

Telecoms Strategy

Harnessing the power of telecoms
to create the network of the future

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Overview

Western Power Distribution is unique in that it operates an extensive in-house facility that delivers inter-office data communications, mobile voice communications and telecoms infrastructure to connect electricity assets to our control centres, from some of the most remote of locations across WPD's four licence areas. The WPD owned and operated approach has proven to be cyber secure and highly reliable compared to services offered by third party telecoms providers.

Telecoms and control & monitoring technology within the electricity industry has experienced minimal change over the last twenty years. The focus has been on customer service to ensure customer minutes lost and customer interruptions are minimised through effective control and monitoring of the higher voltage networks; however the electricity industry is now taking a technology leap in all areas through the implementation of increased monitoring for DSO functions, supporting low carbon technology with new digital strategies that will gather increasing volumes of data from our connected assets across all voltage levels. These new services require telecoms infrastructure, of a new design which improves bandwidth to handle larger packets of data, communicating with a drastically increased number of connected electricity assets.

WPD's objective is to start meeting these increasing demands of the future during ED1 whilst maintaining our excellent standards of reliability in terms of resilience to power failure and cyber risk, endeavouring to keep the lights on or get them back on swiftly, not only in normal circumstances, but also during any high impact, low probability events.

The WPD telecoms infrastructure is therefore to be reinforced and expanded to meet all these demands whilst also assisting our net zero commitments; i.e. we want to be able to do more activities remotely, including patch updates, network switching, protection setting application and monitoring, without using field staff to travel to our remotely placed assets or adding additional vehicle congestion to our towns and cities in our licence areas. This will move us towards an energy network of the future supported by a resilient, reliable and cyber-secure telecoms network.

Vision

The core function of the telecoms team is to support and enhance the delivery of WPD's overall ED2 objectives. WPD's telecom infrastructure shall support the digitalisation strategy, be high performing in terms of availability, cyber-security and resilient to power failure whilst aligning with all of WPD's business objectives and stakeholder commitments.

The telecoms strategy has been developed in collaboration with WPD's various business units and aims to ensure fit for purpose telecoms systems are provided for both DNO and DSO functions.

It has been identified that there is a need for telecoms modernisation and growth. To aid the transition, a short term and long term vision for telecoms services in WPD has been defined;

- Short Term Vision (by the end of RIIO-ED1)
 - Team structures will be adapted in readiness to accommodate an expanding and modernised telecoms network.
 - New processes and procedures will be developed to manage the projects and ensure day to day operations are delivered efficiently.
 - A clear standard of telecoms network architecture will be defined and implemented across all levels of the network throughout WPD's four licence areas.
 - Working with stakeholders and suppliers, a roadmap will be developed for all products on WPD's telecom network.
 - Transition plans for the modernisation of WPD's legacy systems and old technologies will be defined.

- Long Term Vision (RIIO-ED2 and into RIIO-ED3)
 - Legacy systems will either be replaced or modernised.
 - WPD's core telecom infrastructure shall be extended accommodating a new technology mix of extended fibre and private licenced radio.
 - WPD shall commence delivering of connectivity into new lower voltage level assets (LV and increased at 11kV) to collate new data.
 - Staff will be trained to operate and maintain IP enabled/digital networks, and operate to new telecom specific regulations.

Key Principles

The ongoing strategy for delivering telecoms systems into RIIO-ED2 and beyond is underpinned by the following principles;

- Reliability, Resilience and Availability
 - Suitable levels of resilience will be applied based upon the criticality of the network.
 - Communications must always work, whether in urban areas that are highly congested or in rural and more remote areas.
 - Monitoring, back-up and disaster recovery capabilities will be applied as a minimum to all telecoms networks.
 - Ensure all telecoms networks are built and operated to ensure 99.999% availability.

- Security
 - Compliance with Security of Network and Information Systems (NIS) Regulations and consideration to working towards the anticipated new Telecoms Security Requirements (TSR's).
 - Engagement and adherence to industry best practices for both cyber security and physical security.
 - Security controls implemented based upon business criticality and risk rating.

- Fit for Future
 - Systems designed to enable future modification, expansion or change.
 - An architecture 'standards based' approach (common design, implementation, technologies, etc.) to make the network easier to support.
 - Continual horizon scanning for changes in technology and regular review of systems and processes to ensure they remain fit for a DNO/DSO future.
 - Regular review and evaluation of services with the business stakeholders.

- Cost Effective
 - Working closely with WPD's procurement team to ensure that any new telecoms equipment is correctly and cost effectively sourced.
 - Challenging our suppliers when renewing contracts to ensure we always get the best value.
 - Considering total cost ownership when purchasing new telecoms equipment.
 - Well defined and cost justified projects.

