



# Business Plan 2023 - 2028

**SA-03 Supplementary Annex  
Delivering a smart and flexible  
electricity network**

# SA-03 Delivering a smart and flexible electricity network Contents

<b>1. Introduction.....</b>	<b>3</b>
<b>2. Our integral role in meeting net zero .....</b>	<b>6</b>
What success looks like: net zero by 2050 .....	9
UK government net zero commitment.....	10
Welsh government net zero commitment.....	11
Local Area Energy Plans (LAEPs) .....	11
What this means for customers.....	12
<b>3. Harnessing the power of smart meter data .....</b>	<b>16</b>
Smart meter benefits .....	17
<b>4. Network visibility and monitoring .....</b>	<b>21</b>
<b>5. A Whole Systems approach .....</b>	<b>26</b>
<b>6. Modernising Energy Data .....</b>	<b>37</b>
Making our network data available to customers.....	37
Understanding yesterday, today, and tomorrow .....	50
Our Data Culture .....	65
Increasing our collaboration .....	70
<b>7. Delivering Distribution System Operation .....</b>	<b>74</b>
WPD at the forefront of systemic change.....	74
Distribution System Operator – A strategy and a plan.....	76
Smarter and flexible networks in RIIO-ED2 .....	77
WPD's DSO four-point plan .....	78
Operating our network in RIIO-ED2 .....	79
<b>8. Performance metrics for a smart and flexible network .....</b>	<b>80</b>
Structure of metrics .....	80
<b>9. Low Carbon Technologies.....</b>	<b>83</b>
Electric Vehicles (EV).....	83
Heat pumps .....	85
Domestic level energy storage, eco homes and flexibility .....	86
District heating and heat networks .....	86
<b>10. Losses .....</b>	<b>87</b>
Losses and their causes .....	87
<b>11. Community energy .....</b>	<b>90</b>
<b>12. Innovation .....</b>	<b>95</b>

<b>13. Telecoms .....</b>	<b>108</b>
<b>14. System Operator functions .....</b>	<b>112</b>
Network operations .....	125
Governance arrangements .....	141
System Operation enablers .....	147
<b>15. Operational control systems .....</b>	<b>156</b>
<b>16. Appendices .....</b>	<b>162</b>
Appendix A01 - Ofgem Sector Specific Baseline Standards for DSO .....	162
Appendix A02 - Smart Meter Strategy .....	185
Appendix A03 - Network Visibility Strategy .....	185
Appendix A04 – Whole Systems Strategy .....	185
Appendix A05 - Digitalisation Strategy and Action Plan (DSAP) .....	185
Appendix A06 - DSO Strategy .....	185
Appendix A07 - Electric Vehicle Strategy .....	186
Appendix A08 - Heat Pump Strategy .....	186
Appendix A09 - Losses Strategy .....	186
Appendix A10 - Net Zero Communities Strategy .....	186
Appendix A11 - Innovation Strategy .....	186
Appendix A12 - Telecoms Strategy .....	187
Appendix A13 - Distribution Future Energy Scenario (DFES) Reports .....	187
Appendix A14 - Shaping Subtransmission Reports .....	187
Appendix A15 – Distribution Network Options Assessment .....	187
Appendix A16 - Acceptance and Dispatch Principles .....	188
Appendix A17 – Procurement timetable .....	188
Appendix A18 – Flexibility tender results .....	188
Appendix A19 - Distribution flexibility services procurement statement (C31E) .....	188
Appendix A20 – Flexibility service procurement process .....	189
Appendix A21 – Service Partner Agreement and Guidelines .....	189
Appendix A22 - Pricing strategy .....	189
Appendix A23 – Clearing process .....	189
Appendix A24 – Evolution of Distribution Flexibility Services Procurement Document .....	190
Appendix A25 – Standard Flexibility Agreement .....	190
Appendix A26 – Further governance options considered .....	190

# 1. Introduction

- 1.1.** The next regulatory price control review period, known as RIIO-ED2 is a five year period and is the second for electricity distribution to be determined using Ofgem’s Revenue = Incentives, Innovation and Outputs framework. This price control period runs from 1<sup>st</sup> April 2023 to 31<sup>st</sup> March 2028.
- 1.2.** Western Power Distribution (WPD) is required to submit a 200 page Business Plan document, supplementary annexes, detailed cost tables, financial information and a range of other documents which form our submission under RIIO-ED2 to Ofgem, which will be used to determine allowed revenues for the price control period.
- 1.3.** Our RIIO-ED2 Business Plan has been produced and compiled in line with the following key principles:
- Co-created with our stakeholders and supported by them.
  - Our Plan – ‘prepared with our stakeholders for delivery by us’.
  - Aligned with WPD’s purpose and values.
  - Affordable for all of our customers.
  - Sustainable and will enable net zero before 2050
- 1.4.** Everything in our business plan submission is driven to achieve the following four strategic outcomes for customers:





- 1.5. The diagram below (figure SA-03.0) shows the structure of the full Business Plan submission with the red box showing where this document fits into the overall suite of documents:

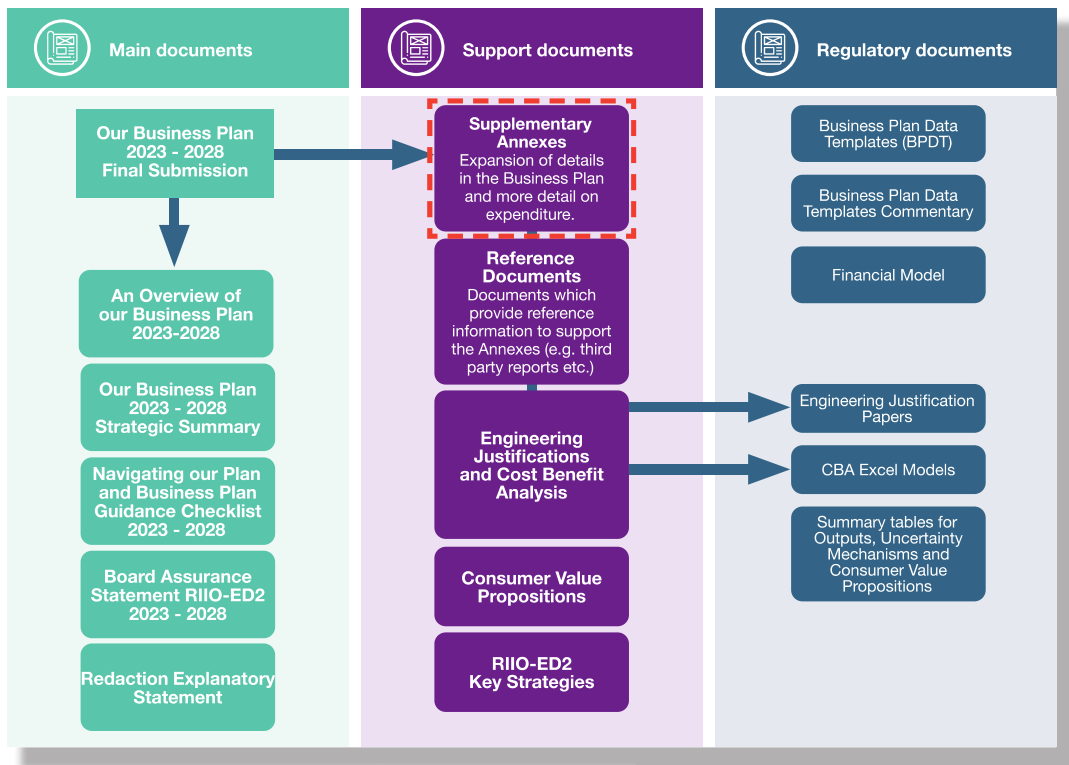


Figure SA-03.0 Business Plan submission structure

- 1.6. This document is a supplementary annex to Chapter 3 of WPD's RIIO-ED2 Business Plan document. Annex 3: Delivering a smart and flexible electricity network provides more details on our ambitious plans to deliver smart and flexible electricity network which drives and supports our move to a smart future for all. It sets out our path towards net zero for the four WPD distribution licences of West Midlands, East Midlands, South Wales and South West.
- 1.7. We appreciate that the readers of the WPD RIIO-ED2 Business Plan suite of documents will range from regulatory experts and well informed stakeholders through to new customers who may have had little previous knowledge of WPD.
- 1.8. This document is aimed at readers who require a more detailed understanding of the commitments that will be delivered.

**1.9.** This document is subdivided into the following sections:

Chapter	Title	Content
<b>2</b>	Our integral role in meeting net zero	Supporting the growth of low carbon technologies (LCTs) to achieve net zero
<b>3</b>	Harnessing the power of smart meter data	Smart Meters give us a valuable initial view into our low voltage networks for both capacity planning and fault response.
<b>4</b>	Network visibility and monitoring	The multi layered approach where smart meter data is blended with other data measured directly on our network.
<b>5</b>	A Whole systems approach	How we will benefit from innovative thinking and extensive collaboration across a range of energy vectors and community groups.
<b>6</b>	Modernising energy data	Digitalisation and data best practice
<b>7</b>	Delivering Distribution System Operation	An industry leading DSO function
<b>8</b>	Performance metrics for a smart and flexible network	An overview of our metrics
<b>9</b>	Low Carbon Technologies	Exploring the technology driving a sustainable future
<b>10</b>	Losses	Understanding and reducing losses from our network
<b>11</b>	Community energy	Engaging with our communities
<b>12</b>	Innovation	Themes and programmes of innovation
<b>13</b>	Telecoms	The changing landscape for the telecoms infrastructure
<b>14</b>	System Operation enablers	Provision of data/information/links to allow DSO providers to interact with our network
<b>15</b>	Operational control systems	The role of our control systems in managing and supporting a network which will become more flexible
<b>16</b>	Appendices	A number of appendices with additional information or containing links to supporting reports and strategies.

## 2. Our integral role in meeting net zero

- 2.1. WPD is leading an energy revolution, delivering a smart, digitalised electricity network by 2028. We're driving the shift towards a low carbon, net zero future for our customers and work is already well underway to transform the energy grid to achieve this. Over the five year period 2023-2028 we will turbo charge the pace of that change in order to meet the energy needs of our customers today and create a sustainable future for generations to come.
- 2.2. Net zero cannot happen across our regions without WPD. We take this responsibility very seriously and are determined to be highly ambitious, adaptive and efficient in everything we do. This in turn will ensure that our route to net zero is quick, effective and seamless for our customers. Above all, it will help us ensure that the smart future is inclusive for all, ensuring no one is left behind in the shift to adopt and benefit from low carbon technologies (LCTs) at scale.
- 2.3. We are transforming our operations, services and processes - delivering unprecedented digitalisation and innovation to meet the rapidly changing needs of our customers in a zero carbon future. As well as helping end user domestic customers, we stand ready to deliver an energy network and a suite of innovative services to support private and social landlords, community groups, multi premise businesses, energy service providers, energy suppliers, Electric Vehicle (EV) charge point developers, car dealers, local
- 2.4. Government has supported net zero growth through The Carbon Plan and more recently the Ten Point Plan and the Energy White Paper. The themes remain consistent through this support: the UK will achieve its carbon targets by decarbonising heating and transport. Decarbonisation is achieved through the electrification of products supported by low carbon electricity generation. Our role in this area is simple: we need to ensure our network can connect LCTs and generation with speed and efficiency. We will use our experiences in RIIO-ED1 and our innovation projects to achieve this role.
- 2.5. We are building on an impressive track record. During the RIIO-ED1 period, we transformed our network to accept low carbon generation. A mixture of Flexible Connection Offers and a modelling approach based more on energy volumes than maximum demands helped us connect more than 31GW of generation on a network conventionally designed for 14GW of demand.
- 2.6. We already boast a host of industry firsts in the pursuit of a sustainable future. We were the first Distribution Network Operator (DNO) to create Distribution Future Energy Scenarios (DFES) reports to forecast rapidly changing low carbon technology uptakes through to 2050, and the robustness and granularity of these has never been better thanks to extensive, ongoing engagement and co-creation with every local authority in our region. We were also the first network operator to cost the Distribution System Operator (DSO) transition, develop standardised DSO services, implement functional separation between our DNO and DSO operations and we already operate the UK's largest flexibility programme.
- 2.7. This new period sees a shift in focus from low carbon generation connection towards the growth of LCT products such as electric vehicles, battery storage and heat pumps. Net zero is a legally binding target for the UK and our work to connect LCT demands to complement the generation already connected is central to the achievement of that target.
- 2.8. In RIIO-ED2, we will see the focus shift from large scale renewable generation connections and towards high volumes of smaller LCT connections. Where we already see connection activity in generation at capacities around 5,000kW, the shift will be towards the volume connection of electric vehicles and heat pumps with capacities in multiples of 7kW. While the concept of connections and customers service is the same, the volumes will require a redesign to our business model to support the change.

- 2.9.** We must ensure our network development encourages the connection of LCTs by responding to changes in volume, by making capacity available and also by providing access to our network data to allow stakeholders to develop their own strategies for a net zero carbon outcome.
- 2.10.** Government figures forecast targets of 600,000 heat pump connections per year in the UK by the end of RIIO-ED2. At a similar time, all new cars will be electrified, leading to around 1,000,000 new EV connections per year. With WPD operating in around one third of the UK, we could see more than 500,000 new connections per year, or 2,000 for each working day. These levels trigger an automated approach to provide a quality service to our customers.
- 2.11.** An automated approach flows through to how flexibility might be realised on our domestic networks. While we will operate and schedule larger demands and generation on our higher voltage networks, the Low Voltage network cannot be micro-managed by us in the same way. We see flexibility being delivered through supplier tariff signals and aggregation offers. We do not expect to interact directly with our individual domestic customers.
- 2.12.** For these new solutions to operate, we need to understand our network in more detail. Maximum demand modelling will take a back seat as energy volume modelling takes over. In all cases, data becomes a key facilitator. We will ensure that we have a smart network that uses digital technology including monitoring equipment, communications networks and automated devices to actively analyse the network status and operate the network for optimised running arrangements.
- 2.13.** Presumed Open Data allows organisations which might not have historically operated in our area to understand how they might create solutions to benefit customers and support net zero. We are leading the industry in data provision and will continue to do so. Our Data Triage rules ensure that the maximum level of data is shared for others to develop.
- 2.14.** We have already experienced automated eco homes in work completed in South Wales. We expect this area to grow with new players in the home energy management arena. Management of whole housing estates as pseudo power plants is also an area where we expect growth, with benefits for the connected customers and the network operator alike.
- 2.15.** We will use the innovation tools that we developed in RIIO-ED1 to support this change. Flexibility is now embedded in our system operation plans as a result of innovation. Research in Electric Nation has showed us how we can connect more EVs to the existing network. BAU innovation has changed the way we provide customers with a service, now standardised on a three phase solution to provide capacity for the future.
- 2.16.** We are a dynamic and adaptive business, and will continue to be during the next regulatory period. During RIIO-ED2, we will continue to harness innovation and digitalisation to meet the changing demands of our customers. Our innovation team has an extensive back catalogue of tools and systems ready to deploy as our customers' demands evolve towards net zero. We are already researching new alternatives and expect that, during RIIO-ED2, our focus will move to support high volume connection management and community-led network management solutions.



- 2.17.** This annex outlines our strategic approach to driving the industry towards net zero. We detail not just the activities we are taking to deliver on our net zero ambitions, but also how they form part of a wider, interlinked strategy, which ensures we are able to deliver excellent customer service and prioritise digitalisation and innovation – all while supporting our most vulnerable customers, tackling fuel poverty and ensuring bills remain affordable for everyone.
- 2.18.** When determining our response in this chapter, we have considered at length:
- **What success looks like:** The energy revolution we are driving and our vision for a smart, flexible grid
  - **What this means for our customers:** The new services, tangible benefits and positive outcomes we will deliver
  - **How we'll achieve it:** The essential building blocks to achieve the positive outcomes for customers, from utilisation of smart meter data to improve network visibility through to a Whole Systems approach, company-wide digitalisation and a world-class programme of innovation.
- 2.19.** Our DSO, Innovation, Digitalisation and Whole Systems strategies cover in detail the actions we will take to revolutionise the network to deliver a smarter grid, maximise efficiency of existing assets before further reinforcement is needed and unlocking additional capacity (all of which are vital if we are to drive net zero across our regions). And, the impact of these strategies stretches to every corner of our business and will be felt by everyone working for WPD. They are foundations that will underpin all we do in RIIO-ED2, influencing the development and deployment of entirely new ways of working and innovative new services for customers that will drive efficiency in all we do.

## What success looks like: net zero by 2050

- 2.20.** The UK and Welsh government plans for net zero are clear and can only be met by decarbonising heat and transport powered by low carbon electricity generation. This will drive a huge increase in demand for electricity in the years ahead, with rapid growth in EVs, an increase in electric heating solutions and the acceleration of renewable, decentralised generation, such as solar panels and battery storage. WPD is therefore pivotal to net zero success.
- 2.21.** Having already transformed our network to connect high volumes of LCTs and low carbon generation in RIIO-ED1, in the next five years our focus will shift from large scale renewable generation connections to huge volumes of smaller LCT connections, including electric vehicles and heat pumps. The task is significant; government figures forecast the connection of 600,000 heat pumps a year in the UK by the end of RIIO-ED2. What is more, all new cars will be electric from 2030, leading to around a million new EV connections every year. WPD serves over a quarter of the UK, which means we are likely to see more than 400,000 new connections every year – the equivalent of 1,600 connections every working day – to provide power for an additional 1.5 million EVs and 600,000 heat pumps specifically in our region.
- 2.22.** This fast increasing level of demand will mean that we need to employ an automated approach to the connections application and acceptance process to ensure a consistent, quality service for our customers. Our market leading automated approach will not only deliver consistent and reliable service to the customers we serve, it will also be used to manage flexibility on our domestic networks. We operate and schedule larger flexible demands and generation on our higher voltage networks, but it will not always be efficient to manage capacity in the same way on the low voltage network. So we anticipate flexibility also being delivered through supplier tariff signals and aggregation offers.
- 2.23.** To implement innovative new solutions we need to collect and analyse increasingly diverse and comprehensive network data. As modelling based on maximum demand is superseded by energy volume modelling, our smart network will harness digital technology, including monitoring equipment, communication networks and automated remote control, to analyse the network and optimise its operation.
- 2.24.** Smart meters will be a core part of real time monitoring on the low voltage (LV) network. In the past, we successfully used templates and pre-set profiles to model the network but as the number of smart meters grows we will replace these simple approaches with more accurate smart meter derived load profiles. This is a cost effective way of creating an initial view of our LV networks, with more comprehensive substation level monitoring used at locations where smart meters predict high levels of network demand.
- 2.25.** As set out in our Digitalisation Strategy, our approach to presume all data 'open' will enable other organisations to identify and create solutions to benefit customers and support net zero. We are leading the industry in data provision and will continue to do so over the next five years, ensuring that the maximum level of data is shared for others to use and develop.

