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Need for Increased Spectrum Allocation and Investment in Operational Telecommunications (OT) to enable the Electricity Networks to facilitate the 'Net Zero' transition

Position Statement of Strategic Telecommunications Group

What is ENA?

Energy Networks Association (ENA) represents the 'wires and pipes' transmission and Distribution Network Operators (DNO) for gas and electricity in the UK and Ireland. Our members control and maintain the critical national infrastructure that delivers these vital services into our homes and businesses. ENA's overriding goals are to promote the UK and Ireland energy networks ensuring our networks are the safest, most reliable, most efficient and sustainable in the world.

Confidentiality and Limitation Statement

This position statement has been prepared by the ENA and the Strategic Telecommunications Group (STG) members to raise awareness in government, regulators and the wider stakeholder community concerning the changing needsof OT for electricity networks.

Strategic Telecommunications Group Members (Electricity)

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Need for Increased Spectrum Allocation and Investment in Operational Telecommunications (OT) to enable the Electricity Networks to facilitate the 'Net Zero' transition

Position Statement of Strategic Telecommunications Group

Introduction

Electricity networks in the UK are operated in a co-ordinated way by multiple network operator companies [1] split into transmission and distribution. Collectively, the electricity networks serve all the customers connected to these networks across the UK at all levels of demand from single dwellings, villages, towns & cities without discrimination.

Energy Networks Association (ENA) supports the network operator companies in the UK and Ireland ensuring that electricity transmission and distribution networks are safe, reliable, efficient and sustainable and are developed in a co-ordinated and collaborative way.

Traditionally, in support of the electricity transmission and distribution networks, OT have only been required to operate singularly, switching remote switchgear [2] and plant to manage the network with provision of limited monitoring type data from key locations. As electricity networks develop and become more automated and actively managed systems OT have an essential role in maintaining safe and reliable electricity supplies across this Critical National Infrastructure (CNI), which is crucial to the long-term economic success of UK plc.

The development of so-called ‘Smart Grid’ functionalities, distributed generation and the consideration for ‘Whole System Networks’ means there is now an immediate requirement for OT systems to facilitate the transfer of increased levels ofcontrol and telemetry data from lower voltage levels. This increased data flow arises from the application of more active network monitoring and control, where real time response is required to efficiently and safely manage network capacity and energy supply. Enhanced OT systems will allow electricity networks to respond dynamically to increasingly complex and uncertain power flows arising from the flexible supply / use of electricity leveraging increases in storage capacity and Distributed Energy Resources (DER) e.g., solar and wind.

This document is the result of an initiative by ENA and the Strategic Telecommunications Group (STG), bringing together its Distribution Network Operator (DNO) and Transmission System Operator (TSO) members and the Joint Radio Company (JRC), for the common purpose of identifying how OT are transforming and what enhanced capability needs to be delivered to address current and future challenges.

Enhanced access to the radio spectrum by network operators is key to enabling this enhanced capability and the resultant benefits of increased network reliability, more cost-effective provision of energy and increased value for energy consumers. The efficient transfer of operational data across the electricity network is a core requirement for enabling the transition to a low carbon economy and addressing the ’Net Zero’ ambitions of UK Government.

The position of ENA and STG members has been consolidated within this position statement, with respect to:

- current Operational Telecommunication systems and their critical dependency on access to the radio spectrum.
- anticipated developments in Operational Telecommunications under consideration by industry.
- the critical importance of enhanced access to the radio spectrum and the significant benefits that this will have for the energy industry and UK energy consumers.

The following narrative seeks to set out the industry position and is informed by a question and answer (Q&A) process undertaken by the members of the Strategic Telecommunications Group.

[1] Network operators are privately owned businesses that hold licences for the transmission and / or distribution of electricity for specific licence areas in the UK. The energy regulator Ofgem issues these licenses.

[2] Switchgear are operational assets, which can be remotely controlled to switch electricity network circuits.

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S1. Operational Telecommunications (OT)

“What does OT do?”

The electricity networks are currently remotely monitored and managed by regional control centres with each license area managing their own assets, Control engineers can manually open and close switches to control the flow of electricity. OT can also be used for Active Network Management systems (ANM) which can automatically operate equipment in response to a fault or load situation without the need for manual intervention to maintain power for our customers.

A mix of communication technologies are used to do this, both private build (owned and operated by the electricity companies) and via third party communications providers (CPs). Where control of the assets is critical to the operational integrity of the Electricity Network private solutions are deployed, where the system is designed to retrieve status, alarm or load information, i.e. monitoring only, CPs can be used. Collectively these solutions are referred to as Operational Telecommunications or OT

OT:

- provide end-to-end communications to remotely monitor and manage assets that are critical and dispersed across the national infrastructure supplying electricity to customers.
- connect remotely located electricity network assets with centralised control centres and communicate operational data necessary for the safe, resilient and efficient operation of UK plc's electricity networks.
- assist in keeping customers safe by providing communication channels for automatic tripping and protection elements to disconnect parts of the electricity network when they develop faults.
- reduce supply interruptions and enable quicker restoration of supplies to customers in the event of electrical faults on the network.
- facilitate remote operation of equipment, whether manual or automated.
- enable voice communications between control engineers and field operatives.

