WESTERN POWER DISTRIBUTION INNOVATION TEAM

Innovation Strategy

2019

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Contents

Executive Summary

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This document sets out the detailed Innovation Strategy for Western Power Distribution (WPD). It describes our approach to innovation and describes how we continue to innovate within our business to improve efficiency and set the foundations for smarter network operation and the transition to a Distribution System Operator (DSO). It was originally produced as part of the RIIO-ED1 business plan and has since been reviewed, updated and re-issued annually to reflect changing external factors, business priorities and to incorporate learning from the previous 12 months. The document applies to all four WPD distribution licences of West Midlands, East Midlands, South Wales and South West.

The Innovation Strategy looks at the long term development of our distribution assets, network operations and customer service caused by changing system and customer needs. The Strategy looks through to 2035, yet naturally provides more detail on the shorter term priorities, requirements and proposed initiatives.

Innovation is the process of having new ideas, developing them into practical solutions and implementing them into equipment or processes in order to improve network performance or customer service. It will provide more flexible solutions that are better, cheaper or quicker than the current ways of doing things. The RIIO-ED1 Network Innovation Incentives and the Government's Carbon Plan have and will continue to bring huge change and significant opportunities to innovate. Innovation does not have to be on a large scale; sometimes improvements can be achieved through evolutionary change, involving incremental improvement to existing methods.

We rely on innovation to maintain our position as a frontier performer in network performance and customer service. Innovation is targeted at all of the key outputs safety, cost efficiency, customer service, reliability and environment. In the past innovation has proved beneficial by allowing us to continually improve in these areas. Future innovation will allow us to continue these improvements and will also help us to address the challenges brought about by the Carbon Plan.

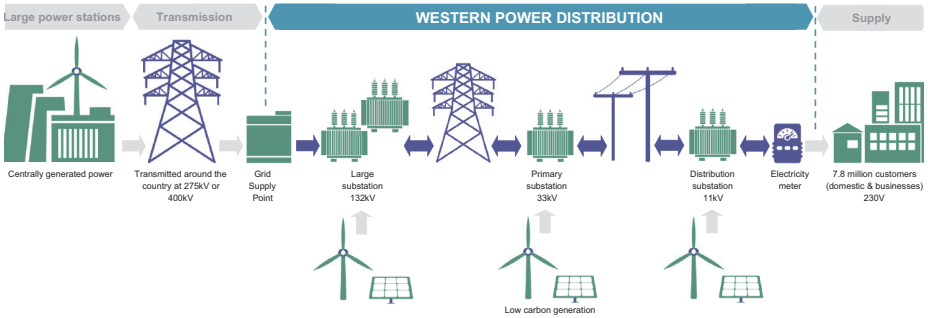
Our innovation project portfolio has enabled us to deliver significant learning to the wider business as well as other network operators. We have delivered over 100 innovation projects over the previous and current price control period, which has enabled significant changes in how we operate our business providing benefits to customers. Key examples of this is the learning as part of our Low Carbon Networks Hub project that has enabled us to roll out Active Network Management (ANM) across each of our four licence areas, and flexibility services now delivered through the Flexible Power brand was created as part of the Entire NIA project, which developed technical and commercial requirements to utilise flexibility as a service to avoid asset investment requirements.

We continue to innovate and ensure third party access and collaboration on our projects is achieved, most notably through our established third party call for projects. This Strategy also sets out our key priorities and challenges during the remainder of RIIO-ED1.

Who We Are

Western Power Distribution (WPD) delivers electricity to 7.9 million customers (27% of the UK population) over an area of 55,000km2. This electricity is distributed over 220,000km of overhead lines and underground cables, fed from 185,000 substations. The area served by WPD is shown in the map below and covers four licence areas, East Midlands, West Midlands, South West and South Wales.

The next figure shows the voltage levels and typical assets we operate across our four licence network areas.



Our core responsibilities as part of RIIO ED-1 are to keep the lights on, maintain equipment, fix the network and connect new customers.

1 KEEP THE LIGHTS ON BY OPERATING OUR NETWORK ASSETS EFFECTIVELY

2 MAINTAIN EQUIPMENT SO THAT THE NETWORK IS IN A CONDITION TO REMAIN RELIABLE

3 FIX THE NETWORK IF EQUIPMENT GETS DAMAGED OR IS FAULTY

4 CONNECT CUSTOMERS BY UPGRADING EXISTING NETWORKS OR BUILDING NEW ONES

We use innovation to support all these elements by trialling and demonstrating technical and commercial solutions to improve the efficiency and operation of the network and services that we offer to our customers.

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Overview

This document sets out the detailed Innovation Strategy for WPD. It describes our approach to innovation and describes how we continue to innovate within our business to improve efficiency and to build on the foundations of previous innovations for smarter network operation and the transition to a Distribution System Operator (DSO). It was originally produced as part of the RIIO-ED1 business plan and has since been reviewed, updated and re-issued annually to reflect changing external factors such as Government policy, business priorities and to incorporate learning from the previous 12 months. The document applies to all four WPD distribution licences of West Midlands, East Midlands, South Wales and South West.

The Innovation Strategy looks at the long term development of our distribution assets, network operations and customer service caused by changing system and customer needs. The Strategy looks through to 2035, yet naturally provides more detail on the shorter term priorities, requirements and proposed initiatives.

This document provides all the information that Ofgem requires in an Innovation Strategy for a licenced network operator, namely:

- Evidence of how previous innovation funding has been used effectively and resulted in improved outcomes for consumers;
- The high-level problems and/or challenges which the sector/company expects to face over the period, and the justification for initiating projects to address these;
- The consequences of innovation not occurring;
- The process or methodology by which we will focus on future innovation;
- Demonstration that the problems/challenges have been identified/prioritised and justified in consultation with stakeholders;
- Discussion of the relative priorities, risks, benefits, value for money and potential customer impacts;
- Deliverables and potential deliverables from the research or development or trials, such as defined learning on an issue, revised codes, new charging methodologies etc;
- A description of our processes for reviewing and updating the Innovation Strategy; and
- A description of our approach to ensuring the efficient roll-out of successful innovation into business as usual (including innovation developed by other DNOs).

This Strategy is one of three annual reports produced that relate to WPD's innovation delivery; the other two are the Network Innovation Allowance (NIA) Annual Project Summary and Environment and Innovation Summary Report, which can be found on our website.

Innovation Process

What Do We Innovate?