- 2.26.** Research from the WPD's Electric Nation innovation trial, the largest project of its type in the world, has shown how we can connect more EVs to our existing network through innovative thinking and new services for customers. During RIIO-ED2 we will continue to innovate in order to respond to the changing requirements of our customers. Our Innovation Team has extensive tools and systems ready to deploy to drive our customers' move to net zero in line with the ambitious regional aspirations of local stakeholders. We are already researching new alternatives and expect that, during RIIO-ED2, our focus will move to support high volume connection management.
- 2.27.** Innovative solutions do not just come from our research, development and demonstration projects. We empower employees in any part of the business to think differently, take action and drive change. For example, a trial of three-phase electricity to new homes in Wales, has led directly to WPD now being the only DNO to install three-phase LV connections into new homes as standard. This ensures that customers who require a higher capacity connection have the power available to charge EVs and heat their homes using heat pumps.

## UK government net zero commitment

- 2.28.** In June 2019, the UK parliament passed legislation requiring the government to reduce the UK's net emissions of greenhouse gases by 100% relative to 1990 levels by 2050. Doing so would make the UK a 'net zero' emitter; the first G7 national government to set such an aspiration into law.
- 2.29.** Net zero refers to achieving a balance between the amount of greenhouse gas emissions produced and the amount removed from the atmosphere. There are two ways of achieving net zero: reducing emissions and actively removing greenhouse gases. While carbon capture will help, lowering emissions will be the main route towards achieving net zero.
- 2.30.** The Climate Change Act 2008 requires the government to set five-yearly carbon budgets. The budgets set caps on the total greenhouse gas emissions allowed to ensure the UK meets its emissions reductions commitments. In December 2020, the UK Government's Climate Change Committee set out the sixth Carbon Budget proposing to bring forward achieving an 80% reduction in carbon by 2035, which includes a further expansion of low carbon energy supplies.
- 2.31.** On 10 September 2020, the UK Citizens' Assembly on Climate Change published a report on the UK path to net zero. The report focuses on transport, house building and energy to get to net zero carbon emissions.
- 2.32.** In November 2020, the UK Prime Minister launched a Ten Point Plan to lay the foundation for a Green Industrial Revolution. The following aspects of the Ten Point Plan will have impacts on distribution networks:
- Zero emission vehicles - providing the power for electric vehicles
  - Green public transport - providing the power for electricity based transport
  - Greener building - providing the power for non-fossil fuel heating
  - Offshore wind - impacting connections and capacity for coastal networks to distribute the power
  - Hydrogen - providing the power to produce 5GW of hydrogen
- 2.33.** In December 2020, the Department for Business, Energy and Industrial Strategy issued an Energy White Paper setting out a long term strategy for the UK's energy system. This has aspects that will have a profound impact on distribution networks. In particular, the government wants to increase the number of electric heat pumps used for heating buildings from 30,000 per year to 600,000 per year by the end of 2028 along with introducing a ban on the sale of diesel and petrol cars and vans by 2030 and hybrids by 2035.
- 2.34.** This will lead to a growth in the ownership of electric vehicles and heat pump heating systems, which will require extra capacity to be built into electricity distribution networks to meet the higher demand.

- 2.35.** The increased demand will add to the existing network challenges that have arisen from previous government incentives to move away from centralised fossil fuel based electricity generation to more localised renewable distributed generation. During RIIO-ED1, the proliferation of distributed generation has impacted networks by changing how the power flows on the network are managed and how demand is balanced with distributed energy resources such as local generation and energy storage.

## Welsh government net zero commitment

- 2.36.** The devolved Welsh government has set a target of achieving a 100% reduction in greenhouse gasses by 2050. It has also declared fixed targets for 2030 and 2040.
- 2.37.** The Welsh government 'Prosperity for all, a low carbon Wales' document looks at all aspects of decarbonisation. It specifically seeks a whole energy system approach to meet its targets. Drawing on both the National Grid FES and the WPD/SPEN distribution scenarios, it plots the route to achieve decarbonisation. A multi-vector approach is key to make use of renewable generation in Wales and bio methane and hydrogen resources which are being developed. To support the key requirements of Wales, representatives from WPD, SPEN and NG work together on the Mid Wales RDP. This draws on the strengths of all networks to consider the best solutions for Wales.
- 2.38.** Turning to transportation, the reduction of travel requirements and the increased use of public transport are key targets. Where EVs are the proposed solution, plans to invest in an EV charging infrastructure are a key part of the document. The Welsh government has set a specific target to reduce the emissions of taxis and buses by 2028 which could also support strategic investment.
- 2.39.** Home heating is another key area, with the Power Building Sector pathway to 2030 supporting a range of measures. Energy efficiency is the first option but, for the residual energy requirements, the decarbonisation of heating will impact electricity networks. WPD is working closely with the Welsh government on the Parc Eirrin development at Tonyrefail, where 250 net zero homes are being built. The network used to support this estate has already demonstrated the future for networks, with three phase service cables and monitoring of demands across the estate.
- 2.40.** In July 2020, the Welsh government welcomed a 'team Wales' approach across the whole public sector to help to reduce emissions and tackle climate change. The Partnership Council for Wales is the formal statutory vehicle for Welsh public services to work together. It is made up of representatives of local authorities, the National Health Service, Fire and Rescue Authorities, town and community councils, the voluntary sector, Police and Crime Commissioners and the Welsh government. The Partnership Council for Wales will be working together through a Decarbonisation Strategy Panel to provide the strategy and leadership to help achieve a net zero carbon public sector in Wales by 2030.

## Local Area Energy Plans (LAEPs)

- 2.41.** LAEPs are aimed at implementing local action that can contribute to the overall UK net zero targets. The local plans for low energy housing stock, electric vehicle charging and industrial/commercial development will influence the demand for electricity and hence the requirements for the electricity distribution network.
- 2.42.** A number of the local authorities have established comprehensive future energy plans, while others are still in the process of development.
- 2.43.** WPD has utilised these plans in developing network requirements and to inform the future energy scenarios that have been developed for each licence area, which in turn influence the amount of network expansion and reinforcement that is required to meet local energy demands.




## What this means for customers

**2.44.** This fundamental change in the way we operate as a business and the radical adaptation of the electricity network is all driven by the requirement to achieve vital outcomes and benefits for our eight million customers and achieve long-term sustainability for generations to come. The impact of our ambitious and innovative proposals for customers will be in four tangible areas:

- **Low carbon technologies:** Making it quick and easy for customers to connect their electric vehicles and heat pumps when they want to.
- **Flexibility services:** Keeping costs to customers low by only reinforcing the network where there is no alternative; while enabling customers to access financial savings in return for managing their energy needs more flexibly.
- **Community energy:** Driving the expansion of community-led renewable energy connecting to the network and participating in flexibility and demand reduction schemes to benefit local communities.
- **Open data:** Offering easier and automatic access to extensive network data, with the ability to tailor data requests to the customer's specific requirements and in a format of their choosing to drive innovative new services and enhanced local area energy planning.

### Low Carbon Technologies (LCTs)

 <p>The key outcome we'll achieve for our customers</p>	<p>Customers can easily connect LCTs without delays due to a lack of available network capacity. We will enable volumes of LCTs in our region (ready for at least an additional 1.5 million electric vehicles and 600,000 heat pumps) that enable the achievement of net zero well in advance of 2050, driving up the ambitions of local regions.</p>
---	---

**2.45.** During RIIO-ED1 we have already transformed our network to accommodate a significant growth of distributed generation, with the capability to connect 31GW of generation on a network originally designed for 14GW of demand, despite it not being part of the original regulatory settlement. Energy storage is increasingly used alongside generation to store excess power and release it to the network at a later point in time. This highly adaptive and innovative approach is a huge success story that puts us in a strong position to accelerate the pace of change in RIIO-ED2 to take a giant step towards net zero across our regions.


**2.46.** During RIIO-ED2, we expect further growth in distributed generation and storage, but by far the most significant changes to the way our network is used will be the exponential growth in electric vehicles (EVs) and heat pumps. We have detailed strategies for each of these technology types which we have published as part of our Business Plan suite of documents. We have undertaken extensive modelling and detailed planning, and we anticipate supporting more than a further 1.5 million EVs and 600,000 heat pumps in the period.

**2.47.** There are a wide range of potential LCT uptake scenario projections depending on a range of factors including government policy and regional aspirations and Local Area Energy Plans. We have worked closely with stakeholders and have undertaken detailed modelling in order to converge these potential scenarios into the most likely view. Details on how we have arrived at our Best View scenario growth projections for LCTs is set out later in this chapter. Crucially, the robustness and granularity of our forecasts is supported by detailed input and shared modelling with many regional stakeholders, including local authorities and local enterprise partnerships. What this means for customers is that we will ensure that the network capacity is ready so that customers can connect huge volumes of LCTs without delay.

We are proposing a 30% uplift in load related expenditure, to expand the network and rollout our flexibility service as widely as possible, with only a 3% increase in overheads to achieve this.


- 2.48. More information on Low Carbon Technologies is included later in this Annex.

## Flexibility services

 <p>The key outcome we'll achieve for our customers</p>	<p>We will expand the roll out of flexibility services by making it as easy as possible to provide these services. This will help to maximise the efficiency of the existing network, avoiding the cost to customers of carrying out conventional network reinforcement. We will allow all customers to gain fair access to our networks and systems and will provide advanced sight and greater certainty of WPD's flexibility requirements so that providers can better plan ahead and make longer-term investments. When connecting to the grid, more customers will be able to choose between a conventional reinforcement solution and a cheaper and quicker flexible solution.</p>
--	--


- 2.49. During RIIO-ED1, our DSO team has established flexibility markets that provide an alternative means of addressing network constraints. These harness the power of new technology and the ability of some network users to provide flexibility in their own consumption either by increasing, reducing or shifting their net import or export.
- 2.50. We are also developing a front loaded payment mechanism to catalyse investment in energy efficiency measures, building on the revenue potential of flexibility. Network areas which would benefit from flexibility may also benefit from energy efficiency measures which reduce network loadings at cardinal points assessed by the DSO. A specific energy efficiency proposition should deliver low risk, long term network utilisation reductions at an economic level.
- 2.51. Research from the 'Smart and Fair?' initiative, set out in our Customer Vulnerability Strategy, will directly inform the development of our energy efficiency product. Utilising insights from this research programme we will identify potential technical and contractual barriers to uptake so that these can be reduced to ensure we provide targeted, accessible information and our product can maximise opportunities to support vulnerable customers.
- 2.52. We will expand the rollout of flexibility services by making it as easy as possible to provide these services. This will help to maximise the efficiency of the existing network, avoiding the cost to customers of carrying out conventional network reinforcement
- 2.53. We will allow all customers to gain fair access to our networks and systems and will provide advanced sight and greater certainty of WPD's flexibility requirements so that providers can better plan ahead and make longer-term investments. When connecting to the grid, more customers will be able to choose between a conventional reinforcement solution and a cheaper and quicker flexible solution.

## Community energy

 <p>The key outcome we'll achieve for our customers</p>	<p>Community groups with less knowledge and expertise of the connections process will receive tailored support to develop their schemes and connect to the network in greater numbers. This will increase their confidence and understanding of our processes, so that they find it easier to gain access to our network, significantly increasing the amount of green energy generation connected to the system. In addition we will build their capabilities to enable local communities to participate in, and benefit from, flexibility markets to unlock capacity in each local region.</p>
--	--

- 2.54.** Community led renewable energy projects and energy demand reduction services have an essential role to play in the nation's efforts to tackle climate change. These projects deliver social, environmental and economic benefits to the local community helping to reduce fuel poverty, encourage engagement with energy issues, and generate community funds from renewable energy projects. We will ensure the network can connect new community owned generation at scale. As set out in the opening context to this chapter, net zero will be regionally delivered and therefore community energy groups are key to driving a fairer energy system that does not leave the vulnerable behind, as they are well placed to identify those in greatest need of support and act as a trusted body to engage them and provide ongoing support.
- 2.55.** Without timely and effective support from WPD, community energy organisations face many barriers, including the lack of viable business models, a shortage of time and resources and the challenge of keeping up to date with the complex and fast moving changes in the energy sector. We therefore recognise that we need to provide additional support to communities and local energy collaborators. We will therefore introduce a dedicated Community Energy Engineer in each of our licence areas to act as a means of access and support. Each will provide a clear focal point for community groups to help them develop and deliver their plans.
- 2.56.** We have already helped more than 100 community energy schemes connect to the network during RIIO-ED1. Our high quality engagement programme, which has been underway since 2014, has also resulted in collaboration with all 97 community energy groups across our four licence areas. That accounts for nearly half (43%) of all community energy groups in the UK, and has enabled the connection of 100MW of community owned renewable electricity to our network.
- 2.57.** Building on this excellent platform, in RIIO-ED2 we are committing to go significantly further and connect at least a further 150 community energy schemes across the five year period. We will hold 60 Community Energy Surgeries a year, with at least two in each local distribution area, led by these local WPD teams who are experts in the local network. This will allow us to engage more closely with groups at the start of their journey and provide guidance on how best to connect to the network and operate efficiently and effectively.

## Open data

 <p>The key outcome we'll achieve for our customers</p>	<p>We will provide our customers and stakeholders with easier automatic access to extensive network data, with the ability to tailor data requests to the customer's specific requirements and in a format of their choosing. This will enable flexibility markets to flourish and enable the development of a wider range of innovative products and services by third parties in the energy sector to devise new ways of lowering carbon emissions and driving towards net zero. We will ensure data is shared in a timely, accurate and complete manner that suits the end user and enables them to meet their aims.</p>
--	---

- 2.58.** Digitalisation of the energy system is at the heart of WPD's transition to build a smart and efficient energy system. It will provide enhanced insights into our existing infrastructure, which will enable us to improve our operational performance by maximising the value, efficiency and effectiveness of our existing assets before new network is required. In addition, it will enable us to deliver timely data and solutions in the right format to meet the needs of our customers and stakeholders.
- 2.59.** We have set out a bold vision for the role that digitalisation and data will play in transforming our business and delivering net zero for our customers and stakeholders. Our plans have been shaped by engagement with a wide range of stakeholders, and are fully focused on the delivery of outcomes for the communities we serve.
- 2.60.** Our proposed suite of projects represents a total investment of £36 million, that will achieve a collective lifetime net present value of £593 million. We have produced Engineering Justification Papers on a project by project basis to explain how our total expenditure in this area has been compiled, using engagement with key stakeholders including industries that are well advanced with digitalisation such as telecommunications to ensure our proposals are in line with best practice. We are delivering exceptional value to customers as a result of our efforts in this area, with a return on investment of £17 for every £1 spent. We believe that this represents significant value for money, and will unlock tangible outcomes including better choice, better customer experience, better access to our data, new markets and services and considerable efficiency savings in our operations. Our programme will also deliver the Data Best Practice guidelines and help us to exceed the DSO baseline expectations set by Ofgem.
- 2.61.** For open data, our starting point is that all data should be presumed open unless proven otherwise for privacy, security, commercial or confidentiality reasons. We will continue to enable our customers to maximise the value of data by creating increased visibility of current and future data, through the use of single source data portals. This will enhance access and utilisation of our data to unlock wide ranging value and benefits. We were the first network operator to provide our data through an online data catalogue called 'Connected Data'. It utilises the Dublin Core metadata standard and ensures a consistent level of supporting information is provided with each dataset. In RIIO-ED2 we will deliver a comprehensive Open Data Platform for our customers. As part of this, in order to enhance access to data that is tailored to their individual needs, we are committing to make at least 60% of WPD's data available via an interactive Application Programming Interface.

## How we will get there

- 2.62.** Having set out the tangible benefits our customers will receive as a result of our development a smart and flexible energy system, it is important to understand the essential steps we must take in order to achieve them. We have clear plans for how we will achieve this and the remainder of this chapter therefore sets out the fundamental building blocks that are key to our successful delivery for customers. These are further detailed in [appendix A01](#).



### 3. Harnessing the power of smart meter data

- 3.1. WPD does not own smart meters or have the responsibility for installing smart meters, but we will make full use of the information collected by smart meters to provide benefits for consumers, including the ability to significantly improve fault responses.
- 3.2. The installation of smart meters, being undertaken by the electricity suppliers, is due for completion by the end of 2024. This means that the rollout will continue into the RIIO-ED2 period and therefore the opportunities to benefit from the data will progressively increase until the rollout is completed.
- 3.3. WPD will take advantage of the information provided by smart meters and has published a Smart Meter Strategy. This includes using the alerts from smart meters to improve fault response, voltage information to determine network issues and load current to inform the need for network reinforcement as well as using the data to refine planning assumptions. Further details can be found in [appendix A02](#).
- 3.4. Historically, there has been very basic and limited information available about the LV network, with reporting of faults being dependent upon customers contacting DNOs and data about the load at substations being limited to basic maximum demand indicators. The installation of smart meters enables a step change in the visibility of the operational status of the LV network compared to the basic monitoring previously available.
- 3.5. The LV system was designed to work passively using templates and models to estimate load patterns and diversity. These models are now being challenged as LCT growth is changing the amount of load and loading patterns on the LV network. Smart meter data will allow us to see aggregated LV network demands over each half hour enabling informed decisions about the available capacity, the ability to connect new load or generation or the need for reinforcement.
- 3.6. The additional functionality and information available from smart metering will allow us to increase understanding of the network, improve our service to customers in existing activities and more effectively facilitate the low carbon transition.
- 3.7. There are, however, a number of challenges. The progressive deployment of smart meters means that certain functions will not be available everywhere. Load information for individual customers can reveal usage patterns and is deemed to be personal data and therefore we have developed a Data Privacy Plan which requires that the data is aggregated or anonymised before it is passed into WPD systems.
- 3.8. The majority of these systems will be developed during RIIO-ED1, but there will be costs and activity during RIIO-ED2 to cover the costs for the services provided by the DCC and to develop additional analytical capability and storage of data.