“What is the difference between network operation and data acquisition?”

Network operation is the real-time centralized management, monitoring and configuration of the live electricity network and is generally referred to as ‘remote’ or ‘automated’ operation. The main benefit of this is a reduced requirement for manual operation by field staff.

Examples of Operational Telecoms include:

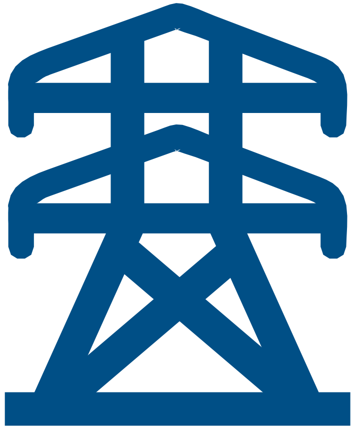
- switching circuits in and out of service in response to changes.
- obtaining information from the live electricity network, which can be used for real-time monitoring of the network, typically the voltage and current for feeder circuits.
- operational type data necessary for the safe operation and monitoring of the electricity network, which is also stored and used by other departments to assist with capacity planning.

Management, determining network performance and pre-empting issues with network operation. More generally, data acquisition within the electricity industry is the data collected for metering and wider Internet of Things (IoT) functionalities. Billing, usage profiles, demographics, control of home appliances and other consumer services rely on the communications that collect this data. General data acquisition can be seen as ‘value added’ data that is not critical for ensuring continuity of supply to customers.

[3] Control engineers are based in centralised control rooms dotted across the UK, each one owned by an electricity network operator, and oversee the ‘real-time’ management of the electricity network for their network operator's particular licensed area.

“Why is OT essential to the operation of electricity networks?”

The OT infrastructure enables ‘real-time’ control and collection of data[4] concerning thestatus of electricity networks, which are essential for maintaining secure and reliable electricity supplies.



Control centres and engineering teams are reliant on OT to manage the electricity networks effectively and to co-ordinate network operations between DNOs, TSOs and generators.

Data obtained from OT is also used to determine optimal network running conditions and to plan for future demand / consumption, and where possible, theconnection of distributed generation and battery storage to help meet demand.

Without OT control centres would be:

- blind to the state of the electricity network and associated equipment.
- unable to determine whether power is being supplied safely to its customers.
- without the capability to switch electricity around the network in order to maintain supplies to customers.
- unable to remotely isolate sections of the electricity network, where the safety of the public could be at risk.

Maintaining the integrity of electricity networks without effective OT would require a significant increase in distributed field operatives to manually monitor and control the networks, resulting in increased costs to customers and increasedtimes to restore supplies following faults on the network.

OT contribute significantly to improving thereliability and efficiency of the electricity network, improving customer experiences without impacting on end-user costs.

OT are key to ‘whole system’ electricity network optimisation by facilitating the connection and management of generation and demand technology. Traditionally, this has been concentrated at large single sites, but such technology is becoming much more widespread and embedded lower down in the distribution network, including for solar generation (PV), electric vehicle (EV) charging and battery storage. Effective management of the impact of these technologies and applications requires OT.

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[4] Data such as frequency, current, voltage, power flow etc.

"What happens if OT fail?"

If OT fail, the electricity networks will continue to operate in its last known state. However, the centralised control centres would lose visibility and remote management of the electricity network and become 'blind' to the status of the network.

A fault on the electricity network during this period of communications failure, would result in significantly more customers losing supply and being without supply for significantly longer periods. In addition, this situation could result in increased damage and repair costs for affected equipment on the network.

Looking ahead to the DSO transition [5], there are additional consequences and risks resulting from local networks becoming overloaded if OT fail. The lack of visibility and control, at the local network level, of demand and generation may well result in loss of supply to customers and increased costs for repair of the affected network – ultimately leading to increasing costs to customers. It would also result in reduced benefits being derived from low carbon technologies both for individual customers and the networks as a whole.

Efficient restoration of the electricity network via the Electricity Restoration Process in the event of a large-scale loss of supply (known as "Black Start"), is also critically dependent upon the availability of OT. Hence these communication systems need to be resilient to power outages and ancillary system failures.

[5] DSO transition will require electricity network operators to use the flexible nature of customer demand or generation to manage power flows on the network. The transition, regardless of which commercial model is decided upon, will enable network operators to have greater visibility of the operational status of local networks. This in turn requires the installation of monitoring equipment and the transfer of data from those devices to central locations.

Without secure, reliable and resilient OT, it would:

- be difficult to maintain the integrity, efficient operation and safety of the electricity network.
- be difficult to maintain supply to customers in fault situations.
- not be possible to monitor and control the flow of electricity.
- lead to significant delays in the restoration of supply to all customers, including vulnerable customers and communities.

S2. Benefits

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“How does OT restore supplies more quickly?”

OT allow prompt remote control of switching devices on the electricity network and avoid delays associated with dispatching field staff to sites to perform these switching operations.