- Governance
 - Adherence to industry best practices.
 - Well defined and maintained policies and standards, including the increased use of telecoms bulletins.
 - Clearly defined responsibilities and ownership.

Privately Owned Telecoms Network

WPD own and continue to invest in an in-house telecoms network to ensure communications can be maintained or promptly restored for virtually any unforeseen event, particularly as a result of power failure or a security attack. The alternative would require a commercially provided operation, but commercial operators have added risk as detailed below;

- Reliability and Resilience
 - When there is a network failure on a commercial network, the repair times are outside of WPD's control.
 - Service levels are often not within the time scales required by WPD.
 - Commercial communications sites have limited power resiliency, therefore if power was to fail, the telecoms would fail resulting in the inability to remotely restore electricity supplies.
 - Commercial communication sites are built using a single communications link, therefore with no resiliency should a link fail, resulting in the connectivity to the site being lost.

- Security
 - As commercial networks carry multiple high volume paying customers, security of data is not guaranteed.
 - Patching to ensure the telecom infrastructure is secure would be out of WPD's control with no way of knowing what is patched and when.
 - Vulnerability assessments would also be invisible to WPD, as WPD carries out regular vulnerability assessments to seek and fix any potential problems found.

- Coverage
 - Commercial networks are built and designed based on population coverage.
 - A communication network for WPD's electricity assets must provide reliable coverage across all of its rural network ensuring connectivity in far reaching remote locations.

- Latency
 - Commercial networks are often designed to allow re-routing, which can delay or result in communication failure through an increase of latency.
 - For WPD, the latency between network assets is critical. The WPD system is already extensive and designed to pre-determined latency parameters.

- Availability
 - Commercial networks fail, particularly as a result of power failure with very low level resiliency to cope with high impact, low probability events.
 - WPD's extensive network not only connects assets in remote and densely populated locations, but it is also resilient to power failure, supported by a robust business continuity plan of batteries, generators and response to allow WPD to restore supplies via remote control.

Regulation

WPD Telecoms is granted rights by Ofcom under the Electronic Communications Code to facilitate the installation and maintenance of electronic communication networks. As a Code Operator, WPD Telecoms is subject to the conditions and restrictions set out in Schedule 3A of the Communications Act 2003. All radio and wireless equipment is operated within licence conditions under the Wireless and Telegraphy Act 2006.

Quality & Security

WPD Telecoms is certified to ISO9001:2015 for its quality management. It is also accredited to information security standard ISO27001:2013 and has achieved accreditation to the Government's Assured Service requirements for telecoms operators known as CAS(T) ((Communications Electronics Security Group) Assured Services (Telecommunications)), these are due to be replaced with the new TSR's.

Target availability over the core network is 99.95% but this target is often exceeded, with operational availability of 99.998% being achieved. The operations teams are available 24x7x365 operating to an immediate response time for telecoms faults with a target to fix faults within four hours.

Maintenance

A stringent maintenance and replacement programme is in place incorporating the fibre network, radio network and communications sites. Radio networks are maintained as a minimum of every two years. All sites have 6 monthly maintenance visits, which cover site security, building integrity, fire safety, air conditioning, backup power (both battery and generator backed) and communication tower integrity. All maintenance tasks are subject to key performance indicators.

Telecoms Services

The telecoms services provided within WPD are broken down as active equipment and passive equipment. The active equipment is made up of electronic components which transmit, receive and process the data, whereas passive equipment is the non-electronic components which make up the telecoms network.

- Active Equipment
 - SCADA (Supervisory, Control and Data Acquisition)
 - Primary SCADA – using primarily licenced UHF scanning radio for the Monitoring and Control of approximately 2,400 132kV, 66kV and 33kV substations, including Analogue Data Acquisition.
 - Secondary SCADA – using a mixture of licenced VHF and un-licenced UHF radio networks for the Monitoring and Control of approximately 20,000 11kV substations, including Automated Restoration of the electricity network.
 - Bandwidth
 - Bandwidth connectivity using Fibre Optics and Fixed Link Networks with Internet Protocol (IP) and Dense Wavelength Division Multiplexing (DWDM) Networks, providing bandwidth capacities from 10Mb to 100Gb.
 - PMR (Private Mobile Radio)
 - A Private Mobile Radio network, allowing secure, reliable and power resilient voice communications between field and office based staff.
 - Protection and Inter-trip
 - Low latency point to point low bandwidth circuits to provide protection of the electricity network.
- Passive Equipment
 - Communications Sites
 - Providing secure and reliable communications sites to support the various communications networks, with each site having resilient backup power supplies.
 - Fibre Optics
 - A core fibre optic network is constructed utilising the overhead Electricity Networks and underground ducts linking key substations and WPD offices, constructed to be resilient to power failure.