Innovation is the process of having new ideas, developing them into practical solutions and implementing them into equipment or processes in order to improve network performance or customer service. It will provide more flexible solutions that are better, cheaper or quicker than the current ways of doing things. The RIIO-ED1 Network Innovation Incentives and the Government's Carbon Plan have and will continue to bring huge change and significant opportunities to innovate. Innovation does not have to be on a large scale; sometimes improvements can be achieved through evolutionary change, involving incremental improvement to existing methods.

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Why Do We Innovate?

We rely on innovation to be seen as a leading performer in network performance and customer service. Innovation is targeted at all of the key outputs; safety, cost efficiency, customer service, reliability and environment. In the past innovation has proved beneficial by allowing us to continually improve in these areas. Future innovation will allow us to continue these improvements and will also help us to address the challenges brought about by the Carbon Plan.

How Do We Innovate?

Innovation is core to our business strategy. We have a small innovation team dedicated to exploring innovative ideas including the delivery of smart grid projects. Our projects are predominantly generated from ideas from staff and stakeholders. When our projects involve the installation of equipment on our network or require a change to business processes we do this in the same way as our standard engineering activities using the skills and efficiencies of our engineering teams. We also draw on the expertise of our suppliers and help them develop solutions. Furthermore, we work with a range of research establishments utilising their specialist skills.

Stakeholder Involvement

Innovation is a key theme of all stakeholder engagement sessions. Our stakeholder engagement process for innovation is the same as for all other areas of our business. Stakeholders understand that innovation cuts across our business and can provide improvements and benefits to all areas. We welcome ideas from our stakeholders and openly encourage them to put forward their suggestions and have, as well as ad hoc involvement, now put in place annual calls for proposals.

Government And Regulation

Our main sources of innovation funding are managed by Ofgem, the industry regulator. Ofgem has established a variety of funding mechanisms to develop future networks that support the Government's Carbon Plan. We work with Ofgem and the Department of Business, Energy and Industrial Strategy (BEIS) to support their ambitions, targets and meet their and our obligations.
We also engage with BEIS and Department for Environment, Food and Rural Affairs (DEFRA) on related matters such as Climate Change Adaptation (CCA) that looks at the longer term effects of climate change on the UK electricity industry.

We actively engage in the development of regulatory and legislative policy and our learning from innovation projects informs the proposals we make in our responses to consultations. The results from our projects are published and freely available via our website, which enables all stakeholders to benefit from our learning.

Innovation Funding Within The UK

Ofgem has provided an innovation mechanism for the previous three distribution price control periods as shown in the table below.

Innovation Mechanism by Price Control

Mechanism	Years
Innovation Funding Incentive	2005-2010
Low Carbon Networks Fund	2010-2015
Network Innovation Allowance / Competition	2015-2023

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The Innovation Funding Incentive (IFI) provided an opportunity to improve the quality of research and development within the UK electricity industry. As part of this mechanism we delivered 62 projects, where a number provided lower Technology Readiness Level (TRL) development to inform further Low Carbon Networks Fund (LCNF) and NIA projects, such as fault currents developed as part of a collaborative IFI project, demonstrated as within the FlexDGrid, an LCNF Tier-2 project, and now being refined and made suitable for small-scale rapid deployment as an output of our EDGE-FCLi project.

The LCNF was designed to support the development of low carbon technologies within the UK electricity industry and facilitate the changes brought about by the Carbon Plan. It contained three elements; large scale projects funded through the competitive process, Tier-2; smaller scale projects that were self-contained, Tier-1, and a discretionary reward where Ofgem have and continue to provide an additional allowance for companies that successfully develop learning that generates benefits for the wider industry. This year we completed our final LCNF Tier-2 project, Network Equilibrium, successfully demonstrating the benefit of dynamically controlling the voltage and network interconnection to maximise generation and demand connection to the network.

In RIIO-ED1 the NIA and Network Innovation Competition (NIC) has replaced the previous LCNF schemes. The NIC has a greater value and is funded through an annual competitive competition open to both distribution and transmission companies. We will continue to develop innovation projects through these mechanisms; we also now have an established process for third party participation, which has built on our individual annual Call for Proposals relating to NIC bids and is now combined with all electricity and gas licence operators through Energy Networks Association (ENA).
We have also previously secured support, and continue to proactively explore non-Ofgem driven funding mechanisms, from the Engineering and Physical Sciences Research Council, Energy Systems Catapult, Innovate UK and the European Regional Development Fund.

This table provides an overview of the number of projects we have delivered against the varying Ofgem driven funding mechanisms.

WPD Projects by Funding Mechanism

Mechanism	Number of Projects
Innovation Funding Incentive	62
Low Carbon Networks Fund	19 13 – Tier-1 6 – Tier-2
Network Innovation Allowance / Competition	42 40 – NIA 2 – NIC

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Co-ordinated Business Approach

To ensure that innovation activity is focussed on suitably supporting the wider business to deliver asset and operational efficiencies to best serve our customers a detailed and co-ordinated approach with the wider business is required. This centres on a close working relationship with the engineering and commercial teams, specifically Policy, Strategy and Distribution System Operation. A number of documents produced by these departments are at the centre of driving our innovation portfolio:

Distribution System Operability Framework

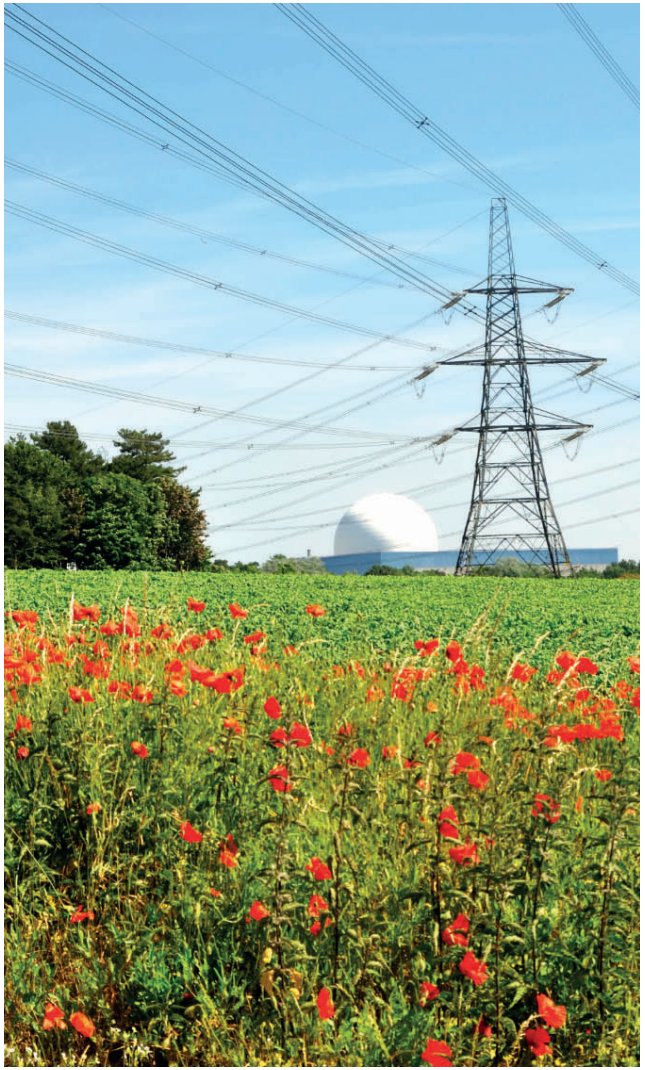
This document details the future technical and commercial challenges aligned with our three innovation themes, Assets, Operations and Customers. This information informs our near term priorities and calls for projects from third parties.