## Smart meter benefits

- 3.9. Smart meter data has the potential to enhance existing business activities such as fault management, network planning and asset management – delivering tangible benefits for our customers.
- 3.10. For many of these applications, the benefits increase as the density of smart meters on the network increases. This means that the level of benefits will vary across the network until the rollout is completed.
- 3.11. To take advantage of the benefits, we have established compliant interfaces with the DCC, established data storage systems and have created systems to interrogate and interpret data into existing WPD processes and systems.

## Fault management

- 3.12. Smart meters can provide alerts related to loss of supply. When there is a power cut, 'last gasp' functionality will trigger a message to notify us of the loss of supply.
- 3.13. Additional functionality allows the 'energisation status' of meters to be checked remotely, gaining a clearer understanding of which customers are off supply and allowing us to determine what kind of fault has occurred (blown fuse, open circuit fault, single premise). This provides a level of visibility down to the individual premise that has not been available before.
- 3.14. This helps us to dispatch the appropriate restoration resources and improve our restoration times. In the case of a call regarding a 'single premise', it also helps to remotely identify if the issue is on the network or on the customer's own equipment.
- 3.15. We have already developed an automated system which handles these messages and checks the meter status before transferring the alert into our fault management systems. Once transferred, we use our established rules to check if an off supply alert is part of a known interruption or whether a new incident needs to be created.
- 3.16. On completion of the fault, it is possible to check that all supplies have been restored. This is particularly useful in storm scenarios where faults on the high voltage network can mask additional issues on the LV network. The ability to check the status reduces the possibility of teams leaving the area while customers are still off supply.

## Network monitoring

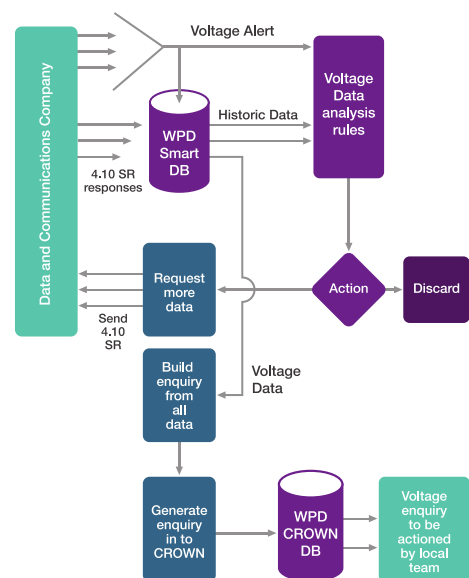
- 3.17. Smart meters measure both voltage and current and this data can be used to identify loading issues on the network.
- 3.18. Voltage data is related to the network rather than the individual and therefore does not need to be anonymised. This allows the measurement of voltage along a feeder which can identify potential generation or demand issues on LV networks. High voltages at the end of a network can indicate high levels of embedded generation, whereas low voltages can indicate high levels of load. The voltage data can be supplemented with aggregated load data to show whether particular feeders are highly loaded.
- 3.19. We can use this data as an early warning triage of our network. Substations with predominantly high or low volts over a long period of time can be identified and substation level monitoring can be installed. The monitoring can then verify the issues and appropriate reinforcement actions can be planned.

## Network planning

- 3.20.** Network planning at LV uses load profile templates to determine whether reinforcement is required. Smart meter data is being used to verify and refine the load profile assumptions. However, this only provides a representative view when there is sufficient density of smart meters on a feeder.
- 3.21.** We have estimated that a feeder requires 80% of customers to have smart meters fitted before it can provide a reasonable representation of the whole feeder. To check that this estimation is correct, we are comparing the smart meter data to data for the whole feeder from monitoring equipment installed at the substation. We are testing a range of densities from 60% to 100% to identify the appropriate level of density that provides a reliable indication.
- 3.22.** This will help us to refine the generic assumption used for planning and open up the opportunity for bespoke analysis for each feeder based upon its own profile.

## Voltage complaints

- 3.23.** Currently, WPD receives around 500 'voltage complaint' enquiries each year directly from customers. The existing method for investigating the enquiry is a time consuming and labour intensive process which frequently results in the voltage being within standard parameters, once investigated.
- 3.24.** Smart meters can send alerts when over or under voltage thresholds have been exceeded. As more smart meters are installed, this has the potential to generate a number of voltage alerts that will require some form of investigation.
- 3.25.** We are therefore developing a system, outlined in the diagram to the right, which allows us to react to voltage alerts and carry out more desktop-based investigations of reports made by customers. (See figure SA-03.1)



**Figure SA-03.1 Voltage Alert Flowchart**

- 3.26.** The system will automatically evaluate voltage alerts from a smart meter. Thresholds will be implemented to filter alerts depending on occurrence rate, level of voltage excursion and time of excursion. Alerts which exceed the thresholds will trigger automatic analysis of the other smart meters on the same feeder. When the analysis is complete and pre-set rules (such as a number of smart meters exhibiting similar alerts) have been met, a 'voltage complaint' enquiry will be raised within the database. This enquiry will be automatically passed to the local team to investigate using monitoring equipment and correct any issues identified.

## Future applications

- 3.27.** It is recognised that electrification of transport and heating, along with the adoption of distributed generation, will present a number of challenges to the operation of the LV network. Smart metering functionality has the potential to support future network operations, either through directing time of use tariffs that benefit the distribution network or using the data about the status of the network to support load shifting, controlling vehicle charging or triggering vehicle-to-grid support.

## Quantification of benefits

- 3.28.** The benefits from smart metering can broadly be split into two categories;
- existing business functions such as outage management and capital investments
  - future applications such as active network management and demand response.
- 3.29.** During 2019, the Energy Network Association (ENA) employed PA Consulting to produce an updated Network Benefits Realisation paper to outline the benefits of the smart meter rollout programme for DNOs. A summary report was published in September 2019 which detailed the expected benefits available based on the current smart meter penetration levels and expected coverage increase through the remainder of the rollout and out to 2030.

## DCC charging arrangements

- 3.30.** A regulated organisation called the Data and Communications Company (DCC) manages the systems for communications between the meters and users of smart meter services.
- 3.31.** In order to fund and support the operation of the national smart meter infrastructure, the DCC levies charges for use of its network. These charges cover the full end to end process and the costs of following elements:
- the communication network from the smart meters to the DCC - provided by the Communication Service Providers (CSPs);
  - internal DCC processing provided by the Data Service Provider (DSP);
  - the communication network from the DCC to user's processing centres;
  - Enrolment of SMETS1 meters into the DCC;
  - Supporting the Ofgem Faster Switching Programme including costs for the new Central Switching Service (CSS)



## Smart meter-related projects and outputs

- 3.32.** During RIIO-ED1, we started working on projects to prove the benefits of smart meter data for network management.
- 3.33.** The development and approval of the WPD Data Privacy Plan has given us the opportunity to start designing systems to handle and anonymise customer sensitive data from smart meters.
- 3.34.** We are undertaking the Smart Meter Profiling project which aims to compare smart meter load data with measured substation load profiles. This will provide an understanding of how these two data sets can interact and will inform the density of meters that is required for accurate representation of substation load. These will help us to refine our template models used for network planning.
- 3.35.** Smart meter alerts enable us to respond to potential issues on the network. We have developed processes that can filter out erroneous alerts, analyse valid alerts and act upon them following rules. We currently manage over 40,000 alerts per month with over 75% being assessed and used in WPD systems.

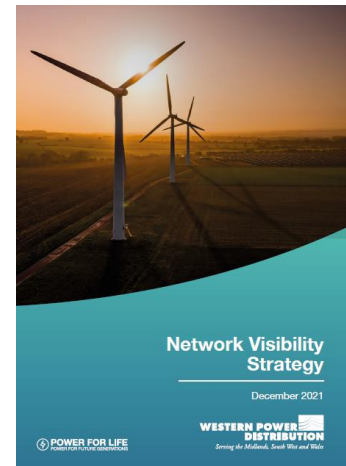
## Objectives and outputs for RIIO-ED2

- 3.36.** Most of the work to realise the benefits of smart meters will have been completed in the RIIO-ED1 period, but some of the benefits will be limited until the rollout is completed.
- 3.37.** In the RIIO-ED2 period, we will build on the foundations of RIIO-ED1 and use data analysis to refine our systems. We expect our alert handling systems to be improved through refined decision rules. Load profile data will be available by RIIO-ED2 and we will focus on making the data more visible in planning and operational systems. Work in this area will tie into our Data and Digitalisation Strategy projects.

## 4. Network visibility and monitoring

### WPD Network Visibility Strategy

- 4.1. In April 2020, WPD published a Sensors and Measurement Strategy, which identifies the monitoring requirements to be able to develop smart networks, improve network design and improve network security. This was updated in 2021 and given a new focus, to become our Network Visibility Strategy. Further details can be found in [appendix A03](#).
- 4.2. Critical to the successful operation of these new systems is good quality, reliable, and timely data relating to the state of the network. The achievement of this depends upon a significant amount of work to upgrade WPD's data acquisition capabilities.
- 4.3. Our ability to harness network data will deliver direct benefits to customers – in the shape of improved services, even better service continuity and quicker fault response times.



### Development of smart network solutions

- 4.4. As a great deal of the new, embedded generation on the higher voltage networks is based on intermittent renewables, there is an opportunity to connect more generation than would normally be allowed under traditional design processes geared towards conventional generation. This can be achieved by exploiting the intermittency of renewable energy sources and the relatively low probability that they will all reach full output simultaneously.
- 4.5. These connections (referred to as 'flexible' connections) depend on the ability to control the associated load. This may involve curtailing export when the network is highly loaded and unable to accept the generator's full output or using flexibility services to manage constraints by engaging with other connected customers who are able to operate flexibly and who can be contracted with to alter their generation and/or consumption on instruction.
- 4.6. Regardless of whether constraints are mitigated by using alternative connections, flexibility services, or a combination of both, the need for accurate, reliable real time data allowing real time analysis of the network becomes crucial.

### Improving network design

- 4.7. The proliferation of embedded generation and LCTs have also had an impact on the information required for network design purposes. Historically, little more than the maximum demand at a substation was needed to ensure the adequacy of the network. While demand readings remain useful for network design, they need to be supplemented by more information.
- 4.8. In many cases, it is not possible to determine the direction of the power flow which is an increasingly important consideration because reverse power flow can occur when generation levels are high at the same time as demand levels are low. Furthermore, the half hourly averaging that is carried out as standard runs the risk of masking true peak power flows when there is significant load variation within the half hour. Improvements are therefore needed in the way in which measurements are taken and recorded for planning and design activities.

## Power quality impacting network security

- 4.9. The increasing addition of inverter-based technologies such as renewable forms of generation, battery storage and electric vehicles has the potential to significantly impact power quality. Excessive levels of harmonic distortion have detrimental effects on the network, including the possibility of protection systems operating when they shouldn't, putting potentially large numbers of customers at risk of disconnection.
- 4.10. By monitoring power quality on a continuous basis, the levels of harmonic distortion on the network can be better understood and, therefore, acted upon in order to prevent damage to network assets or to prevent protection mal-operation resulting in significant load loss events.

## Existing scale of monitoring

- 4.11. The monitoring equipment installed at individual substations depends on a number of factors such as geographic location and network topology, but is most dependent on the nominal voltage, with the lower voltages having significantly less monitoring.
- 4.12. At a Grid Supply Point, Bulk Supply Point or primary substation, most of the required measurement transformers (current transformers (CTs) and voltage transformers (VTs)), telemetry, and control is already installed, but may require additional functionality such as transducers that take current and voltage measurements and convert them to directional real and reactive power flows.
- 4.13. At distribution substations, the amount of monitoring is considerably reduced, as the benefits have been limited in the past. There has been an increasing amount of remote control installed at HV, but the monitoring equipment associated with this is relatively basic. For low voltages, there is even less existing monitoring, in many cases limited to a basic maximum demand indicator that needs to be read manually.

## Track Record and RIIO-ED1 monitoring

- 4.14. Monitoring at primary substations and above has been established for many years. We have taken distribution substation monitoring from Innovation through to business as usual in recent years. We have also started to add monitoring to distribution substations and plan more for RIIO-ED2 complemented by Smart Meter data.

## Network Visibility – Our RIIO-ED2 projects

### Distributed Energy Resource SCADA monitors

- 4.15.** Traditionally, distributed energy resources (DER) were allowed to connect without a need for remote monitoring and control because the network was passive in its design. As more DER has connected to the network and the management of the network becomes more active, there is a need for improved visibility of the operating regime of DER.
- 4.16.** During RIIO-ED1, WPD commenced a programme of retro-fitting telemetry to customer points of connection where significant distributed generation or other flexible distributed energy resources (DER) are located.
- 4.17.** Additionally, following the low frequency event of 9 August 2019, and subsequent BEIS investigation, there is a requirement for telemetry and control to be fitted to all significant (>200kW) DER. This programme has also commenced and during RIIO-ED1 will address 132kV, 66kV and 33kV connected DER along with locations where there are clusters of 11kV distributed generation. However, there are over 1,000 DER installations and the majority are associated with smaller 11kV DER where the work will be delivered during RIIO-ED2.

### Directional power flow at primary substations

- 4.18.** The growth in generation connected to the distribution network is leading to different power flows, which in some cases can flow in the opposite direction to the way the network was designed. In addition, the different types of DER connected to the network have varying power factors affecting the amount of useful power that can be delivered to customers.
- 4.19.** In order to gain a better understanding of reverse power flow and power factors, power flow monitoring equipment is to be installed at all primary substations giving visibility of the 11kV network and higher voltages.
- 4.20.** The amount of work required at each substation will depend on a number of factors. For visibility of the 33kV and higher voltage networks, most primary transformers already have the required instrument transformers (CTs and VTs) which would enable a multifunction transducer capable of determining direction power flow to be installed where not already present. Multi-transformer sites that do not have busbar VTs will need an additional voltage selection panel to be installed to enable busbar voltage to be determined for any running arrangement. For additional visibility to cover the 11kV network, multifunction transducers would need to be installed for each circuit at a primary substation.

### EHV monitoring for smart systems

- 4.21.** The growth in generation connected to the distribution network is leading to different power flows, which in some cases can flow in the opposite direction to the way the network was designed. The different types of DER connected to the network also have varying power factors affecting the amount of useful power that can be delivered to customers.
- 4.22.** WPD has been rolling out various smart solutions during RIIO-ED1, including Active Network Management (ANM) and Demand Side Flexibility (DSF). During RIIO-ED2, other smart grid solutions such as System Voltage Optimisation (SVO) will be applied more widely. For these smart systems to operate effectively, we need more detailed information about the network loading and status.

- 4.23.** This often involves collecting additional data from existing installations or adding new telemetry systems to substations. This project will proactively fit additional sensing and monitoring to sections of the network prioritised for expansion of smart solutions.

## Power quality monitoring

- 4.24.** With more LCTs relying on inverters for connection to the network, power quality is becoming an increasingly important consideration. Excessive levels of harmonic distortion have detrimental effects on the network such as increased thermal stresses on equipment and mal-operation of protection equipment.
- 4.25.** The Primary Network Power Quality Assessment (PNPQA) innovation project is currently developing an understanding of more sophisticated, automated monitoring equipment. By monitoring power quality on a continuous basis, the levels of harmonic distortion on the network can be better understood and acted upon in order to prevent damage to network assets or to prevent protection mal-operation resulting in significant load loss events.
- 4.26.** The PNPQA project documentation indicates that approximately 60 sites per licence area would benefit from the improved monitoring.

## LV network monitoring

- 4.27.** Domestic customers are increasingly adopting low carbon technologies (LCTs) such as rooftop solar panels, electric vehicles, and heat pumps. Electric vehicles, in particular, have the potential to add very large levels of demand co-incident with existing periods of maximum demand. Our forecasts for the adoption of LCTs predict that up to 25,000 distribution substations could exceed their demand capacity by the end of the RIIO-ED2 period. This level of demand growth will lead to a requirement for reinforcement of the LV network, but opportunities should be taken to verify the requirement and prioritise the work.
- 4.28.** Traditionally, there has been very limited monitoring of the LV network, with, at best, very basic maximum demand indicators being used that were read manually during substation inspections. During RIIO-ED1, WPD has started to install additional monitoring for LV networks to better understand load profiles and gather information
- 4.29.** Installing monitoring to existing equipment requires a retro-fit. Our solution, developed through innovation projects, uses Rogowski Coils to measure current and voltage. For new equipment, we are working with manufacturers to include the monitoring equipment as part of the equipment specification.
- 4.30.** The locations for installation will be prioritised based upon analysis of smart meter data which will be used to provide an insight into where the network may be reaching capacity.
- 4.31.** Monitoring at LV will provide greater visibility of the loads, allowing proactive measures to be taken in real time and providing a more accurate view of reinforcement requirements, deferring the requirement at some sites. It will also provide verification of modelled information, enabling improvements to the modelling assumptions.