A fully managed OT infrastructure also facilitates swift supply restoration, where remote diagnostics can identify the location and type of faults on the electricity network.

In addition, operational telecoms provide the communication paths necessary for automated operation of equipment on the electricity network. When triggered by an outage, these automated operations quickly restore power to potentially hundreds or thousands of customers.

It can also enable the redirection of power to an alternative circuit, bypassing any fault, and restoring supplies [6] thus reducing restoration times.

[6] Restoration of supplies can be automatically or through intervention by a control engineer.

[7] The Electricity, Safety, Quality and Continuity Regulations 1989, as amended, prescribe limits for voltage and frequency in the UK.

[8] Network Codes include the Grid Code for electricity transmission systems and the Distribution Code for electricity distribution networks.

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“How does OT preserve security of supply and ensure operational safety”

OT provide the means by which data can be sent to users or intelligent devices connected across electricity networks.

These devices are designed to:

- operate the electricity network in an optimal manner.
- help maintain security of supply.
- ensure operational safety of network infrastructure, employees and members of the public.

The OT network provides monitoring and remote operation in real-time, which allows electricity networks to be operated within voltage and frequency limits in accordance with applicable Regulations [7], Network Codes [8] and Standards, which are all intended to protect connected customers.

DNOs and TSOs prioritise operational safety and security of supply above other demands, such as low carbon energy sources. The absence of sufficient and appropriate telecommunications capability will inevitably result in constraining these systems impacting the UK’s Net Zero ambitions. Hence the need for a more strategic solution for the provision of enhanced OT capability.

“How does OT benefit customers / society”

OT support the provision of a safe and reliable supplyof electricity to customers by enabling timely disconnection of faulty equipment and reconfiguration of the network duringfaults or planned maintenance works, minimising disruption of supplies to customers.

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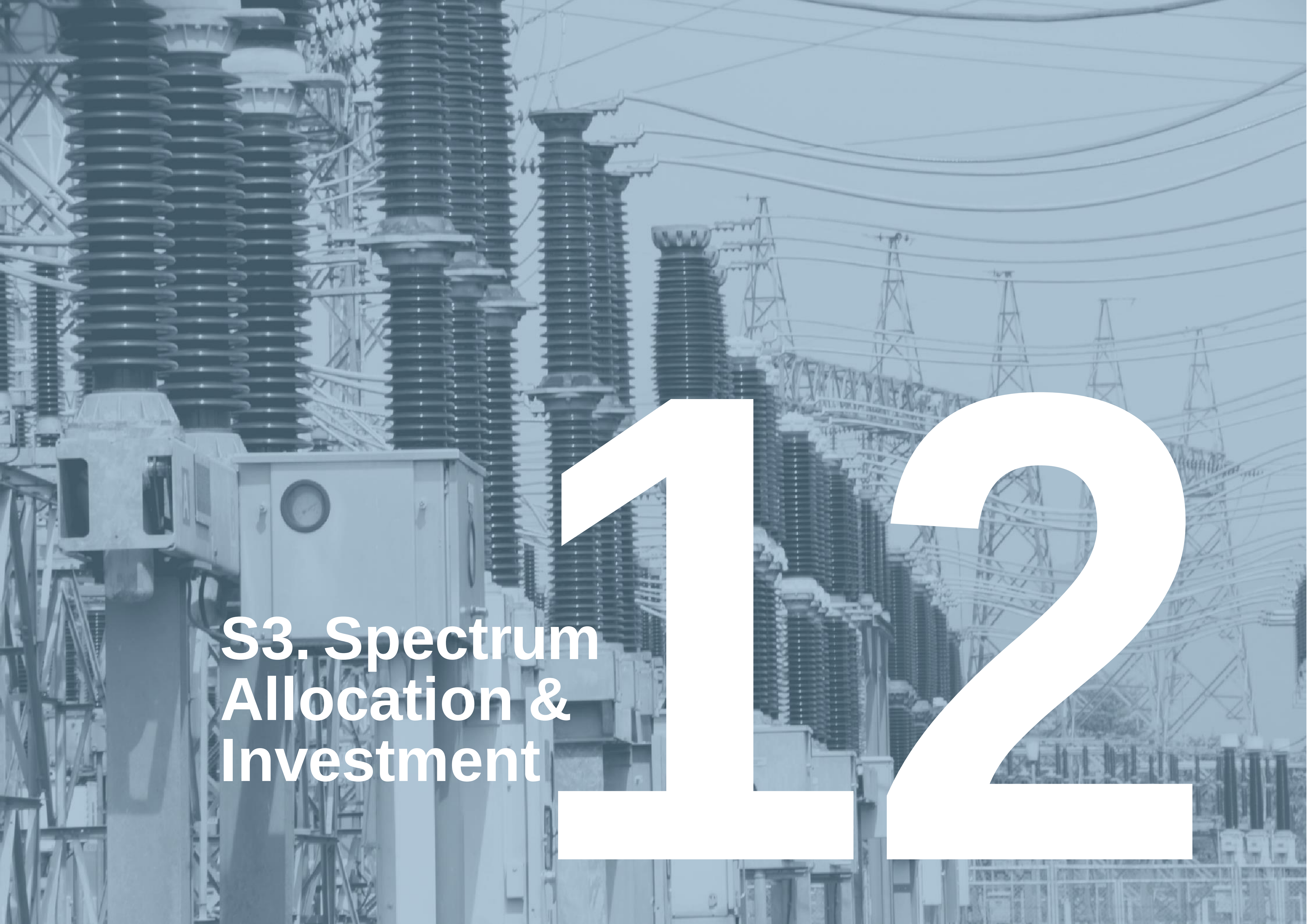
OT allow DNOs and TSOs to meet their licence commitment to provide an economic, efficient and reliable electricity supply. A “connect and manage” approach [9], to new connections is only possible with robust and resilient communications.