Cyber security is imbedded into all telecoms services. Being privately owned and maintained has added benefit that our network is unique and limits the risk of a wide scale cyber-attack. WPD Telecoms works closely with WPD IR Cyber-Security team, the National Cyber Security Centre (NCSC) and with assistance from external security specialists.

Telecom Infrastructure is the Enabler

WPD's development of DSO capabilities is well underway and already starting to shape the future development and operation of the electricity distribution network. DSO requirements, demands and expectations for telecoms services are already being developed and starting to be rolled out. However, a number of changes will be required to the way telecoms operates and is structured in order to deliver the RIIO-ED2 business plan and the requirements of our stakeholders.

In addition to the DSO activities, there are also a number of other, interlinked drivers influencing the telecoms strategy and changing the direction of the electricity distribution business, many of which are the result of government, regulatory and stakeholder initiatives. The various interlinked strategies include:

- Digitalisation strategy – digitalisation is at the heart of WPD's transition to building a smart and efficient energy system and underpins our RIIO-ED2 strategy. Digitalisation is the process of using digital technologies to fundamentally change how the network operates in the future. Over the course of RIIO-ED1 WPD has gradually moved to digital technologies in place of analogue based automation and monitoring equipment.
- Net Zero strategy – WPD is committed to delivering a network which meets future energy requirements, enabling the transition to a smart, flexible and low carbon energy system in support of the UK Government's commitment to achieving net zero by 2050.
- Sensors and monitoring strategy – critical to the successful operation of new DSO systems and processes is good quality, reliable and timely data relating to the state of the network. By the end of RIIO-ED2 WPD is aiming for 100% visibility of its 11kV and higher voltage networks by ensuring that directional power flow measurements are available at all its primary substations.
- Innovation strategy – updated on an annual basis the strategy is focused on the long term development of distribution assets, network operations and customer service in response to changing system and customer needs.

As well as aligning to the various strategies, the telecoms strategy has also taken Government and Regulatory requirements into consideration, with particular emphasis being placed upon NIS, the proposed new TSR's, PSTN switch off and recommendations from network innovation funded Distributed ReStart project.

RIIO-ED2 Challenges

RIIO-ED2 will provide a number of significant challenges to our telecoms team, particularly in relation to the increase in number of electricity assets to be monitored: other key challenges include;

- Providing geographical coverage to ensure additional electricity assets can be connected to the telecoms network.
- Providing suitable bandwidth to ensure the extra data being collected does not cause congestion on the telecoms network.
- Ensuring that the high-availability of the telecoms network is maintained as the network grows, ensuring it remains resilient to all types of events especially during a power failure.
- Providing cyber security controls on all parts of the telecoms network.

RIIO-ED2 Telecoms Deliverables

WPD has identified a number of key projects and initiatives for RIIO-ED2 requiring telecoms services and new systems. Many of these projects and initiatives are specifically related to the delivery of customer commitments in the previously mentioned strategies and will result in an increased telecoms spend in RIIO-ED2 compared to that of RIIO-ED1. The deliverables can be categorised as either the modernisation, enhancement, upgrade and/or replacement of existing systems and technologies, or as the development and/or purchase of new systems and technologies. Many of the deliverables will fall into both categories. RIIO-ED2 projects include;

- Replacement and modernisation of 2,245 Remote Terminal Units (RTUs), which are now end of life. The replacement device will be an IP enabled RTU providing enhanced two way data traffic that will drastically improve system monitoring, remotely allow the administration of system upgrades but also be of a standard afforded to IDNO's and third party generators. The new RTUs will be IP enabled and of a 'plug and play' design ready for the next generation of IP enabled switchgear.
- Modernising WPD's radio based telecoms system to a Private Enterprise Long Term Evolution (eLTE) solution to enable communication between Control systems and field based assets. The existing radio telecoms system used for the control and monitoring of the electricity network is becoming restricted due to its limitations in terms of the number of connected assets and the small amount of throughput data it can handle. The radio infrastructure for our future will be able to overcome these limitations and be scalable for future network growth and data demands, but will remain privately owned and maintained to ensure effectiveness in operation, be resilient to power failure and to be at the point of need i.e. located where the electricity assets are, all aspects not provisioned by third party commercial telecom operators.
 - A modernised eLTE radio system is currently under review by OFCOM with BEIS and OFGEM oversight. All mainland UK gas and electricity network operators collectively agree that an eLTE solution is urgently required to support net zero objectives. This is mirrored in other advanced economies e.g. Europe, USA and Ireland. Nb. eLTE will have 100 times more capacity than the current radio system.
- Legacy telecoms equipment including Plesiochronous Digital Hierarchy (PDH) and Synchronous Digital Hierarchy (SDH) along with other vintage bespoke items will not support the modern IP requirements of future electricity network systems. WPD's proposed replacement of these devices, will seamlessly enable remote operations to continue but also manage the enhanced two-way data communicating to and from field based assets that are essential for both the safe management of the electricity network.
- Low voltage (LV) monitoring, is becoming increasingly important, as customers with lower voltage connections invest into low carbon technologies such as solar panels, electric vehicles and heat pumps, operating within a smart grid environment. Given WPD's near 8 million customers, monitoring at LV will increasingly be required year on year to pro-actively monitor the networks behaviour to these advancing technologies. The provision of the data collected will allow pro-active measures to be taken real time if required, enhancing automation where required and informing the need for network reinforcement. These devices will require connection to WPD's telecoms infrastructure.