## Enhanced network modelling – RIIO-ED2 projects

4.32. Our list of network modelling projects is shown in figure SA-03.2.

Enhanced Network Modelling – Our RIIO-ED2 Projects		
Project Title	Background	Project Details
<b>Distributed Energy Resource SCADA Monitors</b>	As more DER has connected to the network and the management of the network becomes more active, there is a need for improved visibility of the operating regime of DER.	This project will continue a programme of retro-fitting telemetry to customer points of connection where significant distributed generation or other flexible DER are located.
<b>Directional Power Flow at Primary Substations</b>	The growth in generation connected to the distribution network is leading to different power flows, which in some cases can flow in the opposite direction to the way the network was designed.	In order to gain a better understanding of reverse power flow and power factors, power flow monitoring equipment is to be installed at all primary substations giving visibility of the 11kV network and higher voltages.
<b>EHV Monitoring for Smart Systems</b>	WPD has been rolling out various smart solutions during RIIO-ED1, including Active Network Management and Demand Side Flexibility. During RIIO-ED2 other smart grid solutions such as System Voltage Optimisation will be applied more widely.	This project will proactively fit additional sensing and monitoring to sections of the network prioritised for expansion of smart solutions.
<b>Power quality monitoring</b>	With more LCTs relying on inverters for connection to the network, power quality is becoming an increasingly important consideration. Excessive levels of harmonic distortion have detrimental effects on the network such as increased thermal stresses on equipment.	The project will install monitoring for power quality on a continuous basis, allowing levels of harmonic distortion on the network to be better understood and acted upon in order to prevent damage to network assets or to prevent protection mal-operation resulting in significant load loss events.
<b>LV Network Monitoring</b>	Domestic customers are increasingly adopting LCTs such as rooftop solar panels, electric vehicles, and heat pumps. Electric vehicles, in particular, have the potential to add very large levels of demand coincident with existing periods of maximum demand. 1.367. This level of demand growth will lead to a requirement for reinforcement of the LV network, but opportunities should be taken to verify the requirement and prioritise the work.	Monitoring at LV will provide greater visibility of the loads, allowing proactive measures to be taken in real time and providing a more accurate view of reinforcement requirements, deferring the requirement at some sites. It will also provide verification of modelled information, enabling improvements to the modelling assumptions.
<b>Internet Protocol Substation</b>	Original protection and SCADA were electro-mechanical systems and more recently these have been replaced by electronic versions, but often manufacturers have used their own bespoke software and communications standards. Modern systems have become standardised onto Internet Protocol (IP) communications.	This project will test this IP approach to protection and SCADA to establish the working practices and policies for wider deployment.

SA-03.2. Our RIIO-ED2 Enhanced Network Modelling projects



## 5. A Whole Systems approach

- 5.1. We have produced a Whole Systems Strategy which details how we will partner with other organisations to ensure we always deliver the most effective solution to meet our customers' net zero aspirations. Further details can be found in [appendix A04](#).
- 5.2. Network operators are responsible for assessing all potential options when developing their networks and then proceeding with the most cost efficient and economical solution. In the past, these have generally been focused on the solutions available from within an operator's own network.
- 5.3. We understand that delivering net zero in the most efficient way for our customers and wider communities requires innovative thinking and extensive collaboration across a range of vectors. We will consider every possible option when developing our network to make sure we deliver the most cost efficient outcome to match our customers' energy requirements. There may be opportunities for solutions to be delivered by other organisations, where this is the most cost effective result for the customer. This will involve greater collaboration with others across the wider energy industry, as well as with other utilities. It may also mean greater interaction with customers' systems where these can provide a benefit.
- 5.4. We believe that the whole system is comprised of four 'layers' to create a complete whole energy system. In RIIO-ED1, layers one and two of our Whole systems framework have become part of our 'Business as Usual' approach to Whole Systems (see figure SA-03.3). In RIIO-ED2 we will significantly expand this to layers three and four to take the most holistic view of Whole systems:

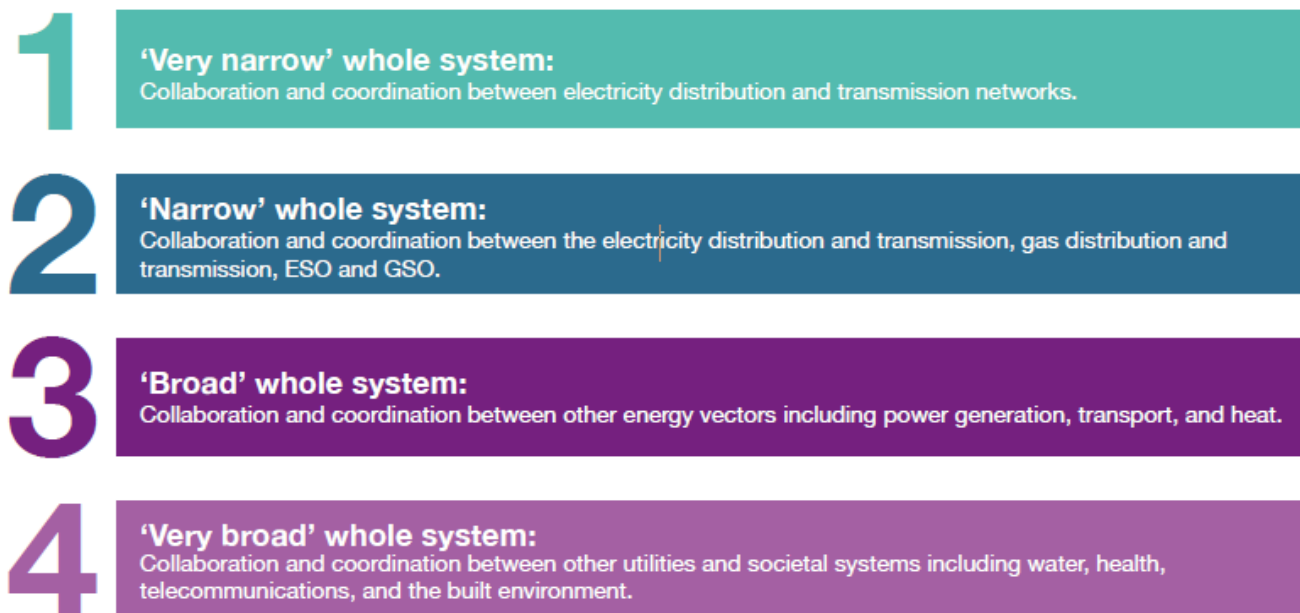
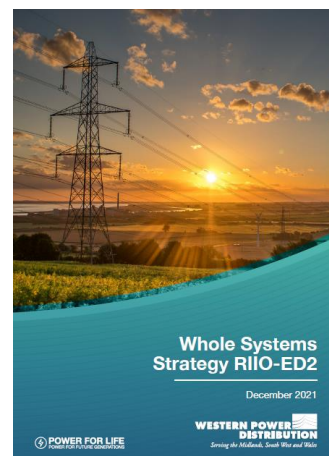


Figure SA-03.3 Whole systems framework

- 5.5. For the RIIO-ED2 price control, our whole systems ambition is to build on our existing approach – where layer one and two of our whole systems framework are essentially ‘Business as Usual’ already – to start delivering on layers three and four during RIIO-ED2 and, importantly, ensure we are ready to fully deliver on these areas in later years as the energy transition accelerates and other stakeholders also engage in whole systems thinking more fully. In RIIO-ED2, we believe greater collaboration, coordination and cooperation across electricity transmission and distribution, greater work across the energy vectors regulated by Ofgem and wider consideration across other sectors as shown in [SA-03.4](#) below.

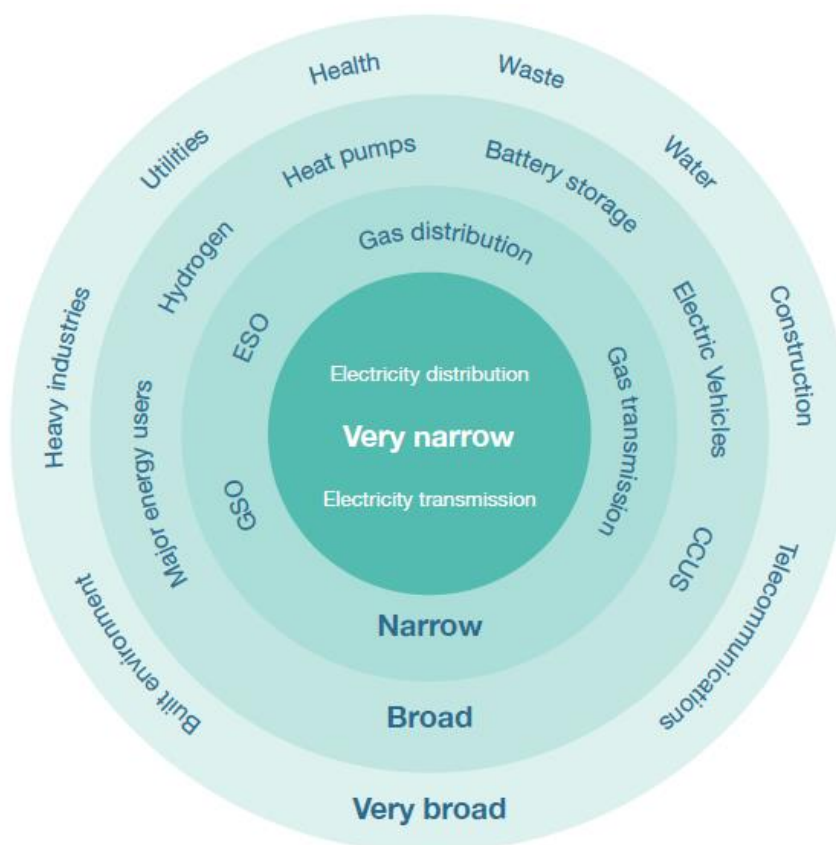


Figure SA-03.4 Complete whole energy system



- 5.6. Delivering a whole systems approach requires the right people, systems, processes, and data to be in place to meet the needs of our stakeholders (See figure SA-03.5). Recognising that the needs of our stakeholders are ever evolving, a whole systems approach also requires appropriate engagement with our stakeholders on an ongoing basis. Accordingly, a good whole systems approach will have several components to it:





Figure SA-03.5 Whole system approach components




## Our RIIO-ED2 Approach to whole systems

**5.7.** Figure SA-03.6 outlines some of the key projects we are already taking, and plan to take, to deliver a whole systems approach during RIIO-ED2 and, equally importantly, to be ready to deliver a whole systems approach during RIIO-ED3 and beyond. More information on all our whole system projects can be found in the Whole System Strategy.



Item	Whole system layer	Description
<b>Internal whole systems training</b> 	Broad (Energy)	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>Developing training tools for our individuals will enable them to understand and implement whole systems thinking and techniques into their work.</li> <li>Training sessions held will be driven by our stakeholder and wider system needs to ensure we target the appropriate spaces.</li> </ul> <p><b>Actions</b></p> <ul style="list-style-type: none"> <li>As an initial engagement stage, we will host training sessions to sense the current understanding of whole systems within the business. The internal training sessions will be driven by our stakeholders through our stakeholder engagement activities and wider whole system needs.</li> <li>Using our whole systems framework and definitions we will host further training sessions to enhance the knowledge of our teams to ensure they develop their understanding.</li> <li>We will host sessions with various groups, including innovators, digitalisation teams and others to learn how teams can embed whole systems thinking into their work.</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>We will measure the success of our sessions by reassessing people's understanding of whole systems following the training in comparison to our initial engagement stage.</li> <li>Ensuring the effectiveness of our training is hinged upon the implementation of processes and vice versa. Introducing training sessions on Whole Systems will build on the knowledge of individuals and allow our teams to embrace whole systems thinking in their decision making.</li> </ul>
<b>Whole Systems Management Team</b> 	Broad (Energy)	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>Establishing a Whole System Management Team will enable us to achieve our business plan deliverables and ensure whole system outcomes. This team will also allow us to apply a whole system thinking to decision making across the business, as well as ensuring accountability of the team to deliver our commitments.</li> </ul> <p><b>Actions:</b></p> <ul style="list-style-type: none"> <li>The management team will be involved with encouraging whole systems thinking, hosting the internal whole systems training sessions increasing awareness of the importance of whole systems thinking across the organisation.</li> <li>We are leading the way regarding the creation of our whole systems management team through our allocation of resources to collaborate with the Welsh Assembly on reaching their Net Zero targets This is highlighted through core commitment 1 where we are driving to achieve net zero across our regions sooner than 2050 in line with stakeholder plans (some areas as early as 2028), by ensuring network capacity is available.</li> </ul> <p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>Having a whole system team will allow us to embed whole systems thinking into our daily decision making enabling effective results for our stakeholders.</li> <li></li> </ul>
<b>Whole Systems Workshops</b>	Broad	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>In 2018/19, stakeholders put whole system approach as a high priority citing that increased collaboration, whole system planning and scenarios development as top issues. Stakeholders also emphasised the importance of</li> </ul>

<p><b>(Enhanced Stakeholder Engagement)</b></p>  <p>Completed</p>	<p><b>(Cross-Sector)</b></p>	<p>engaging with local authorities to support them to deliver on their net zero targets, sharing knowledge and information.</p> <p><b>Actions</b></p> <ul style="list-style-type: none"> <li>Throughout RIIO-ED2, we will host a series of targeted workshops to identify potential partnerships with authorities we previously would not have cooperated.</li> <li>As part of our core business plan commitments we are dedicated to supporting communities. We plan to significantly increase the volume of community energy schemes, connecting at least 30 Community Energy Groups to the network each year by holding 60 community energy surgeries per year and providing a dedicated WPD community energy representative to assist with connection and flexibility offers (please refer to core commitment 8).</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>Organising and delivering whole system workshops will allow us to further collaborate with other agencies such as water companies which are delivering in positive programmes in areas like biodiversity and the Environment Agency around flood defenses.</li> <li>With a large variety of stakeholder collaborating, we hope that the workshops will identify new methods and interlinkages through collaboration and coordinating where previously we would implement conventional methods.</li> </ul>
<p><b>Collaboration with Welsh Assembly Government, NG, WWU and SPEN</b></p>  <p>Future</p>	<p><b>Broad</b></p> <p><b>(Cross-Sector)</b></p>	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>The Welsh Assembly Government has recently published 'Net Zero Wales'. The publication contains 123 government policies and proposals to reach their target of delivering 70% of Wales' electricity demand from Welsh renewable electricity sources by 2030, as well as delivering net zero across the Welsh public sector by the same date.</li> <li>There needs to significant coordination between network companies, the Welsh Assembly Government and other key stakeholders to ensure that efficient whole system solutions can be developed to allow the connection of the required generation in a timely manner and at lowest cost for consumers.</li> <li>One of our core commitments is to drive the achievement of Net Zero across our regions sooner than 2050 in line with stakeholder by ensuring network capacity is available, see core commitment 1.</li> </ul> <p><b>Actions</b></p> <ul style="list-style-type: none"> <li>We have committed £2m of specific resources across RIIO-ED2 to collaborate and assist the Welsh Assembly to identify challenges faced by the Welsh energy system and assess potential solutions.</li> <li>We will engage with stakeholders to ensure a joined-up approach enabled with relevant data and information sharing. Our stakeholder engagement will also capture where decisions and actions are being taken at a more local government level utilising our stakeholder engagements in DFES with local authorities.</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>With increased coordination and planning through our specific resource and other partners, we will ensure that the transmission network use is maximised where possible and therefore ensuring lower network reinforcement costs for the consumer.</li> <li>While there will be a significant number of different parties involved in delivering these targets, our work in delivering a National Energy Plan for Wales will enable these benefits, by providing the grid infrastructure required to connect the various low carbon technologies.</li> </ul>



<p><b>Funding streams for community energy groups and advisory groups</b></p>  <p>Future</p>	<p><b>Very Broad</b> <b>(Cross-Sector)</b></p>	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>Our community energy groups have requested that we support them to access any available funding streams which could help them to establish a new project. We will therefore partner with them and support their ideas. One of our core commitments is to support a growth in community energy schemes by facilitating their access to available funding streams (see core commitment 9)</li> </ul> <p><b>Actions</b></p> <ul style="list-style-type: none"> <li>Our CVP-3 will engage a team of four community energy engineers to proactively support community energy stakeholders. This will help them to access funding streams by providing support to community energy groups when making submissions to our calls for ideas.</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>Supporting local energy stakeholders to secure funding will allow the reality of viable and ambitious low carbon schemes to go ahead, benefitting the community in the long run and provide whole system benefits.</li> <li>The expected benefit of this service will provide advice and consistent support to various community groups. We expect the net present benefit over the next five years to be around £11.3m (see P-8, or CVP-3 for further detail).</li> </ul>
<p><b>Net-zero South Wales</b></p>  <p>Completed</p>	<p><b>Narrow</b> <b>(Energy - Gas)</b></p>	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>With WWU, we were the first DNO to produce an integrated Distribution Future Energy Scenario (DFES) study which covered both the electricity and gas distribution networks in South Wales. The project went above and beyond the current industry standard in producing a DFES every two years.</li> </ul> <p><b>Actions</b></p> <ul style="list-style-type: none"> <li>This innovation project was about bringing two networks together, developing insights and value from an integrated approach to gas and electricity network planning.</li> <li>The project involved combining and extending studies previously completed separately for both WPD and WWU into a single integrated view of future net zero scenarios for their network areas.</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>The analysis produced a set of joint electricity and gas Net Zero 2050 scenarios covering WPD and Wales &amp; West Utilities' shared distribution network region in South Wales and explores a range of possible futures for our electricity and gas distribution networks.</li> <li>Building on this project and collaborating with WWU, we continue to develop shared in DFES ensuring standardisation and ultimately more accurate forecasts for our local authorities, wider stakeholders and consumers.</li> </ul>
<p><b>Peak Heat</b></p>  <p>In progress</p>	<p><b>Broad</b> <b>(Energy - Heat)</b></p>	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>With our ongoing work in publishing DFES and forecasting emerging technologies, we identified heat electrification could have a major impact on Low Voltage (LV) and Medium Voltage distribution network peak loads.</li> <li>Understanding further the resultant load profiles of these new electricity loads and technology shifts (e.g., from Economy Seven storage to Heat Pumps), the impact they may have on networks, and the opportunities they present for flexibility will provide whole system benefits for our consumers.</li> </ul> <p><b>Actions</b></p> <p>This project is comprised of the following work packages:</p> <ul style="list-style-type: none"> <li>WP1: Archetype creation</li> <li>WP2: Heat market landscaping</li> <li>WP3: Customer</li> <li>WP4: Area typology modelling</li> <li>WP5: CBA, Analysis and recommendations</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>The project will create demand profiles that can be incorporated into main business planning tools for future network development planning and load growth modelling.</li> </ul>