Without such an approach the extent of traditional reinforcement of the network required would be greater, with the resultant increasing costs and connection times for new low carbon generation connections.

Without OT, customers would be off supply forextended periods because of the additional time to dispatch fieldstaff and carry out manual switching operations.

[9] A “connect and manage” approach allows generators to connect, subject to meeting certain criteria, which ensures they only generate when network capacity is available.



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S3. Spectrum Allocation & Investment

“What is radio spectrum and why do electricity networks need use of it?”

The ultra-high frequency (UHF) radio spectrum is the part of the electromagnetic spectrum with frequencies from 300 MHz to 3 GHz. Electromagnetic waves in this frequency range, called radio waves, are extensively used in modern technology, particularly for telecommunications. In the context of operational telecoms, it is the available bandwidth in the radio spectrum that is used for radio communication between sites across the electricity network.

To prevent interference between different users of the radio spectrum, the creation and transmission of radio waves is strictly regulated by national laws and coordinated by an international body, the International Telecommunications Union.

The UHF radio spectrum is a commercially attractive commodity, where large commercial telecommunications operators [10] have committed to paying substantial licence fees for access to it. UK electricity network companies intensively use the limited amount of radio spectrum available to them for operational telecoms but are very small users in comparison to the large commercial telecommunications operators.

An alternative to using the radio spectrum is for electricity network companies to use fixed network solutions, e.g. fibre. This is undesirable becauseof the inherently large civil costs and the significant disruption caused to public infrastructure whilst installing the fibre optic or copper cablesto sites requiring communications. Whilst fixed networks are typically used for certain high capacity critical services, they are not financially viable for widely deployed services [11] of typicallylow date rate across a network operator’s licence area

Access to appropriate radio spectrum by electricity network companies is the most cost efficient and technically appropriate option to facilitate dedicated and robust communications to support the volume of smart grid devices being deployed now and anticipated in the future.
As DNOs transition to become DSOs they will become responsible for communicating with these large volume of smart grid devices, which will require increased use of the radio spectrum.

Hence strategic considerations such as availability, resilience and cybersecurity is appropriate, especially where electricity networks are considered to be Critical National Infrastructure. By contrast, for most typical users of the radio spectrum, communications usage is more commercially driven than strategically important. Hence the nature of deployment and operation is very different from that of the electricity networks, which is required to monitor and control critical infrastructure

Such radio spectrum-based communications systems arecrucial to the operational integrity of electricity networks as a whole.

[10] Commercial telecommunications operators include EE, Vodafone, Three, O2.

[11] Widely deployed services include automation of equipment across the electricitydistribution network and provision of large-scale smart grid functionalities.

“Why not rely on third-party / public communication networks for critical network operations?”

Third-party / public communication networks will remain integral to providing a diverse range of communications to support the operation of the electricity networks. In some cases, these communication networks are the obvious solution for certain types of utility applications as they meet all the technical requirements for those applications but at a reduced cost compared to being delivered through a utility private network.

This is due to the TELCOs’ ability to leverage the emphasis of coverage and capacity of their networks in dense population areas resulting from delivering services to the mass market. These networks will continually evolve to meet the demands of the mass market, which is the core commercial driver for the operators of public commercial networks. Utilities will ultimately benefit from this, either through TELCOs offering up better services and products, or by driving advancement in telecommunication technology, e.g. 4G and 5G, which can then be applied to improve existing utility solutions.

Furthermore, the area served by third-party / public communication networks is generally concentrated in areas of high population density. Electricity networks can be located in remote rural areas, where commercial communications operators are unable to provide a service to the level required by electricity network operators.

However, certain utility applications will have higher performance requirements than TELCOs can offer to utilities, particularly around contractual commitments to high availability and reliability of both the telecommunicationsnetwork and its back-up power supply during power outages.
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Utility applications that directly communicate to control equipment in substations must be highly available - that is to say, very reliable with high degree of redundancy to avoid single point of failures.

This is so that the utilities can reconfigure the electricity network to restore power supply to as many customers as quickly as possible. Third-party/public communication networks do not offer this level of service, mainly as the requirements exceed what is required by the vast majority of their existing customers and making the necessary network improvements outweigh the potential revenue gains from a relatively niche sector.