Shaping Sub-transmission Networks

Each of our four licence areas has a Shaping Sub-transmission document produced and periodically reviewed, which details the forecast requirements of the 33kV, 66kV and 132kV networks based on projected Distribution Generation (DG) and Low Carbon Technologies (LCTs) integration. This data is used to determine and provide justification for the business case produced for new innovation projects, where appropriate, prior to approval.

DSO Transition Plan

We recognise that the change from a Distribution Network Operator (DNO) to a DSO is essential to driving performance and efficiency from our network and to ensure it can meet the future energy demands of all our customers. Therefore, we have produced a detailed DSO Transition Plan that has a clear plan for the transition; suitable innovation projects are shaped and delivered to support the technical and commercial needs of operating as a DSO.



Why We Innovate

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External and Industry Trends

The changing global attitude towards fossil fuels is driving customers towards greater electrical solutions for heating and transport. The generation sources which support this increased demand are more renewable and distributed in nature. Creating a passive network that supports this increased electricity usage would be expensive using purely conventional methods. Our Innovation Strategy identifies, investigates and evaluates affordable alternatives. The alternatives may include solutions that postpone expensive investment whilst there is uncertainty. They may also provide long term active solutions to the management of networks.

These new type of low carbon loads, coupled with a mismatch of when the energy is needed compared to when renewable DG generates, leads to substantial growth in morning and evening peak demand. The network peaks will be an order of magnitude greater than today. To build the networks large enough to cater for these peaks would lead to significant over capacity in the system most of the time. In certain regions there is now also a summertime or daytime peak of generation export due to solar generation. These changes in energy profiles, larger peaks in demand, substantial swings in DG output and a more active energy market will create challenges for us as we manage our network. The installation of monitoring and control systems to regulate Distributed Energy Resources (DER) which includes distributed generation, active demand and flexible storage provides a potential solution but represents a step change in operations from our passive past.

The transition from operating a passive system sized to support maximum demand, to one where DER is actively controlled, dependent on real time and forecast energy flow, now referred to as a DSO. Innovation Projects have helped inform our DSO Transition Plan. Current and future projects will continue to deliver further insight into new roles and responsibilities of the DSO. They will often be critical in advising on the nature and timing of business change.

Innovative solutions can also improve the security of electricity supplies by ensuring generation matches demand in local areas. Solutions could enable sections of the electricity network to be run in isolation for short periods of time. Distribution network technology will continue to advance and we can gain benefits by adopting it. Our experience shows that new solutions available today will become standard in the near future. For example, Active Network Management (ANM) was bespoke when our Low Carbon Hub project started in 2011. ANM is now business as usual and we have a framework agreement in place with three vendors, with multiple zones currently active and a plan in place for all of our remaining network to be active by 2021. A critical evolutionary change is the capability of LCTs such as electric vehicles (EV) and electrified heating solutions on the distribution network, where the challenges, opportunities have been demonstrated by our Electric Nation and FREEDOM projects, respectively. The connection and operation proliferation of energy storage technology is continuing, where they are largely providing frequency services to National Grid, however breakthroughs are also likely, for example, in the cost and density of energy storage devices making them affordable for demand side management as demonstrated as part of our Industrial and Commercial Storage project. Network innovations we are developing today are designed to enable us to prepare for multiple technology and industry outcomes.

Customer Focus

Through the deployment of a wide variety of new technologies, such as smart thermostats, solar photovoltaic panels, and EVs, customers are increasingly able to control their electricity usage and spend, as well as the type of power they buy and when they use it. Some customers want the ability to self-generate and sell that power back to the grid. The demand profile for our customers is changing, and is expected to change even more drastically with the forecast uptake in EVs and the decarbonisation of heat in the early parts of the next decade.

Why We Innovate

As a result of this, we will need to continue developing commercial models and technical solutions that facilitate customer choice in a cost-effective way, whilst at the same time managing the impact on the networks. We believe that at the forefront of our ability to serve our customers' evolving needs are increased engagement and communication, as well as transparency and efficiency in our plans and priorities. We demonstrate this through active innovation participation in our stakeholder events, which range from DG forums, Member of Parliament (MP) visits to depots and innovation project sites and regional Smart Energy Events.

Government Policy

Concerns about climate change have led the Government to produce the Carbon Plan setting out the UK's commitment to reducing greenhouse gases by 80% by 2050. New challenges will emerge for DNOs as the Carbon Plan seeks to drive down the levels of carbon released by both heating and transport activities thereby shifting demand from oil and gas to electricity. The scale and pace of the changes are uncertain but we need to be ready to accommodate the changes when they arise. The aspirations within the Government's Carbon Plan will increase demand on the network and there will also be significantly more DG incorporated.

We have already observed the effects that changes to Government policy can have. The feed-in-tariff (FIT) for generation led to a significant increase in the volume of applications for generation connections, with many applications being received just prior to subsidies being reduced as generator developers seek to maximise their returns from incentive mechanisms.

Devolved Government policy in Wales may lead to specific demands and need for innovative solutions. Our plan is flexible and therefore able to accommodate these. We expect that some LCTs will also see a high level of uptake that will be influenced by Government subsidies or incentives. The strength of incentives will alter the speed and volume of uptake.