- Public Switched Telephone Network (PSTN) is the current UK standard for phone line connections to all homes and businesses in the UK that are not on a fibre connection. Openreach and OFCOM have decided to modernise the UK infrastructure to be IP enabled by 2025, this is known as the “PSTN switch off”. This switch off will impact the whole of the UK; for WPD, approximately 1,400 third party telecoms connections will be affected and will need to be replaced with a suitable alternative. PSTN connections are used for a variety of purposes from phone lines, to alarm systems and CCTV systems, while some sites affected are critical to WPD’s distribution network some assets are also registered as Critical National Infrastructure. WPD will migrate all PSTN affected lines onto a WPD private network, avoiding the requirement of less reliable third party provider services.
 - The PSTN switch off will have an impact on WPD’s customers, therefore we will be continuing to monitor developments to ensure that WPD can continue to maintain high standards of customer contact during power outages.
- Due to the increasing complexity of localised grid including reverse power flow and varying power factors, power flow monitoring equipment is to be installed at multiple and various voltage levels within the electricity network, with all the devices requiring connection to WPD’s telecoms infrastructure.
- Expand WPD’s fibre network by installing fibre communications cables at the same time as ED2 planned overhead and underground asset replacement work alongside independent fibre installations. This will enable establishing new fibre connections to strategic electricity assets e.g. substations and telecoms sites. This work will be an efficient approach to extend and connect more fibre as an alternative to radio communications. This approach also affords a reduction in of procured services from third party telecoms operators.
- Construct additional telecoms sites where required whilst refurbishing others to extend remote control and monitoring functionality of the electricity network. The new sites will accommodate an increase in connected assets in areas where there is currently limited connectivity or radio coverage. The existing telecoms sites requiring refurbishment shall be upgraded with digital infrastructure maintaining resilience to power failure and enhanced cyber security.
- A digital network requires a reliable backhaul facility, for WPD we use a mix of microwave, and fibre that include IP networks and firewalls. With the enhanced requirements to support the future electricity networks, some of the WPD backhaul networks are also to be upgraded, as some circuits are no longer supportable and others require cyber enhancements.

In order to successfully deliver these projects during RIIO-ED2, the telecoms team will need to be supplemented by contractors and some of the roles of the team will be different to accommodate the changing landscape of the telecoms infrastructure.

WPD Telecoms Team Structure

The Telecoms Team is part of WPD's Logistics section under the responsibility of the Operations Director to ensure strategic alignment with WPD's core businesses. The Telecoms Manager leads a team of 90 staff, structured into four core teams as detailed below;

- Four regional Operations Teams, South Wales, South West of England, East and West Midlands (Aligned with the WPD network services areas) responsible for the installation, maintenance and repair of the various telecoms networks. Each team is made up of an Operations Team Manager, Communications Engineers and Telecoms Apprentices to cater for workforce renewal.
- The Telecoms Network Management Centre (TNMC) and Projects Team serves all four WPD DNO regions, managing the TNMC and delivery of key multi-regional projects. This team consists of an Operations Team Manager, Technical Specialists, Communications Engineers, Team Supports and Telecoms Apprentices.
- The Design Team operates across all four WPD DNO regions and focuses on the design and strategic development of the communications network. This team is made up of a Design Manager, Network Infrastructure Managers, Technical Specialists and Wayleaves Specialists.
- The Commercial Team operates across all four WPD DNO regions, focusing on the commercial aspects of our sites and services. This team consists of a Commercial Manager, Sales Manager, Sales and Marketing Coordinators and Team Supports.

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