		<ul style="list-style-type: none"> <li>The project also assesses and investigates how heat pumps operate in different types of buildings (e.g. construction, size) and regions of our network.</li> <li>We will also analyse how thermal storage as an enabler to flexibility compares to other flexibility sources. This includes assessing the overall economic case for these sources versus upgrading the network.</li> </ul>
<b>Cost Benefit Analysis Tools</b>   In progress	<b>Narrow (Energy)</b>	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>Our use of cost benefit analysis tools is continually evolving to consider the options available.</li> <li>Throughout our business plan we have incorporated the Ofgem RIIO-ED2 cost benefit analysis tool to assess various reinforcement options. The tool has been used as part of the business planning process to determine the optimal conventional reinforcement.</li> <li>We have used the Common Evaluation Methodology (CEM) cost benefit analysis tool to evaluate the extent to which flexibility is used on our network. The tool is used to assess flexibility deferral within our business plan as well as the twice yearly DNOA process.</li> <li>As part of the Open Networks project, we will continue to work with the ENA to contribute to the development of whole system CBA tools which will be used to appraise projects in the future.</li> </ul> <p><b>Actions</b></p> <ul style="list-style-type: none"> <li>The Ofgem CBA tool is used to calculate the NPV of an asset by assessing the spend profile of all options, as well as the capacity added to the network.</li> <li>The CEM tool allows us to assess the net benefit of flexibility against a baseline of conventional reinforcement. If flexibility procurement is determined the optimal solution, it could create savings that can be passed onto consumers and stakeholders.</li> <li>The whole system CBA tool will be tested as part of our EPIC Network Innovation Allowance (NIA) project and then incorporated into BAU.</li> </ul> <p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>The range of tools used allows us to perform a greater assessment of whole system solutions and allows us to consider the long-term value for consumers and society. Once BAU, we will use the ENA whole systems tool for all our whole system projects enabling us to compare costs and benefits across different sectors and across a number of stakeholders and allow us to evaluate a number of scenarios.</li> </ul>
<b>Regional Development Programmes (RDP)</b>   In progress	<b>Broad (Electricity)</b>	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>The Regional Development Programmes (RDPs) provide detailed analysis of areas of the network which have large amounts of Distributed Energy Resource (DER) and known transmission / distribution network issues in accommodating that DER.</li> <li>The conventional methods would require agreeing changes in approach at industry forums before making changes to the way the industry works. This can take time and deals with hypothetical situations, whereas the RDP approach solves a real issue with real solutions.</li> </ul> <p><b>Actions</b></p> <p>The analysis innovates and pushes the boundaries of current thinking with a 'design by doing' approach to resolving issues. By focusing on the options for a specific case study that has a pressing need to improve outcomes for customers, it is possible to make faster progress.</p> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>In RIIO-ED2, we have committed to delivering three RDPs to further understand the interaction between the transmission and distribution network gained via whole system planning.</li> <li>Our business plan commitment 7 highlights our ambition to broaden our RDP's in order to further improve network efficiency. In RIIO-ED2 we will utilise a whole system approach for major reinforcement.</li> </ul>


		<ul style="list-style-type: none"> <li>We will undertake three regional collaboration trial schemes by 2025 involving a combination of gas, hydrogen electricity, water, waste, transport, and heating sectors.</li> <li>For example, we will investigate possible hydrogen network and storage requirements in our regions including blending hydrogen into the gas grid and for heating, analysing the possible impacts on our electricity distribution network.</li> </ul>
<b>Whole System coordination register</b>   In progress	<b>Broad</b>  <b>(Electricity)</b>	<p><b>Context</b></p> <ul style="list-style-type: none"> <li>As part of the new Whole System licence conditions, we are required to publish a whole system coordination register.</li> <li>The register includes details of any actions or processes that have been implemented (or are being implemented) because of coordination and cooperation activities completed with other electricity network licensees.</li> </ul> <p><b>Our ambition</b></p> <ul style="list-style-type: none"> <li>The scope of the coordination register found within ENA Open Networks Product (WS1B-P9) is very narrow and only considers the electricity network. For RIIO-ED2, we will drive more ambitious and detail relevant coordination and cooperation that are 'broad' and 'very broad' via the ENA as outlined in our whole system framework.</li> <li>This will allow our stakeholders and sectors other than electricity network licensees to understand opportunities that have been identified. This will further advance the industry in delivering whole system outcomes.</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>The coordination register will inform our stakeholders all the relevant coordination and cooperation activities completed with other electricity network licensees during a relevant period to develop whole electricity system outcomes, including data sharing.</li> </ul>

Figure SA-03.6 Whole systems projects

## Other Whole System activities

### Accelerated loss of mains change project

- 5.8.** The accelerated loss of mains change project is a project being delivered by National Grid ESO, Distribution Network Operators, and Independent Distribution Network Operators to accelerate compliance with new requirements in the Distribution Code on behalf of the Distribution Code Review Panel.
- 5.9.** The purpose of the initiative is to address issues with the settings for loss of main protection installed at distributed generators. The aim is to reduce the risk of inadvertent tripping and reduce system balancing issues by giving National Grid ESO greater latitude with regards to system rate of change of frequency limits.

### Statement of Works Appendix G

- 5.10.** Generators wishing to connect to WPD's distribution system may have an impact on the transmission system. Under the Connection and Use of System Code, DNOs are required to make a request for a Statement of Works (SoW) to NGET in relation to the potential impact of generation connections on the transmission system.
- 5.11.** Due to the lengthy SoW process and cumulative impact of connecting large volumes of new generation to the distribution system, an alternative approach has been developed with NGET and a new trial SoW process is currently in place, known as the 'Appendix G trial'.

- 5.12.** WPD has been instrumental in trailing this new process and the first DNO to have an Appendix G in place. The introduction of the Appendix G has reduced the time customers have to wait for the outcome of the process from around four months to six weeks.

### Flexible Power Collaboration

- 5.13.** Following the successful adoption of Flexible Power as a business as usual approach within WPD, other DNOs have also adopted Flexible Power within their business operations. Scottish Power Energy Networks, Electricity Network West Limited, Scottish and Southern Electricity Networks and Northern Powergrid ENWL, SSEN and NPg have all committed use the Flexible Power branding, tools suite and processes, creating much needed standardisation and consistency across network operators when assessing, procuring, dispatching and settling flexibility services.

### DCUSA DCP350 – Embedded Capacity Register. Power Collaboration

- 5.14.** Initially developed as the System Wide Resource Register as an Open Networks Project, this has now been enacted into DCUSA. The register provides visibility of customer connected assets and capacities, as well as the interaction between flexibility services and pending reinforcement upgrades. It provides benefits for who systems planning, visibility and operations.

### FES Network Forum

- 5.15.** Through RIIO-ED1 we have collaborated with the ESO and other network representatives within this forum. DFES data has been shared and queried during the FES process to help better inform the regionalisation of the national FES. This group also inputs to how the scenario framework is generated on an annual basis so it is reflective of distribution network needs. Spatial GB Clean Heat Model.
- 5.16.** This project has provided a first-of-a-kind integrated, high spatial granularity framework for regional energy demand and supply mapping that captures competition between all LCTs and the impact that consumers, communities, distribution networks, and regional and national bodies will have on the national heat decarbonisation strategy

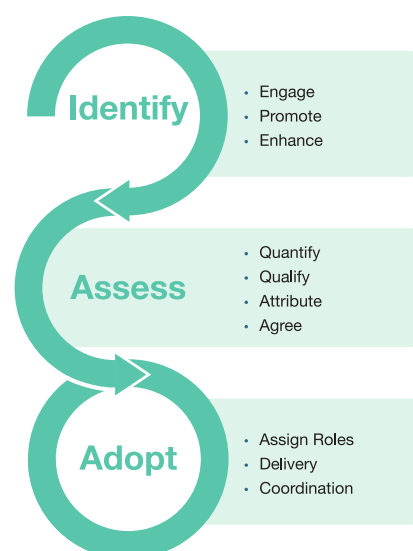
## Delivery of whole systems in RIIO-ED2

- 5.17.** Whilst decarbonisation and transition towards net zero is certain, the speed and means of that transition are uncertain. Since the electricity sector will be increasingly intertwined with other sectors, the outlook for electricity demand (not only annual energy consumption, but load duration curves and also locationally), storage and generation (such as the amount of local generation connected to the grid) on the road to net zero is highly uncertain.
- 5.18.** The number and wide range of scenarios highlights the need for us to be flexible in our approach to whole systems solutions across RIIO-ED2: since the world around us will not be static, neither can our approach to whole systems. An effective whole systems approach will need to recognise and respond to this uncertainty by constantly scanning the horizon for changes in markets and sectors, proactively engage with stakeholders to understand and influence their needs and dynamically and regularly updating plans for the electricity distribution network.
- 5.19.** There is no single vector by which net zero emissions can be delivered cost effectively, but electricity is well placed to deliver significant short-term progress. It is our priority to ensure our network and processes make electrification an easy route.
- 5.20.** To achieve our whole system solutions and outcomes in RIIO-ED2 (see figure SA-03.7), we have four lenses when approaching our projects and processes:



**Figure SA-03.7 Four lenses for approaching projects and processes**

- 5.21.** To ensure that any developments occurring on WPD's network have sufficient regard to interactions with the rest of the whole energy system, WPD will continue to engage with a wide range of stakeholders when developing a view of network requirements. This will include actors across the whole electricity system (ESO, TO, DNOs, iDNOs), other electricity market actors (Suppliers, Aggregators/ VPPs, Flex Service Providers), actors across the whole energy system (GDNs, Water, Transportation), Industry and representatives of businesses at various levels, communities/social interest bodies and also national, regional and local governments.
- 5.22.** By understanding the requirements and capabilities of all these stakeholders, alongside WPD's own, a much wider approach to option identification pathways can be taken, delivering outcomes which maximise the total benefits realised.
- 5.23.** Innovation will be a key delivery conduit, with whole system tools and processes still in an early stage of development. This will also be supported by technology innovation.
- 5.24.** WPD will develop different ways of understanding and measuring customer value, so that a better picture of benefits distribution is formed, leading to creation of a portfolio of whole system projects and developments with a published implementation timeline.
- 5.25.** Our approach to whole system development will form a waterfall-process, identifying potential projects and issues requiring mitigation, evidence based assessment of options against a quantifiable criteria and adoption of those positive elements, with WPD's whole system management team taking a leading role in coordinating the delivery of those outcomes. (See figure SA-03.8).



**Figure SA-03.8 System development waterfall**

- 5.26.** WPD will continue to consider whether there are activities that would benefit from whole system consideration. These may arise as a result of specific constraints on the network or as a result of proactive coordination with other organisations and sectors.
- 5.27.** Distribution benefits of whole system actions have been included in the relevant EJPs where identified.
- 5.28.** WPD will leverage its network to provide additional whole system benefits where identified and will continue to work with other actors to deliver those benefits, using the approach described above.
- 5.29.** Specific benefits realised during RIIO-ED1 and expected to continue to be delivered during the RIIO-ED2. By using the ESO's FES framework, we have reduced the cost of implementing regionally specific future energy scenarios. This has saved £2.76 million to date in RIIO-ED1 rising to £4.8 million in RIIO-ED2. Within WPD's areas we have undertaken two RDPs within RIIO-ED1. Saving £13 million across the RIIO-ED1 period, with a further £13 million estimated for future RDPs in WPD areas.
- 5.30.** Much of the flexibility in a future energy system will be connected to the distribution network, coming from both DER and demand. Ensuring market opportunities are available to D-connected assets within WPD regions will save the whole electricity system around £45 million in RIIO-ED2.
- 5.31.** We believe there are four key components to deliver whole system outcomes for our customers in RIIO-ED2. Within each of our whole system components, we have outlined many commitments demonstrating track record, current projects we want to take a step further and new whole system projects and initiatives delivering clear whole system outcomes for our customers.
- 5.32.** As outlined, our whole system approach and ambition is clear. The majority of processes we implemented during RIIO-ED1 are regarded as 'very narrow' and 'narrow' and these are now considered 'Business as Usual'. Our whole system strategy sets out a number of new 'very narrow' and 'narrow' initiatives which we aim to make 'Business as Usual' by the end of RIIO-ED2. There are also several new commitments within the 'broad' and 'very broad' whole systems layers which we believe this will ensure an important foundation beyond RIIO-ED2 as the energy transition accelerates and future stakeholders who will engage from a whole systems perspective.

## 6. Modernising Energy Data

### Making our network data available to customers

#### An ambitious and transformational Digitalisation Strategy

- 6.1. We have developed a comprehensive Digitalisation Strategy and Digitalisation Action Plan which has been central to our RIIO-ED1 plans for a smarter energy system, increasing sharing of data and better choice for our customers and stakeholders. Further details can be found in [appendix A05](#).



- 6.2. However, we recognise that in the past we have not fully seized all the opportunities presented by Digitalisation and data. The time is now right for us to move quickly to seize these opportunities to make our business more efficient, respond to the increased demands from our customers and deliver net zero for our stakeholders. We will become a 'data first' business over RIIO-ED2, putting data at the core of our decision making.
- 6.3. In line with this ambition, we have refreshed our Digitalisation Strategy and Action Plan for RIIO-ED2, setting out a bold vision for the role that Digitalisation and Data can play in transforming our business and delivering net zero for our customers and stakeholders.
- 6.4. We know that Digitalisation and data can deliver better outcomes for our customers, including improved customer experience for connecting low carbon technology, new services to support our vulnerable customers, better choice of communication channels, reductions in customer interruptions and minutes lost, better access to our data and can also stimulate new markets and innovative services.
- 6.5. Our updated Digitalisation Strategy and Digitalisation Action Plan has been shaped by engagement with our customers and stakeholders. It is now more focused on the delivery of outcomes for our customers and stakeholders, in line with our RIIO-ED2 Business Plan. We have taken a 'whole business' approach to maximise benefits for stakeholders.



- 6.6. To understand the scope of digitalisation, we must distinguish between digitisation (collecting data), digitalisation (using data) and open data (sharing data), this is detailed in figure SA-03.9 below.

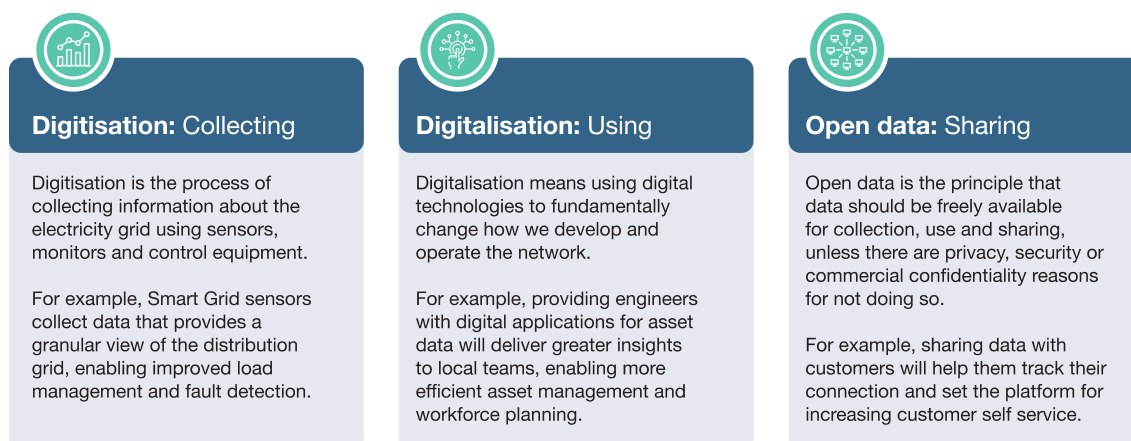
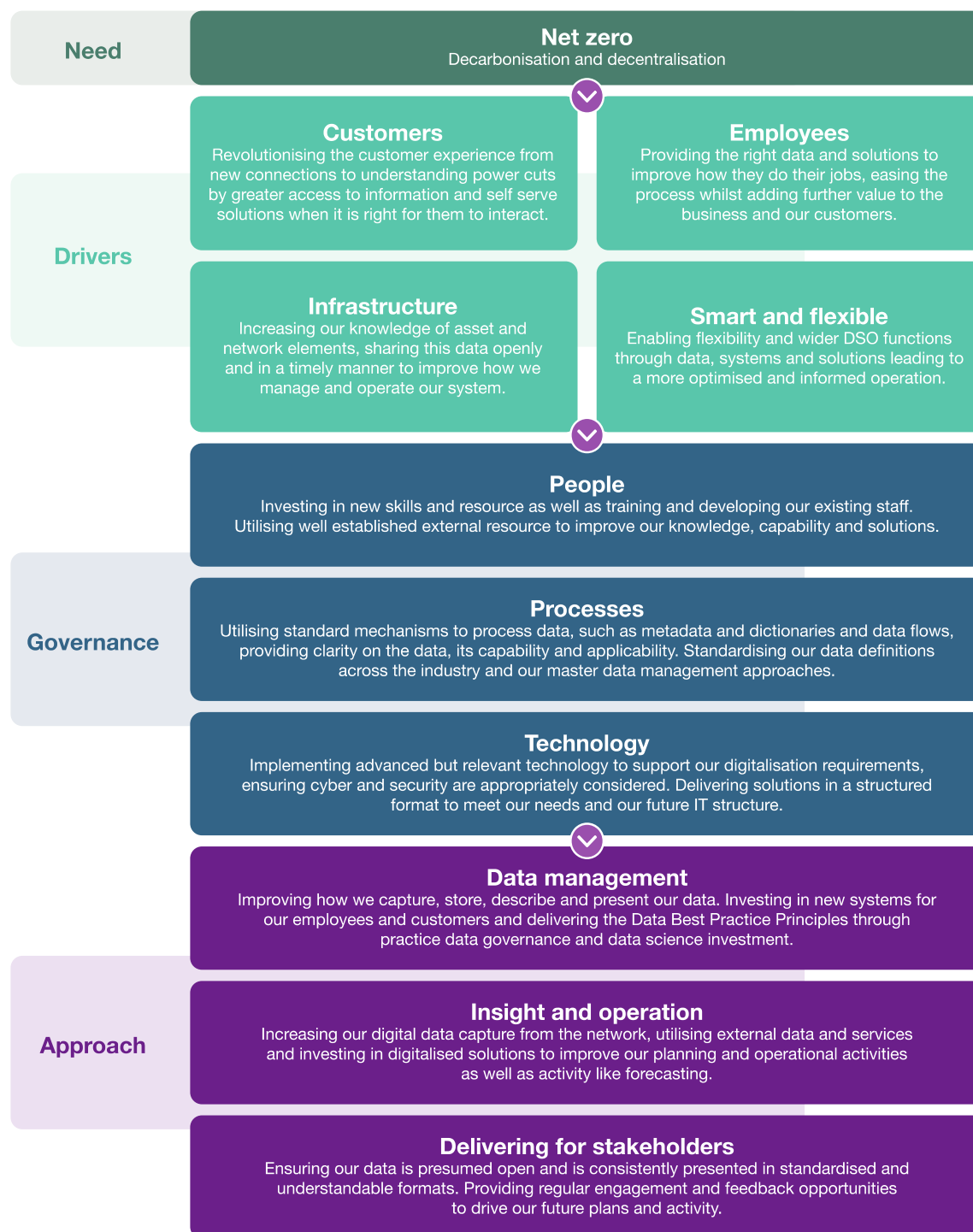