The impact of new forms of generation and demand will become clearer during RIIO-ED1 and into RIIO-ED2 and our plans need to be flexible to respond to changing circumstances. We will accommodate any changing requirements into our Innovation Strategy as part of the annual review.

DSO Transition

We recognise that the change from a DNO to a DSO is essential to drive performance and efficiency from our network and to ensure it can meet the future energy demands of all our customers. The enhanced capabilities we are developing will also give our customers the freedom to access other opportunities within the developing energy system.

We see the planning and operation of a more active regional distribution network as a natural extension of its current role and believe DNOs are well placed to lead the management of an efficient and cost effective electricity system at a local level. With DSOs managing the co-ordination of transmission and distribution services at a local level, it enables the GB System Operator (GBSO) to concentrate on balancing the national network using un-conflicted services competitively made available.

There is currently no singular set view of what the future energy system will look like and Ofgem and BEIS are looking for the industry to provide evidence to support decisions on what this future should look like. Therefore, it is critical that we continue to both commercially and technically innovate to ensure that the DSO is developed efficiently and effectively to best serve the future energy of our customers.

Why We Innovate

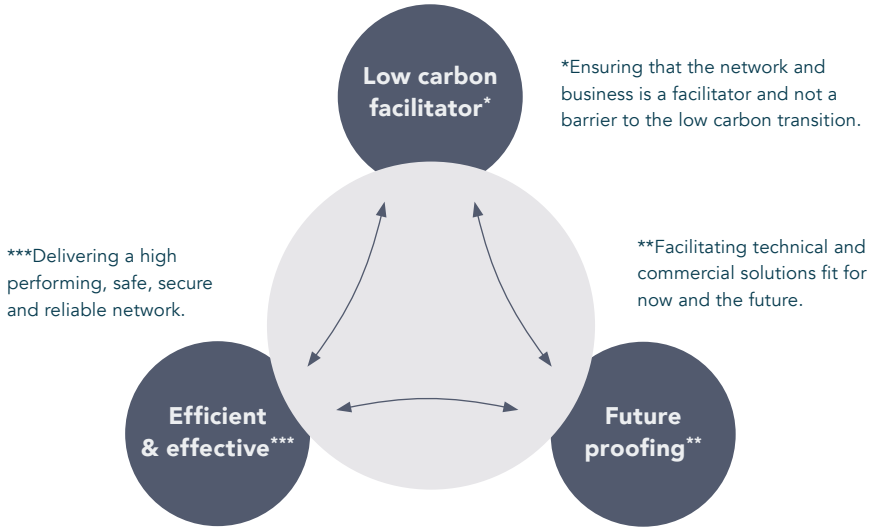
Managing Uncertainty

A high degree of uncertainty exists with respect to the GB Energy System and it is therefore important that we seek and use key sources of external data and guidance to ensure that we have the best forecasts possible. Whilst we are guided by national scenarios developed by BEIS we also employ organisations such as Energy Savings Trust, Centre for Sustainable Energy and RegenSW to tailor them to the WPD regions. To aid consistency in the development of Operability Frameworks we have aligned future WPD scenarios to those used by National Grid in our Shaping Sub-transmission documents.

The detailed understanding that we gain informs the development of our innovation programme to deliver solutions for the potential problems we expect to encounter. Wherever possible we also ensure that our projects are scalable and capable of providing more generic solutions that can be adopted irrespective of the specific type and level of LCTs that drive increases in electricity usage in the future and can also be transferable to other DNOs.

Our Focus and Priorities

Our focus as a business and through our innovation strategy is to ensure that we operate an efficient and effective network, by understanding the current and future needs of our customers whilst maintaining a secure and reliable system. A critical part of this is acting as a low carbon facilitator, ensuring that we're ready to support the connection and utilisation of low carbon generation and demand on the system. We also need to ensure that the investments we make now are fit for purpose moving forwards; this is supported through alignment of our innovation strategy with our Distribution Future Energy Scenarios.



In order to ensure we deliver against our focus areas we have highlighted a number of priorities to shape our innovation programme of delivery, centred on transport, heat and data.

Transport

We are supportive of the Government's Clean Growth Strategy, which has set ambitious targets to have near zero emissions from transport by 2050 and in the shorter term reduce emissions from transport by 30% by 2032. We are clear that a significant challenge and opportunity exists, where a large proportion of the current cars and vans on the road will become EVs and these will need to be able to charge in a manner that suits the customer whilst not causing additional significant peaks on the electricity network, avoiding the need for large-scale reinforcement. Key challenges exist for the complete electricity system to facilitate this and particularly for distribution networks in the form of:

- Facilitating on-street EV charging - How to technically deliver power to dense urban environments whilst minimising additional infrastructure requirements;
- Enabling flexible charging arrangements - Understanding the needs and wants of customers to efficiently and effectively charge their EV whilst considering the impact on cost, carbon and the network;
- Using EVs as a storage medium - Facilitating and benefitting from EVs as mobile storage facilities in the form of vehicle to grid (V2G).

As part of our innovation programme to date we have invested significantly in EV trials, principally our Electric Nation and LV Connect and Manage projects, which has enabled us to generate industry leading learning on the capability, acceptance and benefits of managed and smart charging of EVs; this has fed directly in to and shaped our current EV Strategy. It has also allowed a small-scale trial of V2G technology. Our focus moving forwards, as well as building on this learning in the form of providing flexibility offerings for EVs through our Flexible Power brand will be to develop and trial on-street charging network infrastructure solutions and a large-scale trial of V2G solutions to understand their impacts and benefits to the network.

Our Focus and Priorities

Heat

Providing energy for heating currently accounts for around 32% of all UK emissions, in order to reduce this the need to increase heating from low carbon electricity, moving away from traditional gas solutions, is required. This is highlighted in the Government's recent announcement that from 2025 no new homes will be able to be gas heated, indicating a significant increase in electrically heated homes and demand on the network. How existing properties transition to a low carbon heating solutions will also have a significant impact on the demands of the electricity network and how to facilitate the mass deployment of heat pumps (HP) as an example, whilst maximising the utilisation of the existing network to avoid the need for large-scale asset reinforcement. The need to understand the demands and usage of these HPs and other technologies is paramount and drives our need to innovate in the following areas:

- Usage patterns and profiles of HPs - understanding the impact of significant HP integration on the network;
- Flexibility of heat demand - how and when can heat load be shifted through flexibility to manage network loading whilst providing the required service for customers.

