spectrum to a 3GPP Band that will enable Private LTE deployment with access to available equipment ecosystem and alignment with the energy sectors in Europe. We agree with the point raised by Ofcom on the need to analyse coexistence with Fylingdales radar.

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?	Confidential? – N Reconfiguration of the band is key to a more efficient use of it and to avoid interferences. The reversed frequency arrangement of the current channel plan in the UK compared to mainland Europe will very likely result in interference on legacy narrowband radio in the UK coming from private LTE deployments in continental Europe. Further analysis of the current usage of the band should be completed together with a definition of the requirements for coexistence with Fylingdales radar. We consider that options for a partial-phased replan should be analysed in detail. A phased replan of the band could result into additional capability.
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? – N This band is not a 3GPP band and as such would not be a good option for immediate development of standard Private LTE. We note the currently unused nature of this band in NI, which is otherwise used by railway services elsewhere. We also note the need for developing an equipment ecosystem (which could be more severe considering the small market of NI) and resolution of competing potential demands.
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? – N A key constraint noted by Ofcom in the CFI document is the fact that, despite being a 3GPP Band (LTE B39), there is no available ecosystem in Europe. This would require additional timelines for the vendors to go through the validation and certification process for EMEA deployments. From the technical perspective, we consider that 1900 MHz band would be a suitable option for specific use cases requiring increased capacity. TDD arrangements have advantages such as: • Ability to have separate telecoms networks infrastructure, i.e. there is enough bandwidth available to allocate a 5 MHz range for electricity utilities and another 5 MHz range for gas utilities. • LTE-TDD favours the flexibility to accommodate asymmetrical traffic profiles to suit specific Smart Grid use cases and applications that require a higher downlink or uplink data rate. However, TDD arrangements typically provide lower level of coverage requiring a larger number of eNodeBs to cover the same geographical area. That added to the fact that 1900 MHz is a higher band than the rest of bands proposed (all sub-1 GHz) means that the TCO to deploy a Private LTE network in 1900 MHz to serve rural Smart Grid targets not covered by public cellular will significantly increase.