Figure SA-03.9 Digitisation, digitalisation and open data definitions

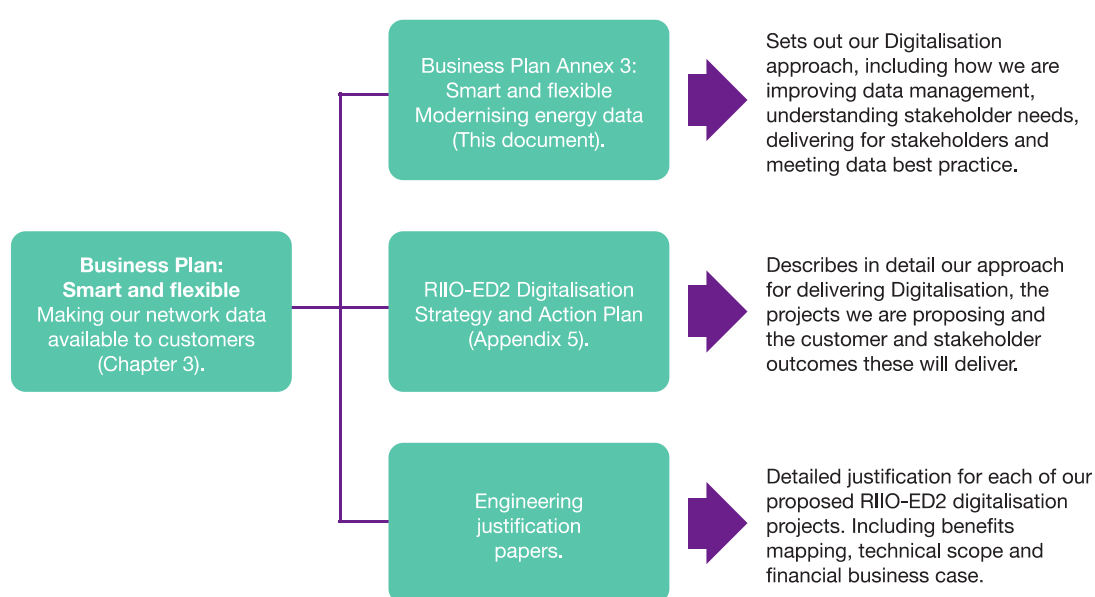
- 6.7. Our core principles from RIIO-ED1 'Improving data management', 'Increasing network insight and operation' remain. We have expanded our third principle 'Ensuring data is presumed open' to become 'Delivering for stakeholders' to reflect that we recognise the need to invest in Digitalisation to deliver tangible outcomes for our stakeholders. Each of our principles will ensure that value is delivered to the energy industry, and across Whole Systems to meet the net zero challenge.
- 6.8. We have carefully considered the needs and drivers behind our investment in Digitalisation and data and have grouped our approach into three themes which will enable us to deliver in a way that maximises benefits and outcomes for our customers and stakeholders. Our approach will be anchored by strong governance, which includes people, process and technology to make sure we are taking a holistic approach to deliver transformation, see figure SA-03.10.



**Figure SA-03.10 Data needs and drivers**

**6.9.** Moving from a legacy analogue system to a modern, digitalised energy system, is a critical step in enabling the UK's transition to net zero carbon emissions while keeping the lights on for customers. The availability and utilisation of good quality and accessible data is key. We are clear on the need to provide increased access to the right data at the right time within our organisation and through open access to our customers and interested stakeholders.

- 6.10.** We have demonstrated significant improvements in our data management processes through targeted project activity to understand our data sets, improve quality, and business and third party use cases. We have employed a consistent approach to data management, delivering standardised and effective processes to share data with other network licensees and wider customers and stakeholders.
- 6.11.** We continue to collaborate with all other network licensees through the Electricity Networks Association to establish common data descriptions, metadata standards and approaches to sharing data to ensure that a standardised and interoperable process is taken forwards. We have demonstrated leadership in this area as the first British DNO to share its complete high voltage asset and connectivity data in Common Information Model format.
- 6.12.** In addition to this section of the Business Plan, there are several other supporting documents (see figure SA-03.11) that should be read to develop a full understanding of our proposals for Digitalisation and data:



**Figure SA-03.11 Supporting documents**

- 6.13.** Each of our RIIO-ED2 Business Plan commitments are enabled by our investments in Digitalisation and data (see figure SA-03.12). We have thought carefully about our investments and how each of them combines to enable our main Business Plan commitments:

ID	Core commitment area	Our Digitalisation and data commitment
1	Customer Service	<ul style="list-style-type: none"> <li>Developing outstanding customer service acknowledging increasing customer expectations</li> <li>We aim to offer an Amazon level of digital engagement with immediate customer response across multiple channels 365x24. Those customers wanting a digital interaction will be able to do everything online. Every customer facing process will have a fully digital pathway.</li> </ul>

ID	Core commitment area	Our Digitalisation and data commitment
		<ul style="list-style-type: none"> <li>Predictive and proactive customer contact - by the end of RIIO-ED2 we will use data, machine learning and analytics to predict why customers are contacting us and move them to the most appropriate channel to get them the quickest response.</li> <li>Using digital to enhance traditional channels such as Telephone (Automation, agent desktop, process mining, 360-degree customer view) to free up our customer contact staff to deal with complex customer journeys</li> </ul>
2	Vulnerability	<ul style="list-style-type: none"> <li>We are going to exploit digital technologies to support our vulnerable customers. Multiple channels to support customers in power cuts, use digital means as part of our energy advice service and community support function. All our channels/platforms will be fully accessible with ISO accreditation</li> <li>Digital can be used to offer new services for our vulnerable customers, for example offering voice activated apps (Alexa) that combat loneliness and help customers access energy efficiency advice, additional support and services</li> <li>We will work with other parties (Peer organisations and cross sector) to improve the data we hold on our vulnerable customers to ensure that we are able to offer them tailored services and additional support.</li> </ul>
3	Connections	<ul style="list-style-type: none"> <li>Full digitalisation of the customer connection journey. Self-assessment, auto estimating, online contracts, book and reschedule work, customer satisfaction review. We will use data to drive the process by fusing network data, customer data and geographic data (For example, satellite).</li> <li>We can use digital technology to improve the time it takes to get a quote, visibility of the status of customer connections and also speed up delivery time to ensure that low carbon technology is connected to our network as quickly as possible</li> <li>Utilisation of APIs and open data standards to make the exchange of information during a connection (OEM, customer, installer, DNO, local authority, suppliers, energy service providers) more transparent and done 'once' rather than many times</li> </ul>
4	Social Contract	<ul style="list-style-type: none"> <li>Digital energy advice service. Automated home surveys for energy efficiency and low carbon technology options.</li> </ul>

ID	Core commitment area	Our Digitalisation and data commitment
		<ul style="list-style-type: none"> <li>Use of digital solutions to build an 'early warning system' of areas that are a risk of being left behind in the energy transition, potentially due to network constraints, planned third party investment, housing stock etc.</li> </ul>
5	Network Resilience	<ul style="list-style-type: none"> <li>Using machine learning to use proactive and preventative fault identification before they happen. Using insights from LiDAR to reduce faults from vegetation and asset health assessment.</li> <li>Automated workforce scheduling, tracking and resourcing to locate and repair faults faster.</li> </ul>
6	IT and Cyber	<ul style="list-style-type: none"> <li>Leading edge Cyber Security Operations Centre (SOC) – making use of expertise and best practice from international comparators and other sectors to deliver excellence securely</li> <li>We have developed a partnership with the NCSC. Using Digitalisation to enhance risk management, defence, detection, and recovery from cyber threats</li> </ul>
7	Safety	<ul style="list-style-type: none"> <li>Using data to provide the right information at the right time to staff, contractors, customers and stakeholders to support safe working practices.</li> <li>Connected worker and connected construction to monitor potential safety incidents by understanding where people, plant and equipment are to continue to keep everyone safe.</li> <li>Use of VR, AR, XR to improve the effectiveness of training - using digital to transform the approach to learning, e.g. immersive training using VR headsets</li> </ul>
8	Workforce Resilience	<ul style="list-style-type: none"> <li>Enabling data and insight to be accessed throughout the business to deliver clarity and purpose to business operations and creating a greater community amongst employees.</li> <li>Staff now have the same expectations in terms of their experience as customers do. They have smartphones, are used to downloading apps, have smart home technology etc. Data and digital applications will be used to improve employee engagement and also attract new talent.</li> <li>Data and digital also open up new career paths (e.g. Data science) and new digital skill development (e.g. agile) for employees for employees and can support our employees with their accessibility needs to become a more inclusive employer</li> </ul>

ID	Core commitment area	Our Digitalisation and data commitment
9	Environment	<ul style="list-style-type: none"> <li>Optimising our operations through digitalised solutions included optimised workforce routing and activity, the use of machine learning design activity to develop environmentally considered construction.</li> <li>Minimising electricity lost by heat by analysing historical data patterns and adjusting network operations through machine learning processes.</li> <li>Using data insights to ensure that we build a 'green supply chain' and sharing more data with suppliers to help to reduce overall carbon footprint.</li> </ul>
10	Smart & Flexible network	<ul style="list-style-type: none"> <li>Digitalisation drives the foundational requirements for a continued smart and flexible network, including highly accessible and visible data to drive DSO functions, state estimation planning platform to optimise our short- and long-term operational activities. We will use our digitalisation programme to provide all data users the right data at the right time to make informed and improved decisions.</li> <li>Using open standards and APIs to share network operational data, and flexibility data with the market to avoid operational constraints and encourage new innovation and services. Development of energy as a service is customer led</li> <li>Improving forecasting by using machine learning and AI, and using external datasets (for example, weather and socio-economic data)</li> </ul>
11	Innovation	<ul style="list-style-type: none"> <li>We will deliver improved and increased innovation activity throughout the business and with our stakeholders through the implementation of our Innovation Data Hub; beta and leading edge data to be used by researchers and academics to speed up the transition to net zero</li> <li>We will use digital tools to identify, plan, manage and assess business innovation and improvement</li> </ul>
12	Community Energy	<ul style="list-style-type: none"> <li>Tailored digital services to serves communities and their activities. Providing digital workshops to empower communities to maximise the value from data to deliver net zero. Highly granular and relevant data will be presented effectively to support local area planning processes.</li> </ul>

Figure SA-03.12 Commitments



- 6.14.** We have mapped the engineering justification papers for our proposed projects in RIIO-ED2 to the 12 core Business Plan commitments to illustrate how our RIIO-ED2 projects to a whole business approach to deliver significant improvements. Further details are shown in figure SA-03.13 below.

EJP ID	Project Name	Customer Service	Vulnerability	Connections	Social Contract	Network Resilience	IT & Cyber	Safety	Workforce Resilience	Environment	Smart and Flexible Network	Innovation	Community Energy
74	Smart Meter data for planning and operation												
89	TSDS and data historian platform												
90	Self Service Connections and Services Solution												
91	Machine Learning applications and data analytic solutions												
92	Planning State Estimation												
93	Low Voltage Connected Data												
94	Internal Data Platform												
95	Innovation Hub												
96	Open Cloud Data Platform												
97	Online Work Scheduler Viewer												
98	Data Mastering Solution												
99	Work Scheduling and Management Solution												

**Figure SA-03.13 Project to Business Plan commitment mapping**

## Our approach

**6.15.** Our Digitalisation activity is delivered across three pillars, (see figure SA-03.14) which have been developed and refined from our initial strategy through our ongoing internal and external stakeholder engagement. We continue to engage extensively through our innovation, network strategy and dedicated Stakeholder Engagement Team in support of these three pillars and the Digitalisation Strategy.



**Figure SA-03.14 Digitalisation activities**

## Improving data management

- 6.16.** Improving our data management is key to enabling the development of digitalised solutions and ensuring our customers can interact with and benefit from our data. We understand the need to continually improve in this area and our success measurements will help us track our progress. A key part of improving our data management is to employ best practice in this area, and we are committed to delivering against the Data Best Practice Principles.

### Governance processes

- 6.17.** Key to robust and appropriate data management is data governance with a clear focus on appropriate data owners and processes, responsibility and transparency in order to enable data quality to be managed and improved. (Figure SA-03.15) Providing a set of rules and processes to follow that are fit and appropriate for our complete business is key to ensuring that we maintain a consistent approach to data improvement and management as well as providing a route for feedback to improve and adapt as required. Our Data Governance processes, set out further in our Data Strategy, are managed centrally to ensure coverage across the business and incorporation of all necessary people, process and technology considerations.



**Figure SA-03.15 Data governance**

- 6.18.** We have created a robust framework to ensure the confidentiality, quality and integrity of WPD's and our customers' data as is essential to meet social and legal obligations, including regulatory compliance, data sharing and privacy policies. Continuing to increase oversight, ownership, visibility, and management helps avoid the risk of data breaches or compliance issues. This framework will continue to enable the integration and consolidation of information from multiple systems historically managed in silos throughout the business into a single source of data providing economies of scale and making it possible to tie information policy and process to business strategy, delivery, and efficiency improvements.

## Improving data quality

- 6.19.** Digitalisation is powered by good data. We have seen evidence of this in our developing flexibility activity, where accurate and reliable data has underpinned improved solutions, which is why we're on a mission to continually improve the quality of the data we collect and use. Additionally, we know that good data quality can deliver better customer outcomes, if we improve the data, we hold on our vulnerable customers we can better tailor additional support services for them.
- 6.20.** Good data is essential to maximising the impact of digitalisation for our customers and our business. We have seen this demonstrated already in the improvements and innovation delivered in our smart and flexible solutions which require accurate, reliable data to deliver for our customers. With better quality data, we can better tailor our services to deliver the outcomes our customers require, whether that be providing support services for vulnerable customers or digitalising contact channels for customers looking for self-serve solutions. It is therefore key we continually improve the quality of the data we collect and use and the importance of this is demonstrated by our specific data quality success measures which we will use to capture our progress in this area.
- 6.21.** The first stage in improving our data quality is to drive improvements in data collection and we will continue to do this by developing the digital data collection methods available to our colleagues in the field, facilitating their ability to make better operational decisions for our customers and our network. Now and through RIIO-ED2, we focus on delivering long term, sustainable improvements in data collection by replacing manual data collection process with automation and supplementing this with machine learning technology to improve data requesting and collation.
- 6.22.** We have already made significant changes to data collection by developing a range of iPad applications for use by all our field staff, which enables them to make better operational decisions and support our customers in the field. To make long term improvements to data collection, we are increasingly replacing manual processes with automation supported by machine learning technology which can automatically request and collate data.
- 6.23.** Applying data governance processes is already supporting data quality improvement as well as the implementation of project driven improvement activities to fill data gaps and quality issues. Our approach to data, including our clear data governance, plays an important role in improving our data quality through clear ownership and responsibility. Implementing this data centric approach throughout our business is driving data quality improvements including changes to how we capture data at source, store the data and manage it. For our historic data we have largely relied on relatively manual processes for improving it. We now focus on rules based improvements initially to enable a degree of automation supported by machine learning (ML) to provide improvement on an enduring basis.

## Single source of the truth

- 6.24.** We store our data using several different legacy systems, with the same data often stored multiple times (for example, some asset records are held in the asset register and in the control systems). Storing data in multiple systems can lead to inconsistencies which is why our focus is to have a single source for our data. Furthermore, we will focus on improving the data we hold about our customers, so we can provide better customer service and additional services for our vulnerable customer base to support them through the energy transition.
- 6.25.** We have implemented our High Voltage Integrated Network Model (INM), which provides a consolidated canonical model by connecting directly to our three core asset data systems: enterprise asset management, network management and geospatial information systems. The INM identifies discrepancies in data between these systems and uses an automated ML process to create a single version of our network, assets and connectivity, driving consistency and confidence in data. In RIIO-ED2 we will expand this to our LV network to ensure that the network that the majority of our customers are connected to is as well understood and available to support our and our customers' future needs.
- 6.26.** We will expand the initial implementation of our central data catalogue to provide regular and reliable single point access to trusted data in a timely and effective manner throughout the business. This will enable customers' decisions to be better informed and made more dynamically (for example, where best to connect their low carbon technology to our network).
- 6.27.** Our innovation programme has already developed new solutions to enhance the operations of our network by having more data available. These solutions, together with advanced control systems, are being rolled out to improve the effectiveness and efficiency of our network operation. This will stay central to our delivery and output in RIIOED2, utilising our innovation programme to enable our wider digitalisation programme.