Our FREEDOM project, partnered with Wales and West Utilities, which trialled 75 hybrid heat pumps that demonstrated the benefit of shifting to electricity to provide heating and using gas as a back-up when electricity capacity was not available. Understanding dense clusters of purely electric HPs on the network will enable us to understand how to design new build networks and how and when to reinforce existing infrastructure as required.

Data

The provision of accurate and reliable data is paramount to facilitate the operation of a DSO. A number of innovation projects have focussed on the creation of increased data sets, such as monitoring to understand the operation of the LV network to a level and granularity not previously possible. The increased granularity of data more widely is vital to operating and managing effectively a distribution network, from understanding when and where to invest to determining optimal flexibility services and solutions for customers. As highlighted in the Energy Data Task Force report, companies are to be recognised for innovative mechanisms for using data to provide greater infrastructure visibility and support productive collaboration, which means that the level and depth of data made freely available by all licence network operators will have to significantly increase and we are committed to leading the way in terms of data available for third parties to understand our networks and equally utilise advanced analytics to further inform our network knowledge. Key to supporting this is innovation in the following areas:

- Facilitating access to existing and future data sets – this will enable greater visibility of our network assets, current and planned operation as well as engaging with third parties to offer service and solutions based on data;
- Generating increased data to facilitate the future needs of the network and customers – utilising additional monitoring and analytics to increase network visibility and understanding.

Previous innovation projects have demonstrated the value and benefit of increased data and network visibility; OpenLV has shown the appetite for third parties to utilise our data and generate additional information in the form of Apps and for customers and community groups to have direct and real-time information to inform on energy usage etc. Our LCT Detection project, which used domestic metering information to understand LCTs, principally EV chargers and PVs connected to the network, that hadn't previously been identified. Generating, accessing and interpreting data effectively we provide us and customers significant benefits.

How We Innovate

Scope of Innovation

We always look for better ways of working. We have adopted many innovative ideas into day to day operations that improve the efficiency and effectiveness in the way we deliver our services to customers.

Our track record of innovation and change has been developed from the implementation of good innovative ad-hoc ideas from staff all the way through to formal innovation projects.

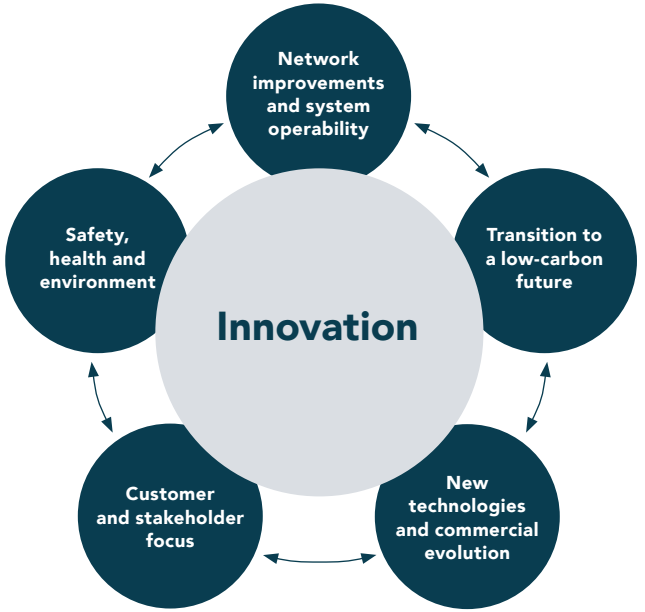
Our innovation programme is grouped in to three main categories. These are:

- Assets – Projects in this category collect data from the network to enhance modelling. They also test alternative investment strategies that can defer expensive investments;
- Customers - These projects develop new solutions to enable customers to connect low carbon technologies. They may also involve testing of new customer tariffs or working with communities to provide local energy solutions;
- Operations - This category of projects demonstrate direct benefits to active network operations from the application of technology.

This programme is then further defined across our innovation developments, described across five broad areas, which have been aligned with the ENA's Electricity Network Innovation Strategy:

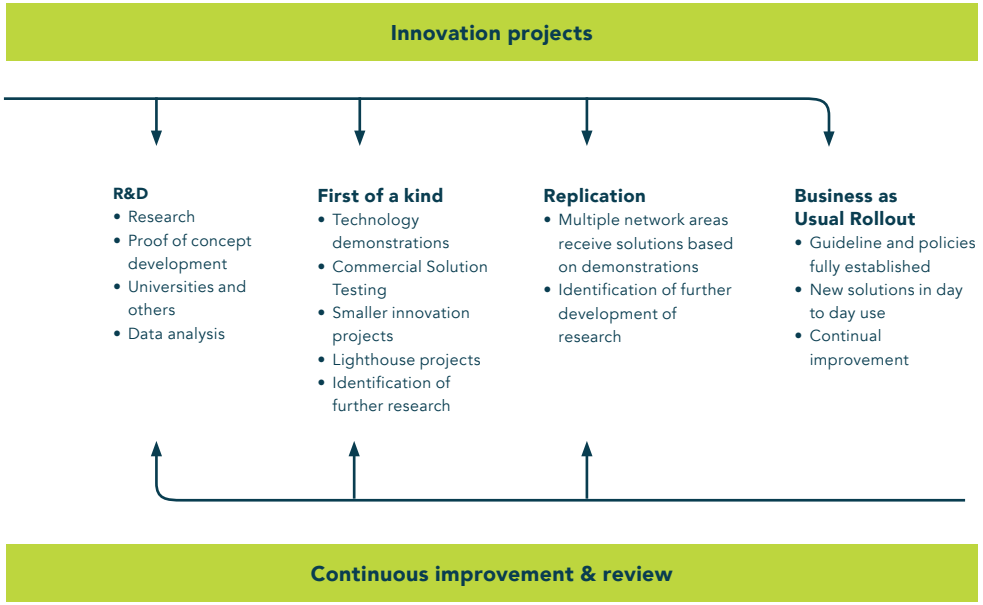
- Network improvements and system operability;
- Transition to a low-carbon future;
- New technologies and commercial evolution;
- Customer and stakeholder focus; and
- Safety, health and environment.

These areas of work are interdependent and progress in one area will often help to enhance innovation development in another.



Our existing portfolio of innovation projects has already shaped how we are thinking about the future. We will continue to innovate and carry out new projects that will build upon what we have already learnt from the projects we and other DNOs have delivered.