Other concerns are the level of cyber security of some third-party/public networks, given some TELCOs may not be operators of essential services as defined in the Network and Information Security (NIS) Directive, as well as the impact of changes to regulation - such as net neutrality and how third-party/public communication networks may prioritise network traffic going forward.

It is not guaranteed that utilities at present or in the future would be afforded priority above over-the-top (OTT) services such as video streaming services, which may be offered in a bundle by the TELCO itself alongside broadband services.

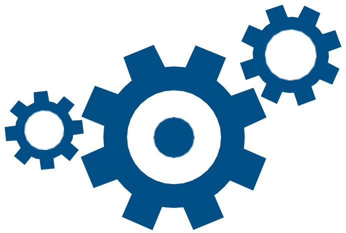
TELCOs can change their business models to access new markets and terminate services and products which no longer serve their new strategies; utility critical telecommunication network infrastructure on the other hand must always be available despite potential changes in legislation, regulation and TELCO business models. Examples of such service withdrawals are PSTN withdrawal and 2G / 3G Sunsetting.

Inevitably this means critical electricity network operations can only be served by an OT network operated independently from public commercial telecommunications networks.

Continuing to utilise private communications networks, taking account of increasing demands, will require access to additional radio spectrum.

14 ***OT networks must also be resilient to loss of mains power supply as these applications are at their most important when they are required to operate the electricity network during power outages.***

Ultimately, utilities have sole responsibility for the electricity infrastructure and therefore the only stakeholder that has a long-term interest in the telecommunications network that operation of the electricity infrastructure is dependent on.



"Why not use shared private networks? For Water, Gas[12] & Electricity – A UK plc utilities communications network"

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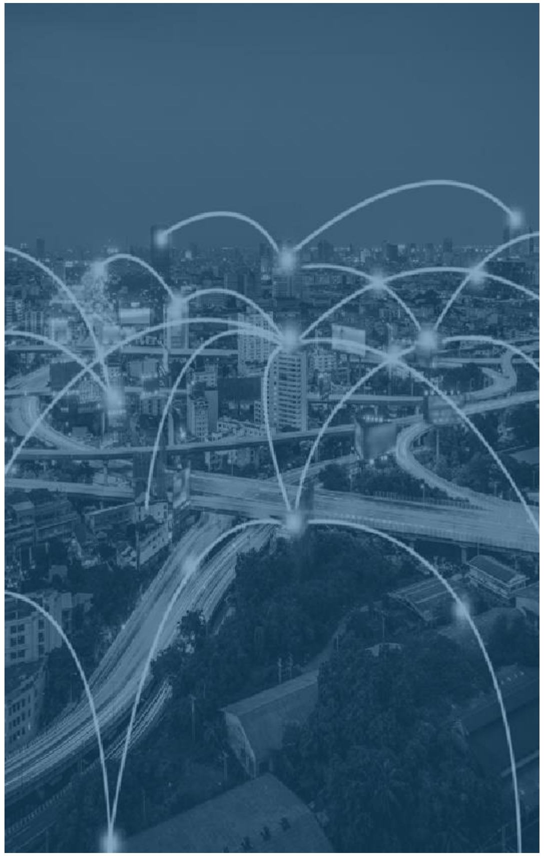


As an electricity networks industry, we believe a shared utilities communications network is worth evaluating and would require facilitation between various Government departments[13] and the UK utilities. It is, however, recognised that as the utility companies are a mixture of privately owned and public limited companies there could be difficulties in establishing and sharing ownership of a new company to create and operate such a communications network.

Notwithstanding, if there was collective agreement by the UK utilities and the technical, commercial and regulatory issues could be resolved, there is no suitable spectrum available at this time that would facilitate the current and forecast communications requirements for this shared utility communications network.

"Why not use the public cloud?"

For the similar reasons concerning use of third-party / public telecommunications networks, the public cloud is unsuitable to the operational control and data acquisition requirements of an electricity network.

- It has no guaranteed and verifiable resilience to power outages and therefore cannot comply with.
- Electricity companies have no control over restoration of the service, if the public cloud fails itself.
- There are security concerns in relation to vulnerability of cyber-attacks.
- Electricity network operators cannot influence the performance or management of the public cloud over time.

[12] It is anticipated that with the emphasis being placed on Hydrogen by the UK Government as an enabler of 'Net Zero' that an enhanced OT network capability will be increasingly relevant to the Gas Network Operators - https://www.gov.uk/government/publications/uk-hydrogen-strategy

[13] DCMS, BEIS, Ofgem and Ofcom.

“Why do you need to invest in new equipment?”

The rapidly changing landscape and the current demands associated with management and visibility of aging technologies means that investment in new equipment will be required to ensure that the electricity network remains safe, secure and reliable over the long term.

The figure opposite shows the relationship between the current telecommunications infrastructure, changing energy needs and the future enhanced operational telecommunications capability. The OT equipment currently employed uses serial communications connectivity but newer equipment being connected to electricity networks is adapted for the digital age and internet protocol IP communications which enables increased functionality.

