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? N **System not networks** The Call for Input (CFI) clearly and concisely summarises key aspects of the energy system transformation that will help achieve Net Zero. Its focus on operational communications for the networks addresses an important requirement for successfully responding to the transformation challenge. However, the networks are only one part of the energy system. Transformation means acting across the whole energy system and not just the networks: ▪ Across the value chain – source, delivery, consumption; in the case of electricity this means generation, transmission net-works, distribution networks, storage and use ▪ Across vectors and sectors – heat, transport, power, business and industry including high consumption industries ▪ Across infrastructure, technology, business models, markets, innovation, policy, regulation and societal engagement ▪ With perspectives at the home, community, local, regional, national and global levels. Critically the interactions, interdependencies and trade-offs between and amongst these parts of the system must also be understood, being mindful that these will be changing over time. The CFI is centred on the operational needs of the electricity distribution networks. It can be argued that bias to electricity is reasonable given the expectation that electrification will be a central part of decarbonisation, but it should be acknowledged that gas networks will continue to play a role, including as they potentially transition to hydrogen. Heat networks may also become more significant. Distribution networks are important players but as the electricity system becomes more distributed and decentralised, new players will be active and functions will be performed at various points in the system. For example, storage assets will be deployed at generation, transmission, distribution and consumer sites and in Electric Vehicles; their use will require communications-enabled

interaction across the whole system if their operational and commercial value is to be accessed and realised.

The networks and their operational integrity are critical in the future system. This underscores the importance of the CFI and its foundational contribution to understanding the overall communications system capabilities required.

Digitalisation and communications systems

Digitalisation… and the communications systems that underpin it… are rightly highlighted in the CFI as drivers and enablers of energy system transformation. Digitalisation of the energy system creates a very substantial and growing co-dependency between digital systems and energy (electrification in particular); when one fails, both will fail unless specific measures are taken. The consequences of not having appropriate communications systems and infrastructure in place amount to no less than placing energy system resilience and security of supply at risk.

Digitalisation means that more communications connectivity will be required:

- More actors and devices will be connected and exchanging substantially more data and interacting more … hundreds or thousands will become many millions or tens of millions or hundreds of millions…
- Connectivity may be needed in places where it is not readily available today.

Transformation does not mean new forms of connectivity must be invented, but…

- Connectivity will be supporting new uses, some of which will be technically or commercially critical or will be necessary to deliver good service to consumers
- The attributes of the connectivity may be different than in the past and will vary across applications/uses: latency, band-width, utilisation, reliability, quality, for example
- New integrations may be needed.

High levels of resilience and security will be critical.

Emerging system requirements

Operational communications in the networks are essential to enable the overall system, but there are other requirements in the energy system where secure, reliable, resilient and available communications will be needed; some examples include:

- Enabling whole energy system optimisation, not just network operation

- Enabling the distribution and decentralisation of assets including generation and storage assets on both sides of the customer meter
- Enabling the uptake of low carbon technologies such as Electric Vehicles
- Enabling the connected home and its low carbon heating and cooling
- Delivering price signals on a timely basis to allow consumers to obtain the lowest prices for energy
- Supporting new players bring new value propositions, services and business models to the sector
- Integration of energy services with offerings from other sectors to deliver new customer value
- Enabling interaction with consumers who wish to participate in new markets
- Supporting good customer experience when engaging with the energy system
- Collecting data that drives policy development and new regulatory models
- Enabling the flow of information between stakeholders that will support good operational, commercial and service decision making
- Enabling the introduction and use of Digital Twins to facilitate planning and operations in a more complex energy system
- Increasing levels of operations and service automation through traditional and advanced techniques such as Artificial Intelligence.

All of these must work together technically and commercially for the benefit of people and the communities in which they live and work. This further underscores the importance of the CFI and its foundational contribution to enabling operational aspects of the required capability.

Urgency

The urgency of energy system transformation is made real in key commitments from Government:

- Net Zero Green House Gas emissions in the UK by 2050 (2045 in Scotland)
- 68 percent reduction in emissions by 2030 compared to 1990 levels
- 78 percent reduction in emissions by 2035 levels

	▪ Sale of new petrol and diesel vehicles to be banned from 2030, with hybrids to follow in 2035 ▪ Gas boilers to be banned from new housing in 2025, and households will no longer be able to buy gas boilers from 2035 ▪ Net Zero Power System 2035 (subject to security of supply) These commitments must be achieved in the context of an emerging highly distributed system architecture, intermittent generation, increasing amounts of storage, substantial change on the demand side and the need for flexibility in the management of supply and demand. In addition, the power system will carry the task of enabling significant decarbonisation in sectors on the demand side. Operational communications must be available on a timely basis to support the change that will be needed to meet these statutory commitments. By serving the requirements of the networks, operational communications will provide one of the key communications capabilities for enabling system-wide change in the near and longer terms.
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?	Confidential? – N Communications systems and the services they provide must explicitly respond to the specific and urgent demands of energy system transformation and its reliance on digitalisation. This includes requirements for security, resilience and availability. The likely solution will be a combination of technologies which will evolve over time in response to change in the energy system, more deeply embedded digitalisation, innovation in communications technologies and systems and the insights from experience of use. System integration will be a bigger question than technologies… and integration must explicitly address technology, processes and people. A systems integration approach will address the important question of when fixed, mobile, wireless or satellite technologies, public networks, private slices of public networks, private networks (wide area dedicated critical control networks) will be used and how they will align and integrate with each other and with other forms of connectivity including the internet to build portfolio-based solutions that deliver the capabilities and services needed. As the CFI foresees, in this context it is important to acknowledge the role of private networks that are specifically designed and configured to address the operational needs of the energy networks.

	Communications systems requirements are not fully knowable in advance nor absolutely certain, and never will be, given the uncertain and dynamic nature of energy system transformation. There will never be a perfect set of requirements for communications capabilities nor a perfect plan for delivering solutions. However, this should not be taken as a reason not to act. Specific solutions to respond to anticipated, well-founded requirements, that are strategically based, architecturally flexible and deliverable should be progressed. These measures will provide capability needed in the near term and if well implemented will provide a foundation for evolving system level solutions. This underscores the importance of the CFI; placing its work in the context of a whole systems approach to energy system transformation will enable alignment and assurance of purpose and direction. Ofcom will have a key role in the community that is focussed on energy system transformation. Its efforts and contribution will align with and be integrated into the work of the (emerging) Future System Operator (FSO); the ENA Strategic Telecommunications Group (ENA/STG) and the JRC; the offerings of Smart DCC; emerging thinking on the Internet of Energy; Business As Usual in the networks and elsewhere; Government (Department for Energy Security and Net Zero; Department for Science, Innovation and Technology; Climate Change Committee, National Infrastructure Commission) and Ofgem initiatives; the PSTN retirement and 2G/3G sunsetting programmes; trials and demonstrations in Network Innovation Allowance (NIA), Network Innovation Competition (NIC) and Strategic Investment Fund (SIF) projects and work in the trade bodies. The ESN programme would also seem to be relevant. The CFI addresses a critical aspect of this; the important role of operational communications in achieving required outcomes highlights the urgency of making progress in this area.
Question 3: Are there any other spectrum bands we should consider for use by utilities?	Confidential? – N No response provided.
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	Confidential? – N No response provided.

our capacity analysis in annex 7 where relevant.	
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 No response provided.
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 No response provided.
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 No response provided.
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 No response provided.

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.	Confidential? – N No response provided.
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 No response provided.
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 No response provided.
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? – N No response provided.