How We Innovate



Stages of Innovation

Projects will continue to deliver additional knowledge across all output areas. The project portfolio will remain balanced across multiple areas:

- Working at various stages of development spanning higher Technology Readiness Levels (TRL) 3 to 8;
- Exploring both technology and commercial solutions;
- Covering the whole range of asset types and network voltages;
- Assessing risk, with no projects carrying unnecessary risk; and
- Utilising a variety of external funding mechanisms to supplement our own R&D budget.

Lower TRL projects will generally be carried out by external research partners under supervision of WPD engineers. Higher TRL projects which, in the shorter term, are more likely to produce a solution for our network or processes will mostly be delivered in-house using business as usual teams.

The full 'research to implementation' timescale can often be between five and 10 years. That is why we focus internal teams on higher TRL stages, building on knowledge from earlier studies outside our own organisation.

How We Innovate

Innovation Objectives

The principal objective of our innovations and our portfolio of innovation projects is to support our key three pillars, Assets, Operations and Customers. These objectives can be distilled down to the following key elements:

- Developing new smart technologies that will accommodate increased load and generation at lower costs than traditional reinforcement;
- Ensuring that a network is technically and commercially developed to deliver the required flexibility to support current and future system needs;
- Delivering solutions that are compatible with the existing network;
- Enabling solutions that can be quickly transitioned to become business as usual; and
- Providing value for money.

Funding the Innovation Programme

For RIIO-ED1 we have been allocated an NIA of 0.5% of total regulated revenue, around £58m throughout the total, eight year period. We also work with partners to provide innovative proposals for larger projects to be funded through the NIC. This is done through an annual Call for Proposals in response to specific challenges we identify.

We will also continue to make use of any other available funding sources where appropriate, in particular national and EU mechanisms.

In addition to NIA and NIC projects we also continue to support research and development in partnership with other DNOs; this is principally co-ordinated through the Collaborative Energy Portfolio (CEP).

Approach to Innovation

The way we approach innovation is fundamental to delivering against our objectives effectively and efficiently. Our approach is:

- Actively involve staff from across the business in the generations of ideas, development of solutions and implementation of projects;
- Working with a wide range of stakeholders to understand their needs;
- Making use of a wide range of innovation incentives and funding provided by the government, regulator and other funding mechanisms;
- Defining clear objectives for each project so that delivery can be focussed and progress can be accurately tracked;
- Using a small core delivery team to co-ordinate innovation projects;
- Avoiding theoretical research or innovation that doesn't not have clear objectives and benefits;
- Incorporating innovative solutions into existing equipment and processes; and
- Sharing what we learning with other organisations and learning from others.

How We Innovate

Generating Ideas

Generating innovation project ideas is critical to the success of a portfolio of balanced projects, specifically ensuring we generate learning and outputs that meet the requirements of our future business operations and our stakeholders. Our ideas come from a wide variety of sources both internally and externally.

Internally we ensure that staff is engaged in innovation project activities through regular dissemination, an example is in the company's internal magazine, which provides staff the opportunity to understand that we're actively developing innovative project proposals and delivering these. We also ensure that our core team delivering innovation projects are all regionally located to enable staff the opportunity to regularly discuss problems and challenges they identify whilst carrying out their role with the aim of working to identify innovative solutions and drive change.

We also actively explore external involvement in the generation of ideas for new projects through a variety of mechanisms:

- Releasing NIA and NIC Third Party Calls to the wider industry to identify potential projects and solutions as identified in our DSOF document, Innovation Strategy and ENA's Electricity Innovation Strategy;
- Identifying learning and best practice development from other DNOs' projects that can be either integrated in to our business as usual practices or developed further through innovation trials;
- Interacting with wider stakeholder groups such as community energy groups and DG operators' forums to understand their needs and challenges to shape our project programme; and
- Investigating activities and innovations being developed outside of our direct industry to understand what can be learnt and adopted to improve our wider business operation.

Selecting and Prioritising Ideas

In order to appropriately prioritise our innovation programme and select the correct breadth of projects to ensure a suitable balance is achieved we group and assess each project against the five broad areas. They are then assessed against the innovation objectives and subsequently prioritised.

Key elements used to select and prioritise a project are the positive impacts of a project on our customers and the cost benefit analysis outcome.

Developing Plans for Innovation

Innovation in smart solutions will help us to accommodate LCTs through RIIO-ED1 and into RIIO-ED2. Our RIIO-ED1 business plan set out expectations for how smart interventions will reduce our investment plans by £128m across the period.

Our innovation plans are regularly reviewed against new information from UK industry, worldwide research, learning from Network Innovation projects and outputs from the Open Networks Project.

We take account of other ideas and initiatives external to the business which can be jointly developed with our ideas. In some cases this allows us to utilise funding from other bodies. We also look for ideas that follow on from earlier Innovation projects to maximise the benefits of investments already made.

We look to collaboratively plan for innovation through the CEP initiative overseen by the ENA, which enables DNOs to work collaboratively where it makes sense for businesses and customers.

How We Innovate

Stakeholder Engagement for Innovation

Our stakeholder engagement process for innovation is the same as for all other areas of our business. Innovation is a key theme of all stakeholder engagement sessions. Stakeholders understand that innovation cuts across all areas of our business and provides improvements and benefits to all business areas. Innovation remains a key theme for our Customer Panel. The panel helped us to prioritise future projects. In addition to innovation projects the panel supports our work to assist the distributed generation community.

In addition to our stakeholder engagement process, we look for feedback on innovation at other panels and groups wherever possible. We work closely with RegenSW, a renewable energy group in the South West of England, who are keen to support the introduction of renewable generation across their area.

We use the Distributed Generation forums, now run by the ENA, to seek other views and to compare our initiatives with those of other DNOs. We support the Major Energy Users Council (MEUC) and have presented our innovation proposals to them for comment and feedback.

Collaboration with other LNOS

We look to collaborate both with our distribution network colleagues but also with transmission and gas network operators and system operator, where appropriate. We do this by participating in ENA working groups that enable close collaboration and interaction with all network operators. Two key current collaboration elements are:

Open Networks

The Open Networks Project is a major energy industry initiative that will transform the way energy networks work, underpinning the delivery of the smart grid. The project brings together nine of the UK and Ireland's electricity grid operators, respected academics, Non-Government Organisations (NGO), Government departments and Ofgem.

Collaboration Energy Portfolio

The Collaboration Energy Portfolio is a consortium of DNOs looking to identify common problems and challenges to deliver collaboratively funded projects that deliver a solution to be developed, trialled and reported that benefit the whole electricity industry.