Therefore, as protection, control & monitoring devices come to the end of their operational life, new replacement assets require IP telecommunications connectivity. The transition to IP based technology has implications for software support, where older versions of software installed in assets can become outdated and unsupported much sooner in the asset’s lifecycle.

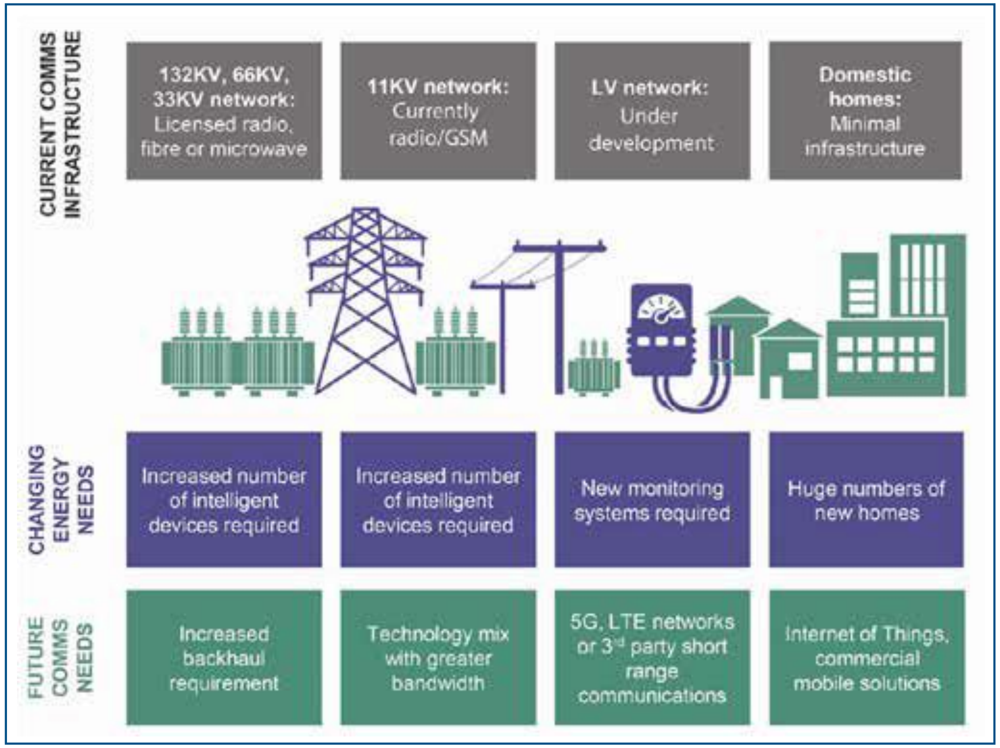
Traditional analogue serial type communications are not susceptible to cyber-attack. However, the vulnerabilities of modern devices using IP communications to cyber-attacks are well documented.

Addressing these security risks are an important consideration for the electricity networks companies. The electricity network operators believe it is now entering a period where replacements of some electricity network assets are significantly influenced by software lifecycles.

This situation will escalate further during the RIIO ED2 period. DSO transition and the increased deployment of smart grid technologies will result in growing numbers of replacement intelligent electronic devices driven by software and enhanced communications requirements.

Investment in new equipment is required to cope with future demand for connections and to provide the bandwidth required to support the upgrading of equipment software at remote sites, which is likely to grow as and when software upgrades are made.

Changing Energy Needs and Future OT Infrastructure



The communications infrastructure currently in use neither has the capability for the anticipated number of new connections required, nor the bandwidth to accommodate the amount of data expected from each new device [14].

[14] Significant bandwidth was simply not required or built-in for previous generations of OT equipment.

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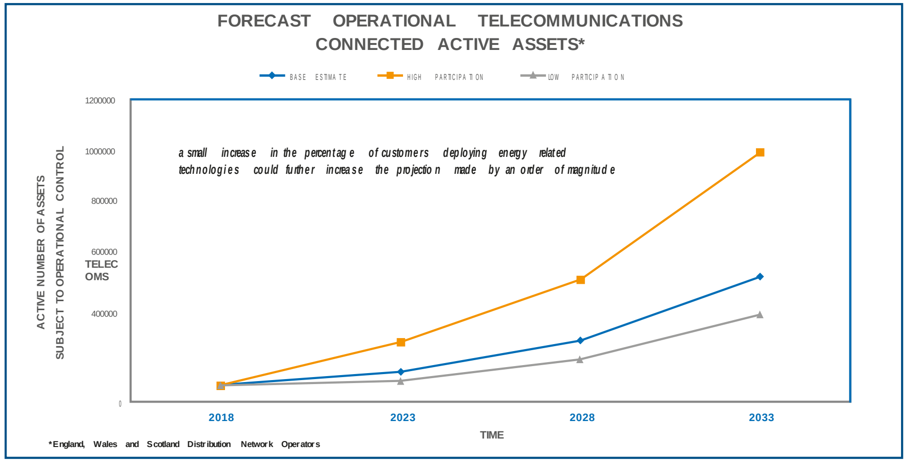
S4. Future Networks

“Are the current OT systems capable of facilitating the DSO transition?”