## Increasing network insight and operation

- 6.28.** Leveraging value from data and embedding digital solutions is fundamental to become a truly digitalised business with enhanced visibility of our operations and network. As part of RIIO-ED1, our innovation projects have delivered new solutions capable of providing enhanced visibility of our network, what it is doing and what it is likely to do. During RIIO-ED2, we will continue to deliver and build on these improvement and innovation solutions, such as automated optimised outage planning solutions, and together with advanced control systems we will roll these out across our network. This roll out is aligned with our customers incrementally switching from fossil fuels to electricity to meet their heat and transport needs, requiring a more dynamic and responsive network. Using increased and improved data is key to how we operate our network in real time and the provision of more informed actions will help maximise the capability of our existing assets and how we maintain, plan and reinforce our network in the long term.

## Additional data and monitoring

- 6.29.** Improved network monitoring and access to more data enables decisions to be better informed and made more dynamically. It is becoming ever more important to have access to data with greater granularity as customers are increasingly engaging with the network for responses to their needs. We are improving our base level network visibility to inform our business and customers with planning and operational timeframes. Targeting areas of greater LCT integration, either actual or projected, with more dense data capture capability in the first instance will support our customers and our business with informed optimised operation to minimise the need for traditional network reinforcement.
- 6.30.** We will drive value from increased asset data, such as data provided from increased sensors on our Low Voltage assets, to understand the condition of the network and specific assets. This will enable greater proactive asset management to identify and plan interventions which deliver cost savings and risk reduction over routine or time based maintenance.
- 6.31.** As well as network data and monitoring, we recognise the value wider data capture can bring to inform and improve our customer service business efficiency, from understanding processes like new connections and outage planning, to how we engage with customers effected by power cuts.

## Use of external data and services

- 6.32.** While we are increasing the density and volume of monitoring and data capture on our network, it's recognised that there's a need to use relevant external data sets and services to leverage greatest value. Therefore, a key focus is to increase the volume of external datasets and services that can be used or combined with our data to deliver greater insight and improved decisions.
- 6.33.** We already harness data, including weather forecasts to inform our operational decisions. We will be making greater use of smart meter data to inform our processes, make service improvements and minimise power cuts.
- 6.34.** As we make more data available, we recognise that others will also have skills and capabilities to drive value from our data. By sharing more data with third parties (while maintaining privacy and compliance), we will be able to identify new improvements and will consider using these third party services to benefit our network and customers throughout RIIO-ED2.
- 6.35.** We will also look to work across the industry to improve the data we hold about our vulnerable customers. We recognise that vulnerable customer data can be improved, and better sharing between peer organisations and across industry (for example, Water, Telco and Transport) can enable the identification of customers who need additional support services.



## Understanding yesterday, today, and tomorrow

- 6.36.** Detailed understanding of our network's historic, live and future activity informs key network operation decisions for us and our customers on how they operate their assets or connect and interact with our network.
- 6.37.** We have recognised this need and share our real time and historic network power flow information openly in our three formats, highly visual, raw data and API, for our four licence areas and have reflected this in our business targets and digitalisation success measures. Our commitment is to further increase the granularity of this data to provide greater insight and as our forecasting maturity develops, we will share this in the same manner to support increasing use of our flexibility services and other solutions.

## Delivering for stakeholders

- 6.38.** Our stakeholders have told us they have different needs and expectations for the same data. That is why we are committed to ensuring the right data is available in the right format at the right time to serve different users. Dedicated engagement focused on Data and Digitalisation ensures our Digitalisation Strategy is focused on customers and stakeholders and our solutions provide the digitalised service our customers require. Data and Digitalisation is also at the core of our internal and external wider business engagement, delivered through our ongoing innovation, network strategy and dedicated stakeholder engagement channels.

## Defining needs and engaging

- 6.39.** We understand that our customers, employees, and stakeholders have specific needs that require our data and digitalised solutions, and it is key we engage and explore with customers to align to these. To ensure the development of these solutions and our customer service remains tailored to these needs, we will continue to focus our internal and external engagement on an action and benefit process. This process focuses on what actions are required to deliver the benefits customers are seeking and what data is necessary to facilitate these. To reinforce and drive this, we are also introducing specific success measures relating to understanding the needs of our customers.
- 6.40.** Through consultation with stakeholders and customers, we build our understanding of how to present the data that is most useful for our customers. We have successfully used this process to gather extensive data use cases categorised against five internal and six external data user categories:

### *Internal*

**Design & Planning** – network planning engineers, commercial flexibility managers and support staff.

**Operation** – network control room functions for DNO and DSO functions.

**Finance** – financial managers, finance support functions and reporting.

**Regulatory** – business analysts, regulatory reporters, and operation planning staff.

**Information / Operation Technology** – system architects, communication engineers and maintenance support.

### *External*

**Energy Sector** – aggregators, energy providers, flexibility platforms, network operators, electricity generators and renewable generators.

**Academic & Innovators** – academic researchers, entrepreneurs and innovators.

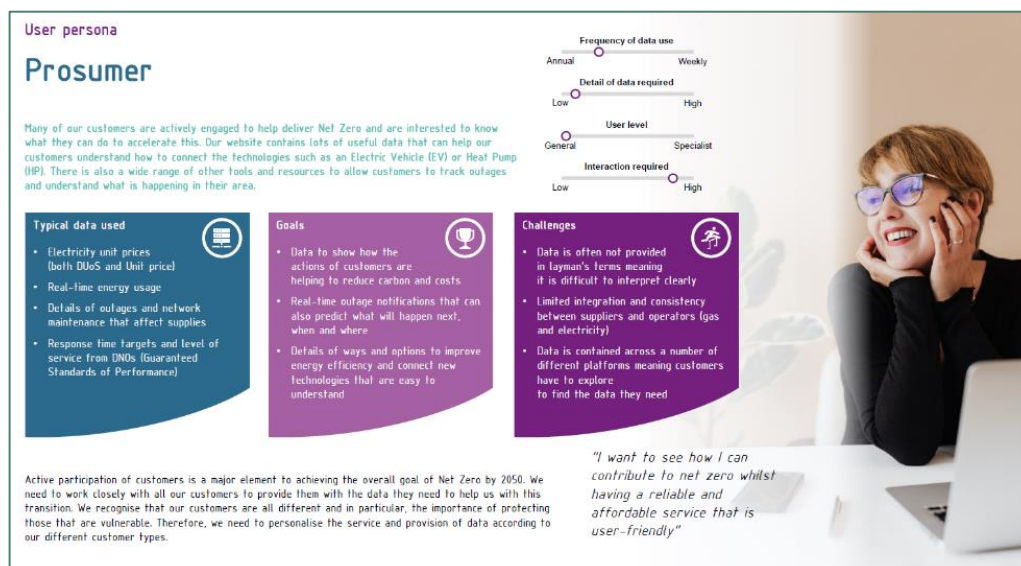
**Third Sector** – charitable sector, campaign groups and community energy organisations.

**Public Sector & Regulatory Bodies** – local authorities, policy makers, regulators, social work and care systems.

**Commercial** – commercial energy market, low carbon technology provider, consultants, developers and EV fleet operators.

**Consumer** – consumers, investors, and intensive energy users.

- 6.41.** By sharing our current user types, we can understand from feedback and engagement where these can be developed and enhanced moving forward, ensuring we are capturing the right user types to prioritise datasets and digitalised solutions.
- 6.42.** Our data and digitalisation activities are informed by extensive and ongoing engagement with data users, both inside and outside WPD. We take part in regular and relevant stakeholder engagement to understand what data is required, the most suitable format and how it can be used most effectively as part of digitalised solutions.
- 6.43.** Our stakeholders have told us they have different needs and expectations for the same data. That is why we are committed to ensuring the right data is available in the right format at the right time to serve different users.
- 6.44.** User personas as shown in figure SA-03.16 provide even greater levels of insight into our data stakeholders and helps us to best meet their needs. We have developed profiles for specific roles within our user types to ensure our investments and developments are aligned to meet and exceed their needs and continuing to expand and review these will serve us and our stakeholders well.



**Figure SA-03.16 User persona profiles**

- 6.45.** Different data formats have been made available for users viewing our future energy scenarios. While interactive maps provide users with an easy to navigate geographic view, we also make available more detailed source data to enable more technical users to build their own analysis.
- 6.46.** We continue to use a number of diverse engagement strategies, from our traditional face to face round table events to providing regular communication in digestible digital formats, such as short podcasts and videos of our latest developments and activities. Consultation is also important to our engagement approach and we will provide opportunities for customers and stakeholders to continue feeding in to formal consultations as well as short polls on LinkedIn and Twitter, to provide quick and easy ways for all user types to readily engage.

## Increasing internal access to data

- 6.47.** Access to a single version of centralised data internally and externally is critical to ensuring that our business and operations continue to be coordinated, efficient and effective while providing visibility to customers to inform their decisions. To do this, we are moving away from locally owned and derived datasets to ensure that data is available as required as its importance in the delivery of digital solutions and in the eyes of our stakeholders grows.
- 6.48.** We will build on our data catalogue and governance activity to ensure that our data is always accessible to drive consistency and system benefits internally and effectively shape the delivery of the needs of our external data users. Additionally, we will continuously and actively look for developments and improvements both to the data itself and our access processes to ensure they are fit for purpose and support our overall Digitalisation Strategy.

## Discoverable and searchable

- 6.49.** We are committed to making sure that our data is both discoverable and searchable. We recognise that data can be difficult to find and we have undertaken a number of activities as a business and a wider industry, through the Energy Networks Association (ENA), to ensure that this is no longer the case.
- 6.50.** In support of this, we are continuing to develop our Connected Data Portal<sup>1</sup> that is key to further improving the availability and access to our data and complementary data sets. This is a crucial part of our improved data management activity, ensuring that we first understand our data, its format, its key descriptors and other relevant information to drive value. This online data catalogue, complementary to our internal version, will ensure that customers and stakeholders are provided the right data, in the right format at the right time.

## Standardised and usable

- 6.51.** We are collaborating on an ongoing basis within our industry to increase data standardisation, with the Embedded Capacity Register (ECR) for example, but we are aware that customers need greater standardisation of data across electricity distribution network operators and wider energy system operators. We are committed to facilitating this standardisation and the provision of usable data supported by information to access, interpret and drive value from the data.
- 6.52.** An online version of our GIS system is already available and we will continue to develop this to provide customers the information that they need to support their planning activity and beyond, and act as a basis in supporting the implementation of the network wide Digital Energy System Map<sup>2</sup>. We will drive the standardisation of the terms used to describe data, whether that is datasets or the detail within them, across the industry so that when a stakeholder is searching our data they are provided with the same detail as any other DNO. We will also continue to lead the discussion with the energy sector to further standardise data terminology through the implementation of an industry wide glossary and vocabulary

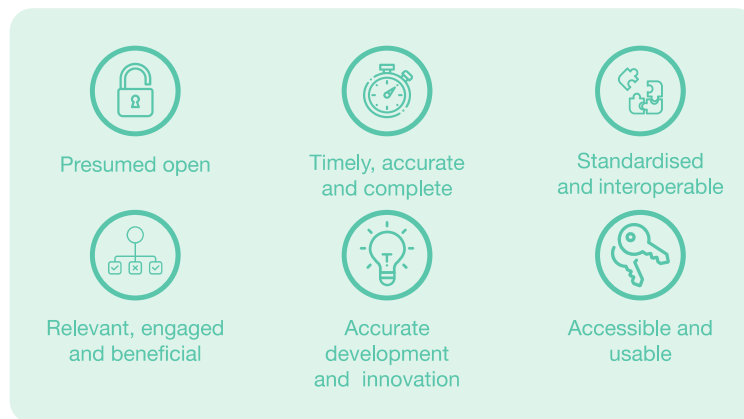
---

<sup>1</sup> <https://connecteddata.westernpower.co.uk>

<sup>2</sup> [NESM \(os.uk\)](https://www.nesm.co.uk)

## Open data charter

- 6.53.** We understand the value of data, to us, our customers and stakeholders and are committed to our Data Charter to ensure we capture, manage and share our data to enable the delivery of the net zero transition. We show this in Figure SA-03.17 below.
- 6.54.** Central to our charter is presuming data to be open and accessible to customers and interested third parties. A company-wide, centralised data sharing assessment tool has been implemented to provide consistency in the way we assess the openness of data. It is not simply the process of sharing our data but ensuring it is shared in a timely, accurate and complete manner that provides for our customers' and stakeholders needs. This targeted approach to data sharing ensures that our delivery stays focused on effectively delivering against the expectations of our stakeholders and facilitating digitalised customer service for our customers.



**Figure SA-03.17** Open data charter

## Putting our stakeholders' requirements at the centre of our approach

- 6.55.** The focus of our data and digitalisation activity is on meeting the needs and surpassing the expectations of our internal and external stakeholders. Ensuring our deliverables are focused on the right areas requires significant and ongoing engagement, both inside and outside WPD, to ensure our focus and priority areas meet current and future challenges as effectively and efficiently as possible.
- 6.56.** We already engage extensively through our Innovation Team, System Operator and our dedicated Stakeholder Engagement Team; and our RIIO-ED2 engagement for digitalisation and data work will continue to build on this success. We will continue to innovate in the way that we conduct engagement with our stakeholders. For example, we are planning to create a digital user community, and perform analysis of the data requests we receive from the ENA portal, and analysis of the popularity and use of data available on our Connected Data Portal.
- 6.57.** For RIIO-ED2, during our engagement with stakeholders they told us several key things that are important to them. (Figure SA-03 18) We have used this feedback to directly inform our approach to Digitalisation and data:

Customer / Stakeholder Feedback	How this has shaped our approach
A common data language across the industry would help customers make better decisions with their data	<ul style="list-style-type: none"> <li>• We will continue to progress our work on a 'common information model' for the industry, which will provide a standard data language for all participants</li> <li>• We understand that access to our data is vital to support the ongoing development of the electricity and wider energy system. Because this data is used by a range of customers and stakeholders, we also recognise that it may need to be presented in different formats</li> <li>• By presuming our data to be open, we are not simply making it available through our systems and services. Our role is to enable data to be collected, housed and utilised, irrespective of a specific access point. Our implementation of (APIs) and client Uniform Resource Locators (cURL) which provide a direct link to an online data resource, will ensure that this is available and appropriate</li> <li>• Our work with the Energy Networks Association on the creation of an energy digital system map for the UK has demonstrated our commitment to make our data available for this purpose.</li> </ul>
Introduction of a customer satisfaction measure for open data	<ul style="list-style-type: none"> <li>• Our Connected Data Portal already has functionality to enable our customers and stakeholders to provide feedback on the quality of our open datasets</li> <li>• In RIIO-ED2 we will proactively survey customers and stakeholders to understand their satisfaction with our open data provision</li> <li>• Our data triage process will ensure that all relevant data is assessed and given a data classification. These will be either open, public, shared or closed</li> <li>• Where data cannot be considered open, we will ensure a version of the dataset can be made available without losing critical value and insight from the data</li> </ul>
Increasing customers 'Energy IQ' by making data more readily available	<ul style="list-style-type: none"> <li>• We have introduced a Business Plan commitment 'Improve the accessibility and usefulness of data, tailored to individual customer needs and in the format of their choosing by making 60% of WPD's network data available via an Application programming interface</li> </ul>
Value of data beyond energy and industry collaboration	<ul style="list-style-type: none"> <li>• We have an ambitious vision for our data to be used to deliver Whole Systems outcomes across sectors. We will collaborate on several Whole Systems projects over RIIO-ED2, and are currently part of the 'West Midlands Regional System Operator' project, exploring ways that better collaboration can help to decarbonise Coventry</li> </ul>

Customer / Stakeholder Feedback	How this has shaped our approach
	<ul style="list-style-type: none"> <li>• We will make sure that data can be both discoverable and searchable. This means making it accessible outside WPD and ensuring that we continue to collaborate with the wider industry</li> <li>• We will continue to develop our Connected Data Portal to further improve the availability of, and access to, our data and complementary datasets in three main formats (Visualised, raw data download and via application programming interface (API))</li> </ul>
Focus on self-serve design	<ul style="list-style-type: none"> <li>• We will be delivering several new digital self-serve options, including for customer service enquiries, connections and open data. We have introduced a Business Plan commitment: <i>'Provide a same day response for customers by introducing online self-assessment tools for individual domestic low carbon technology applications'</i></li> </ul>
Moving to a smarter, digitalised network should not come at the cost of addressing existing capacity constraints	<ul style="list-style-type: none"> <li>• Our Digitalisation and data approach for DSO includes investments in our data management to ensure that we have better data to predict where capacity constraints might be over the RIIO-ED2 period, and intervene early to give our customers better choice</li> <li>• Digitalisation and data also enable innovative connection offers, such as flexible connections which allow customers to connect to our network in areas of existing constraints</li> <li>• Therefore, we believe that Digitalisation and data will help, and not hinder our work to address existing capacity constraints</li> </ul>

Figure SA-03.18 Stakeholder feedback

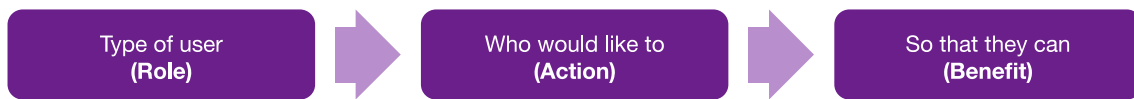
## Engaging our data and digital stakeholders

**6.59.** Continuous and relevant engagement with data users is key to delivering appropriate digitalisation and data solutions to serve their needs and ultimately support the net zero carbon commitments. We have a strong track record across the business of digital stakeholder engagement, both internally and externally, to maximise the value of engagement across the organisation and demonstration of the need for further digitalisation activities.