Third Party Collaboration

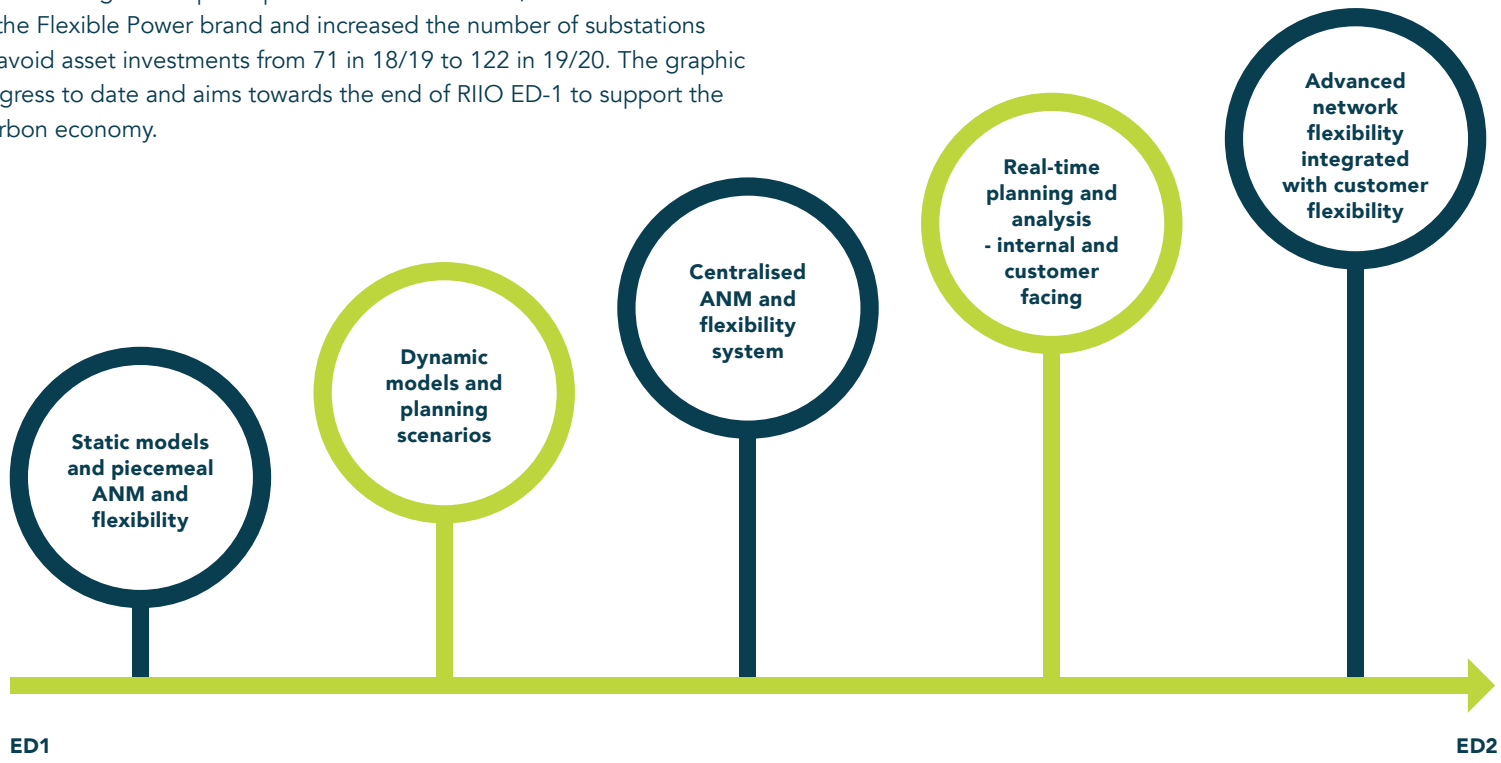
To ensure that we enable and encourage third party collaboration and interaction we proactively seek both NIA and NIC project ideas through Calls for Proposals, which are currently in their third year. This provides an opportunity for organisations that have a long standing relationship with the electricity industry but also organisations that have historically focussed on other areas to proactively be involved in electricity innovation, often bringing a wider perspective to new problems and challenges in the industry.

We also attend a variety of well-established events, such as CIRED and Utility Week Live to ensure that we facilitate a suitable opportunity for individuals and organisations to interact with our innovation and wider business teams to discuss existing and future projects.

Innovation Progress

Our approach to innovation is that it should be an embedded activity and innovations should be developed from small-scale innovations through to trialling as major innovations and finally be integrated in to business as usual activities. We continue to take this approach to innovation. This section provides an overview of some of the completed early stage projects, and how we have further developed these in to either major projects or developed them in to business as usual activities. Most notably we have developed and rolled out active network management (ANM) solutions across our four licence areas, worked to understand the network requirements that can be supported through flexibility offerings and customers' willingness to participate and in what format, which has enabled the development of the Flexible Power brand and increased the number of substations utilising flexibility to avoid asset investments from 71 in 18/19 to 122 in 19/20. The graphic below shows our progress to date and aims towards the end of RIIO ED-1 to support the transition to a low carbon economy.

We have purposely innovated in a wide number of technical and commercial areas, from developing technical solutions for active management of domestic EV charging as part of our LV Connect and Manage project to undertaking a feasibility study on the applicability and suitability of utilising superconducting cables, with far greater power carrying capacity that traditional infrastructure. This wide and varied programme of innovation has enabled us to be suitably place to support our changing needs as a business, customers increasing demands and requirements from the network and to lead future policy and regulatory requirements based on project learning to date.



Governance Arrangements

All innovation projects are delivered as part of the Future Networks Programme. The Programme is the delivery mechanism for the Innovation Strategy detailing ongoing and new projects. All business innovation projects are delivered from the area of the business that has the specific expertise to also be able to develop the idea.

On an individual basis projects are approved in line with our financial approvals process. All projects and works are subject to the same controls and authorisations as other engineering projects in the business. NIA projects are subject to project level approval by the Innovation Manager. Projects registered in NIC are subject to project level authorisation by the Operations Director.

Project process is tracked through normal monthly business reporting arrangements. For each major project this includes the preparation of a balanced score card detailing progress against milestones, significant issues and summary financial reporting. All major projects have a nominated senior management sponsor and progress review group. Projects also undergo regular review by the progress review groups of each major project and by the Innovation Manager for smaller projects. Reviews include an assessment of the risks that exist to the overall success of that project. These risk assessments allow appropriate decisions to be made to mitigate their impact.