Whilst current arrangements facilitate wide-scale operation of high-voltage electricity networks, DNOs have virtually[15] no OT arrangements deployed to manage their low-voltage networks. The majority of new OT requirements are linked to smart grid or DSO functionalities that will be deployed on these low-voltage electricity networks. The currently deployed communications arrangements are not scalable or suitable to address these new requirements.

The figure below shows the current and predicted increase in deployment of operational telecoms assets to cater for smart grid and DSO functionalities[16].

Increase in Deployment of Assets Requiring Telecommunications



Typically, DSO functions require reliable and resilient OT(to maintain the integrity of the electricity network). Other smart grid functions, such as network monitoring, require a high level of bandwidth to cater for large amounts of data transfer. Current operational telecoms can selectively cater for small-scale localised DSO activities. However, based on the dramatic increase in active network components and resultant exponential growth in data traffic, the industry considers that the current ‘piecemeal’ approach to OT provision is inefficient and not scalable to the level anticipated to support future smartgrid developments[17].

The current communications arrangements deployed by electricity network operators do not have the capacity or reach to send and receive the information that is forecast to be required for the DSO transition.

Provision of appropriately allocated spectrum for OT is considered to be the strategic and appropriate solution to facilitate the low carbon future demanded by Government and society to address the ‘Net Zero’ challenge.

DNOs and TSOs are already finding their existing piecemeal spectrum allocations ae constraining their ability to improve operational performance; these allocations have been used to facilitate the growth in primary SCADA and secondary automation activities, which are in line with DNO licence obligations to reduce the number and duration of electricity supply interruptions affecting customers.

Currently, the bulk of the power generated in the UK is generated by a number of high capacity generators, which are permanently manned. Therefore, the electricity system can be operated by resilient voice communications to these sites. As the UK migrates towards distributed generation typically connected to the distribution networks, there are already thousands of geographically dispersed unmanned generation sites.

This creates the requirement for significantly more and wider scale communication links than at present which need to be robust, resilient and secure. The responsibility for this communications capability will effectively transfer from the TSOs to the DNOs.

The Open Networks project has reviewed operational telecoms requirements for the DSO transition; the report can be found at http://www.energynetworks.org/electricity/futures/open-networks-project/
In addition, the WPD Innovation study[18] has demonstrated the technological capability of a Private LTE solution to deliver enhanced OT.

[15] Except for research and development activities.

[16] ENA Survey of UK utility distribution and transmission operators’ telecommunications managers, December 2018.

[17] Every household with PV or EV charging could ultimately require a telecommunications connection.

[18] https://www.westernpower.co.uk/projects/lte-connecting-futures

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“What is the role of OT in enabling customer engagement / active customer?”

OT enable demand side management at the smart meter level, particularly by influencing the time of certain demand, e.g. signaling for electric car charging and switching other loads. Conversely telecommunications allow network operators to constrain energy use [20] or energy generation, when required, to maintain electricity supply quality and to prevent damage to the electricity network or connected customer equipment.

An appropriate allocation of spectrum needs to be aligned with the communications needs of the electricity network operators, which:

- takes account of the number of connections anticipated.
- the amount of data traffic to be carried.
- the technical characteristics of the new customer-based technologies being deployed that require more frequent data exchange with larger data packet sizes [21].

[19] The transmission system operators, distribution network operators and generators will be required to exchange information in real-time to ensure this.

[20] This includes demand management schemes that can automatically reduce electricity demand from connected loads, when necessary.

[21] Typical historic automation scheme technology only required occasional communications with small data packet sizes.

[22] Savings of £17bn to £40bn have been predicted in the BEIS document: “Upgrading our energy system: smart systems and flexibility plan”.

OT allow remote monitoring of the electricity network, including that required for distributed generation and energy storage to be connected to the electricity network, so that electricity demand can be balanced with the electricity generated [19]

“How can OT investment facilitate carbon reduction and efficiency gains”

Investing in OT to support the electricity networks, through appropriate spectrum allocation and use, would enable a continued growth in connections of distributed generation, energy storage and technology solutions to actively manage the network.

Continued growth of these connections and new technologies is key to the implementation of overall carbon reduction measures and delivering against Government’s Net Zero targets. Enhancements and growth in OT would also assist electricity network operators in managing their networks to reduce losses and make more efficient use of assets [22].

In addition, the enhanced availability of real-time data and the increases in the number of local generation and storage facilities that enhanced OT investment would facilitate, provides the potential for local energy trading platforms to be established and increased competition in energy supply.

S5. Strategic Decisions

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"When is the investment in new communication networks likely to be needed?[23]"

Nevertheless, investment in telecommunications is required now to meet the growth in connections and data requirements currently taking place in electricity networks.

The existing communications network arrangements do not have the capacity needed to connect all the devices associated with the transformation to a DSO or deployment of smart grids. The increase in connectivity and data requirements is starting to grow through RIIO ED1[22] and is forecast to grow exponentially through the period 2020 to 2030, as new forms of customer technology are connected and electricity network flexibility is implemented.

There is need for investment in enhanced operational telecommunications network technology now. This is due to increasing connections of electricity storage devices and active network management systems being deployed alongside the growth in demand from Electric Vehicles and Heat Pumps. These generate large quantities of data for every new system connected. To meet the forecast growth in smart grid deployments, significant investment will be required in advance of and during the next RIIO ED2[24] period to provide the enhanced operational telecommunications capacity required to support these systems. Investment will also be necessary to ensure that the telecommunications infrastructure meets the resilience and reliability requirements necessary for the operation of critical national infrastructure such as the electricity networks. Making the appropriate strategic choices now will avoid an un-necessarily piecemeal approach to the overall investment required in the communication systems and associated operational telecoms developments.

"What are other countries doing?"

Some European states[25] are more advanced than the UK with the most technically advanced countries deploying private Long-Term Evolution (LTE) telecommunications[26].

Within Europe there is the 450 Alliance group who are campaigning for access to the 450 MHz spectrum for utility communications.

This spectrum is unavailable in the UK for re-allocation to electricity network operators. Mesh radio[26] is another solution being used in other countries;the only option in the UK at this time for this type of deployment is the use of unlicensed spectrum which would not provide the levels of resilience and securityof access needed.

[23] Open Networks / Transform Smart Grid Forum.

[24] RIIO ED1 is the current regulatory mechanism used to regulate electricity distribution companies in GB. RIIO ED2 will be the next regulatory period from 2023 to 2028.

[25] Ireland - https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/400mhz-band-spectrum/. Germany - www.bundesnetzagentur.de/450mhz/

[26] LTE is a standard for high-speed wireless communication for mobile devices anddata terminals, based on the GSM/EDGE and UMTS/HSPA technologies.

[27] Mesh radio is an emerging technology and one approach to creating wireless mesh networks offering end-users a self-forming and self-healing reliable telecommunicationsnetwork that eliminates single points of failure.

“How do national strategic decisions on spectrum allocation impact the DNOs / TSOs?”

Ofcom[28] regularly consults on spectrum allocation matters and has made strategic decisions that have the potential to impact and drive up costs for electricity consumers.

An example was the Ofcom notification to vacate the 1.5 GHz fixed link band by 2005 to facilitate spectrum to be made available for DAB roll-out. DNOs and TSOs invested in infrastructure to vacate this band but it was subsequently found that the band was not deemed essential for DAB roll-out, although the electricity industry had made alternative arrangements.

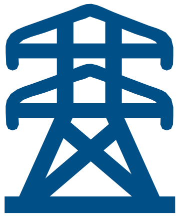
DNOs and TSOs have also utilised BT Very Low Bandwidth products for manyyears. The end of life of these products and migration to other products has resulted in the DNOs and TSOs utilising the currently available ‘last mile’ access spectrum - such as the 1.4 GHz fixed link band. The recent decision by Ofcom to displace existing users from this frequency range by 2023 has resulted in additional disruption and cost to the Energy Network Operators without a clear alternative spectrum solution available to be deployed.

In addition, the plans by Commercial Operators to ‘Sunset’ 2G / 3G based solutions alongside the withdrawal of the PSTN network by Openreach demonstrates the lack of security of access afforded by Commercial Service providers.

Conclusion

Strategic decisions on the allocation of UK spectrum without consideration of the requirements of DNOs and TSOs is likely to have an adverse impact on the ability and cost of delivering electricity supplies to endconsumers. The electricity industry is also concerned about the roll-out of 5G[29] at 26 GHz taking select areas of bandwidth and making those sections of the spectrum either commercially or technically unavailable.

Bearing in mind the UK’s critical dependence on a reliable supply of electricityfor the economic and social well-being of society, the importance of Enhanced OT and their dependency on access to the radio spectrum needs to be afforded more recognition and importance.



[28] Ofcom is the regulator for communications services in the UK.

[28] 5G is the next generation of mobile telecommunications provision.

Glossary of terms

Active Network Management (ANM)	Active Network Management connects separate components of a smart grid such as smaller generators, renewable generation, storage devices, etc., by implementing software to monitor and control the operation of these devices
BEIS	Department for Business, Energy & Industrial Strategy
DAB	Digital Audio Broadcasting
DCMS	Department for Digital, Culture, Media & Sport
DNO	Distribution Network Operator
DSO	Distribution System Operator
ENA	Energy Networks Association
EV	Electric Vehicle
GHz	Giga-hertz
IoT	Internet of Things
IP	Internet Protocol
JRC	Joint Radio Company
LTE	Long Term Evolution
MHz	Mega-hertz
Operational Telecommunications (OT)	Communication systems used to facilitate the control & monitoring of remote assets on the Electricity Distribution network
PV	Photovoltaic
SCADA	Supervisory Control & Data Acquisition
Spectrum	Radio frequency part of the electromagnetic spectrum
STG	Strategic Telecommunications Group TELCOs
TELCOs	Third-party / public network telecommunication companies
TSO	Transmission System Operator

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