Innovation projects are delivered in line with regulatory governance requirements and regular reports are provided to review the progress of individual projects against their targets. Six-monthly reviews are made publicly available for all our LCNF and NIC projects and any NIA project with a value greater than £1.0M.

Major projects are managed in accordance with recognised project management methodologies. There is a suite of standard documents and templates which are tailored for the specific requirements of each project and all covered under a wider project governance guidelines document.

Research Partners and Supplier Arrangements

We have links with a wide range of universities, research establishments and manufacturers, both in the UK and across the world (e.g. Hitachi in Japan and the Electric Power Research Institute in the USA).

We monitor UK and worldwide research to identify concepts and developments that may provide benefits to us in the future. We are active members of CIRED, the forum where the international electricity community meets. To maximise the effect of research and innovation we actively participate in industry wide forums. These forums bring together the best industry knowledge in a cost effective way to pool and manage research which is of use to all DNOs.

Through the ENA, the DNO trade body, we also actively participate in a variety of groups and panels which review and develop industry wide learning. The issues and challenges facing WPD are the same as those for other network operators and we share knowledge wherever possible.

We proactively support knowledge sharing and the development of best practice guides which can benefit the whole industry. It is important that we learn from others and do not spend time or energy duplicating effort on topics which have been well researched. Benefits for the industry and society can be more effectively applied when the specialist experience gained from running innovation projects is shared.

Governance Arrangements

Staff in our Innovation Team reviews other DNO projects in tandem with their own work to deliver our projects. They become our key contact to other DNO dissemination events and ensure we learn as much as we can from the other projects which are being undertaken. We have allocated one person as the key contact to each other DNO group.

We support research that is led by suppliers and manufacturers and share our knowledge and experience to help them develop solutions. Providing this support enables us to influence the research so that it provides a benefit to us.

We work with UK based Small and Medium-sized Enterprises (SMEs), who are playing an increasingly important role in the delivery of new technologies and solutions.

We also provide feedback on the limitations of existing products so that they can be improved. Partners can also trial products or solutions on our network which generates useful practical experience for the developer and allows us to understand how the products can be integrated into existing systems.

Our academic partners enable us to draw on the specific expertise which they have which enables us to cover a wide range of topics and specialisms with people who have in-depth knowledge.

Some projects include technology which is not from the electricity industry and we work with partners who might not be obvious choices but provide us with the best resource. We choose product suppliers using our well established procurement systems. We use the Utilities Vendor Database system, Achilles and have worked with Achilles to develop new product codes to cover elements of network innovation.

Managing Risk and Future Uncertainty

We identify and control project specific and generic (programme wide) risks. Dedicated project management staff periodically review and control risks for individual projects.

Generic innovation risks such as the application of new technology to the distribution network are controlled through close liaison with our Policy Team. This means that new technologies either fit into existing policies and standards or the team develop new policies and standards as a part of the innovation process. The diligence of setting policies at this stage also ensures the long term operation of new technologies by ensuring that new innovations are ready for business as usual deployment at an early stage.

In some cases the risks are associated with uncertainties such as the take up of LCTs or the low carbon transition. Future uncertainty risk is mitigated by regular review of forecasts and identification of tipping points for wider application or a commitment to higher volumes. An example of a tipping point for transport would be a motor manufacturing devoting a whole factory to the production of electric vehicles.

Governance Arrangements

Tracking Benefits

All smart grid projects are regularly reviewed to ensure the benefits they deliver are in line with those predicted at the time of approval. Smaller projects are reported annually in our innovation summary report. Major projects report progress including benefits delivery as part of their regular reporting regime.

All projects delivering against our key outputs have their benefit measured against those outputs. Benefits' tracking is carried out at all stages of the project, from initiation to completion.

Keeping the Strategy up to Date

Our innovation plan is subject to review to ensure that it continues to provide solutions in line with business requirements. We review our plans with our stakeholders to ensure that we allow them to challenge our proposals and shape what we do. Our plans will remain flexible so that we are able to address changing demands.

External factors will influence our plan and feature as part of the review process. We will take account of results from our trials and other DNO projects. Manufacturers will often develop products through DNO trials and will we assess their suitability for adoption as part of our review process.

Our review will also take into account existing Government incentives and potential changes which may impact on customer behaviour.

The Innovation Strategy is approved annually by the Operations Director.

Delivering Benefits from Innovation

We deliver innovation through an in-sourced model with a small team of specialists using the resources of our operational teams to deliver tools or products onto the network. The Innovation Team works alongside the company's Policy department where they interact with equipment specifiers and technical experts of the wider business. Once trials are successfully completed, the outputs are taken forward and replicated across our network.

As outputs are delivered, they are developed into new learning that can be taken forward and developed as business as usual. Outputs obtained from other DNO projects are fed into this process to ensure that we gain maximum benefit from innovation projects.

All solutions rolled out from innovation follow the same route as our other policies and techniques introduced into the company. Policies are reviewed by the senior network managers before they are introduced. The rollout process includes implementation plans and, where appropriate, training and dissemination sessions. We monitor all the projects as they develop and make use of learning and outcomes as they are reported.

Our Lincolnshire Low Carbon Hub project developed a practical application of Active Network Management which is part of our Alternative Connections policy suite. Alternative Connections are available to all generation customers seeking a connection where significant reinforcement is required.

Export limitation devices have been developed by manufacturers to locally balance generation and demand, however due to the lack of an industry standard, the variance in the quality and method of operation of these devices is wide. We developed a policy for acceptance of these schemes which outlines the minimum requirements to achieve compliance with the new WPD policy. This policy was circulated to the other DNOs and following further refinement was developed in conjunction with manufacturers to form a new UK standard, ENA Engineering Recommendation G100.

The ENTIRE project explored the technical and commercial requirements to utilise flexibility as a service to avoid asset investment requirements. Through trialling over 47MWh of flexibility and generating policies and procedures this enabled the Flexible Power brand to be developed and now offering business as usual flexibility solutions to the business.

All projects produce new or revised WPD policies for use during the project lifetime. These policies are always written in such a way that they can be extended to apply beyond the project and in a larger geographic area if the solutions trialled turn out to be successful.

WESTERN POWER DISTRIBUTION INNOVATION TEAM

Find out more about all our projects, request access to project data and view upcoming innovation events at:

www.westernpower.co.uk/Innovation

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