## External stakeholders

- 6.60.** The needs of our customers and stakeholders are critical to ensuring our digitalisation and data activities are focused to deliver the most value and benefit. Identifying external data user types has been a key focus of our digitalisation activity so far; recognising that different users have varying needs and expectations of the same data. As with internal engagement and needs, ensuring the right data is in the right format at the right time is vital.
- 6.61.** We followed an extensive engagement process to ensure we developed a robust high quality methodology to understand our different data user types. We assessed our existing datasets, some publicly available and some currently only available internally, where we identified over 100. We used this to drive a number of external workshops, providing participants an overview of the types of datasets which are and could be available. This stage of the workshop also introduced the 'use case scenario' structure which is set out in figure SA-03.19 below:



**Figure SA-03.19 Use case scenario structure**

- 6.62.** This is a useful tool for structuring input so that use cases are thought out more clearly, outputs are easily ordered and prioritised, and key points can be integrated into the design process for data sharing. 104 use case ideas were collated as part of these extensive workshops to date. In order to effectively analyse these responses there was a need to further group responses under corresponding themes to interpret which use cases were shared or stratified between different sectors, which use cases required the same data and same data access functionality, and which use cases were variants on a central point and should be amalgamated.
- 6.63.** Going forward we will promote visibility of customer interactions and interventions between teams proceeding to omni-channel contact across the organisation. This will streamline contact and reduce duplication between key stakeholders and the contact points of the organisation, but also to provide greater visibility of stakeholder needs to more departments, encouraging collaboration between them to solve problems. In the further case this could become a ticketing system with process workflows that can respond to stakeholder needs and guide where automation can be implemented.

## Internal stakeholders

- 6.64.** Our staff are pivotal to the successful operation of our business and delivering digitalised solutions that meet their needs to continue to be effective and efficient in their roles is integral to our Strategy and Action Plan.
- 6.65.** Enabling all levels of staff to feed into the priorities for digitalisation, highlighting their needs and expectations, is extremely important as well as making sure we 'take them on the journey'. We use formal and informal engagement to understand their data-related needs through targeted surveys on specific datasets to understand their quality and need for improvement to drive additional value and wider engagement to understand the need for additional datasets and digitalised solutions.
- 6.66.** We initially followed a similar engagement process to that used as part of external engagement, facilitating open and interactive workshops with all departments of the business using identified internal use cases. This work to date has supported our data driven developments, such as the Integrated Network Model, providing a single source of the truth for asset and connectivity benefitting a number of internal user types as well as centralising data access.
- 6.67.** This will be taken a step further as part of this strategy. Digitalisation will be focused internally on streamlining business processes and developing new tools and techniques to support our staff across the complete business. The objective of this will be to ensure that our staff are able to maximise their ability to support vulnerable consumers, complex multi-organisation requirements, novel and emerging challenges, ensuring that our staff are able to spend more time on activities that benefit stakeholders and provide excellent service, and less on administration of tasks. In time these complex requests may be shaped into new digitalised workflows to enable us to evolve our systems and processes as stakeholder needs change.

## Technical stakeholder support

- 6.68.** We will continue to lead the sector in enabling innovation that supports the net zero transition and part of this will be promoting access to data and information using data portals and APIs that we have already started to build out in the Connected Data Portal. To further support this and to respond to emerging stakeholder needs we proactively monitor the data requests that we receive directly and via the ENA data request portal to guide what data to prioritise for publication.
- 6.69.** In addition to this we will be engaging much more closely with the innovation community in a number of ways. We will create a user community within energy, whether business, government or academia, that regularly use our data and invite them to contribute their insight into what use cases they have fulfilled and how the data can be improved. In order to make sure that this insight also benefits emerging players in the sector and to reduce the duplication of effort, a community forum will be established with a mixture of WPD data experts and power users to support the community with frequently asked questions, best practice and how-to guides. This will enable a thriving data and applications ecosystem using our digital assets with deep insight into emerging use cases and needs.
- 6.70.** Continuous improvement is also a requirement for keeping the community engaged with our digital services, the continuous community maintenance of metadata, including wiki guides, publication of open data triage results and the prioritised datasets to publish will create unprecedented transparency for the innovation community, allow us to continue to lead the way in enabling access to data and insight to support the net zero transition.
- 6.71.** Finally, following the success of our data science challenge in early 2021 which had global engagement, we will set up regular data science challenges with every major release of a dataset that has a high number of requests from the community. The challenges will be set based on the needs of our external

stakeholders and ensure that data scientists and business working on the bleeding edge of innovation are able to engage with us to solve the most pressing net zero challenges using our data.

## Investing in technology

- 6.72.** To support the transition to a fully digitalised organisation, we will rationalise and modernise our systems. This will include replacing and upgrading legacy applications, embracing and investing in new technologies, integration tools and common data platforms.
- 6.73.** Our IT systems have traditionally been developed under the core principles of security, reliability and resilience. While these have served us well in the past, the shift towards open data and digitalisation means we must make our systems more accessible, agile and adaptable to change, as well as continuing to enhance our cyber security controls.
- 6.74.** We will continue to ensure our IT solutions are appropriate, with use cases driving investment in new and augmented solutions. It is anticipated that some of our 'on premise' solutions located at WPD sites will become cloud-based solutions to ensure they continue to be scalable, supported and flexible. We will adopt a hybrid cloud architecture, utilising infrastructure, platform and software as a service solution (IaaS, PaaS and SaaS).

## Delivering data best practice

- 6.75.** We are committed to ensuring our data sharing activities are in line with the Data Best Practice Guidance, adopted by Ofgem, which outlines 12 principles:
- Identify the roles of stakeholders of the data.
  - Use common terms within data, metadata and supporting information.
  - Describe data accurately using industry standard metadata.
  - Enable potential users to understand the data by providing supporting information.
  - Make datasets discoverable for potential users.
  - Learn and understand the needs of their current and prospective data users.
  - Ensure data quality maintenance and improvement is prioritised by user needs.
  - Ensure that data is interoperable with other data and digital services.
  - Protect data and systems in accordance with security, privacy and resilience best practice.
  - Store, archive and provide access to data in ways that maximise sustaining value.
  - Ensure that data relating to common assets is presumed open.
  - Conduct Open Data Triage for presumed open data.
- 6.76.** We have already undertaken several digitalisation and data enhancements aligned to these principles including:
- Adoption of the Dublin Core metadata standard (a common set of 15 metadata elements describing the data for each dataset) and a standardised Data Dictionary approach.
  - Providing data in a discoverable and accessible form (including information maps, guiding users to key network and supporting information).
  - First British DNO to implement an online Data Catalogue including routine API accessibility.
  - Establishing data and governance roles.
  - Implementing a data triage process.
  - Utilising User Personas to understand our data users' needs.
- 6.77.** WPD is committed to exceeding the Data Best Practice principles through RIIO-ED2, driven by our own internal needs and those of our customers. We will openly share our process against each principle, for both current and future activities, to support relevant stakeholder's needs and future planning for third parties as part of our 'Delivering Data Best Practice' document

- 6.78.** We have mapped the engineering justification papers for our proposed projects in RIIO-ED2 to the Data Best Practice principles to illustrate how our RIIO-ED2 projects enable the delivery of the Data Best Practice principles.

EJP ID	Project Name	Identify the roles of stakeholders of data assets	Use common terms within datasets, metadata and supporting information	Describe data accurately using industry standard metadata	Enable potential users to understand the data assets by providing signposting	Make data assets discoverable to potential users	Learn and deliver to the needs of current and prospective data users	Ensure data quality maintenance and improvement is prioritised by	Ensure datasets are interoperable with other datasets from other digital services	Protect data assets and systems in accordance with security privacy and resilience best practice	Store, archive and provide access to data assets in ways that ensure sustaining value	Treat all data assets, their associated metadata and software scripts used to	Conduct open data triage for presumed open data
74	Smart Meter data for planning and operation												
89	TSDS and data historian platform												
90	Self Service Connections and Services Solution												
91	Machine Learning applications and data analytic solutions												
92	Planning State Estimation												
93	Low Voltage Connected Data												
94	Internal Data Platform												
95	Innovation Hub												
96	Open Cloud Data Platform												
97	Online Work Scheduler Viewer												
98	Data Mastering Solution												
99	Work Scheduling and Management Solution												

**Figure SA-03.20 Project to Data Best Practice principle mapping**

## Our RIIO-ED2 Digitalisation projects and the outcomes they will deliver for our customers and stakeholders

- 6.79.** During RIIO-ED1, we have implemented several digitalised solutions that have allowed us, our customers and stakeholders to operate more effectively, drive insight and add value throughout the energy sector and wider. We have identified several developments for RIIO-ED2, aligned to our Digitalisation Strategy, to further transform our business and continue to deliver value.
- 6.80.** The fast-paced nature of digitalisation and data means that we will need to evolve solutions to meet emerging customer and stakeholder needs throughout RIIO-ED2. We will continue to use stakeholder engagement to shape the changes to meet these evolving needs.
- 6.81.** Our Digitalisation programme will be key to facilitating improvements throughout our business, from how craft staff carry out their roles to forecasting for our DSO elements and our programme is built to ensure this organisational wide approach continues in RIIO-ED2 and beyond.
- 6.82.** Our proposed Digitalisation projects for RIIO-ED2 are described in table SA-03.21 below, along with the stakeholder and customer outcomes they deliver:

Delivering Digitalisation – Our RIIO-ED2 Projects			
Project Title	Description	Financials	Benefits
<b>Planning Data from Smart Meters</b>  Engineering Justification Paper 74	A new system to capture and standardise the smart meter data available from our network. Smart meters are a key component in the transition to net zero. They allow customers to monitor and tailor their energy use and provide vital information about the performance of the network. It is critical that we develop a system now that can harness this data and extract maximum value from it for planning purposes.	Investment £2 million  NPV £23.12 million	Reduced reinforcement and investment - load related expenditure savings of 1.8%/year, equates to £370,000/year Reduced cost for new connections by 1.2%, equates to £240,000/year Reduced time to repair and respond - 1% reduction, equates to £600,000/year Reduced CMLs by 1%, 753000 minutes/year, equating to £0.34 million saving/year
<b>TSDS and Data Historian platform</b>  Engineering Justification Paper 89	Our existing data historian platform needs to be enhanced to consolidate new sources of data such as smart metering, and data from new sensors we will deploy to support DSO. Bringing all of this data into one place will drive more holistic insight about the operation of our network. The platform will be moved onto the cloud, which will enable us to share this data more easily with customers and stakeholders.	Investment £4 million  NPV £41.60 million	Network operational efficiency will increase by 3.5%, saving an average of £2.34 million per year Network designer efficiency will improve by 1.6%, saving an average of £0.69 million per year The cost for new connections will reduce by 2.6%, saving an average of £0.79m per year
<b>Self-Serve Connections and Services Solution</b>  Engineering Justification Paper 90	WPD has been facilitating increased competition in connections, working with customers and third party providers to make it easier for others to assess whether connections can be made. This solution would utilise the data within the Open Platform to facilitate self-serve connections on at least the LV and HV networks.	Investment £2.5 million  NPV £21.64 million	Reduced call centre support time by 2.5% once fully operational, equating to a saving of £0.25 million/year Reduced Designer time assessing new connections will equate to £1.9 million/year

## Delivering Digitalisation – Our RIIO-ED2 Projects

<b>Artificial Intelligence (AI) and Machine Learning (ML) Applications</b>  Engineering Justification Paper 91	As the operation of the networks becomes more complex, more automated processes will be required. The adoption of AI and ML techniques is anticipated to drive value from a Data Platform. Some examples of applications include automated optimised outage planning solutions and real time network optimisation and system configuration.	Investment £5 million  NPV £129.47 million	Network operational efficiency will increase by 2.5%, saving an average of £4.56 million per year Optimising asset reinforcement and refurbishment will increase efficiency by 1.7%, equating to an average saving of £4.86 million per year Load related reinforcement will improve by 0.1% per year, saving an average of £70,000
<b>Planning State Estimation</b>  Engineering Justification Paper 92	We will develop a scalable state estimation platform which combines data from SCADA and measurement data to build a real time picture of our network. This state estimation will enable better long term system planning for connections, reinforcement and flexibility	Investment £4 million  NPV £96.18 million	Load related reinforcement reduced by 1%, saving £0.72 million / year New connections designer time reduced by 5%, equating to a saving of £2.06 million per year Annual customer interruptions reduced by 117,482, saving £2.3 million per year Annual customer minutes lost reduced by 2,438,575, saving £1.6 million per year
<b>LV Connected Data</b>  Engineering Justification Paper 93	Our Integrated Network Model combines data from each of our core systems of record (Asset, GIS and network management) and provides a '360-degree view' of our network.  We will enhance our Integrated Network Model during RIIO-ED2 with advanced LV modelling approaches and facilitate direct LV data provision routinely to customers and interested third parties. This will also enable the automation of appropriate data for external applications including self-service LV design tools and dynamic capacity maps.	Investment £10 million  NPV £67.63	LV Designer time will be reduced by 10%, equating to an average saving of £2.53 million per year Reinforcement costs will reduce by 5%, equating to an average saving of £1.16 million per year The cost of responding to faults will reduce by 1%, equating to an average saving of £0.84 million per year Customer interruptions will reduce by 6,607 per year, saving an average of £0.13 million Customer minutes lost will reduce by 838,973 minutes per year, saving an average of £0.39 million
<b>Internal Data Platform</b>  Engineering Justification Paper 94	During RIIO-ED1, WPD has been developing a data catalogue to document the types of data held within systems. This project is an extension to the data catalogue to create a central WPD Data Platform to enable a single location for WPD data and external data used by WPD staff to ensure a single source of the truth and drive value from this data.	Investment £1 million  NPV £53.72 million	Better quality data available to customers and third parties Better descriptions of datasets available from WPD, increasing customer and stakeholder data 'IQ', and also how to use the data in other applications Broader range of data available to customers and 3rd parties
<b>Innovation Hub</b>  Engineering Justification Paper 95	The Innovation Hub is an online facility to drive innovation. The Innovation Hub will allow the sharing of little understood and unstructured data for further investigation and analysis. It will also be used to share work in an open	Investment £0.5 million  NPV £5.98 million	Facilitation of new markets and new services by third party stakeholders Collaboration across industry sectors to deliver Whole Systems outcomes to reach net zero more quickly

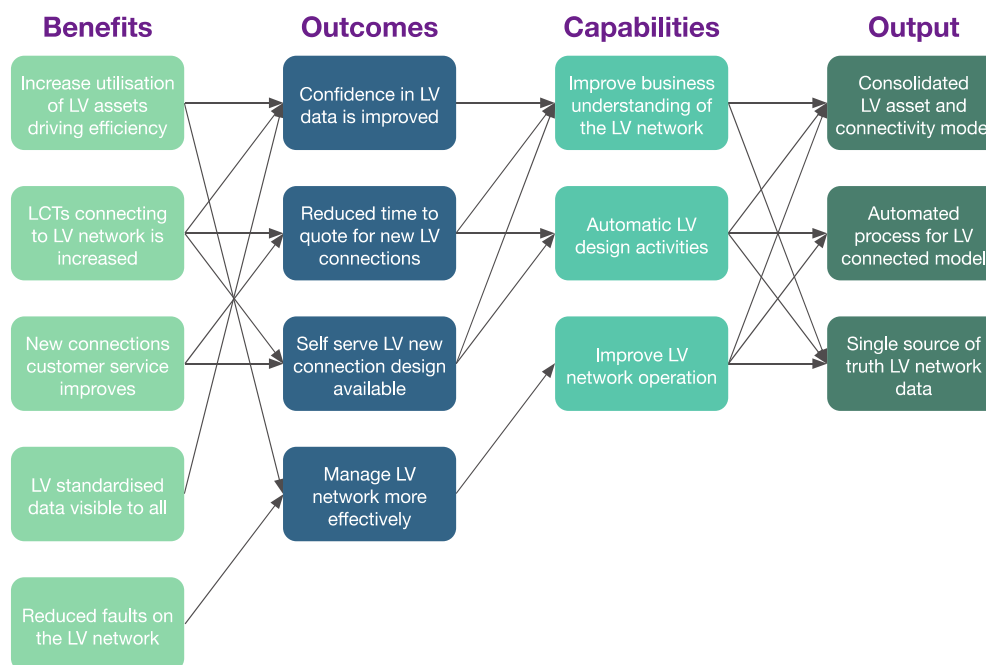


## Delivering Digitalisation – Our RIIO-ED2 Projects

	format so multiple organisations can input and collaborate.		
<b>Open Cloud Data Platform</b>  Engineering Justification Paper 96	Providing customers with access to data will provide the opportunity for new processes, services and network activities to be developed. This project is for the development and implementation of an Open Data Platform, enabling customers to access raw data or WPD processed data.	Investment £2.5 million  NPV £52.60 million	IT and Cyber hardware and storage infrastructure spending will reduce, equating to an average saving of £0.65 million per year. New Connections: Engineering management staff time will be reduced by 1%, equating to an average saving of £3.5 million Reduced customer interruptions (117,481 per year, saving £2.18 million) and Customer minutes lost (2,438,575 per year, £1.1 million saving)
<b>Online work schedule viewer</b>  Engineering Justification Paper 97	Third parties want to understand when WPD will be carrying out work either to coordinate activities such as roadworks management or understand network improvements to enable them to make informed decisions about their own investments. This online viewer would provide customers, stakeholders and other utilities with information about WPD's planned work.	Investment £0.5 million  NPV £9.91 million	Reduced Call Centre Support time, increase efficiency by 2.5%, equating to £260,000 savings per year Reduced Clerical Support time - reduction in queries results in a £0.75 million saving/year
<b>Automated Data Mastering Solution</b>  Engineering Justification Paper 98	Data improvements enable better and more accurate decisions to be made. This system is proposed to develop automated data improvements. It builds on manual and semi-automated data mastering including the INM system to continuously and autonomously improve the data within internal master data systems.	Investment £1.5 million  NPV £20.00 million	Reduced reinforcement and investment - saving 0.75%/ year load related expenditure (£00.5 million / year) LV and HV designer productivity increase by 1%, equating to £1.66 million /year
<b>Automated work scheduling</b>  Engineering Justification Paper 99	As more data about the network is collected and machine learning/artificial intelligence methods improve, there is an opportunity for automatic scheduling of work activity based on the results of the automated analysis. Initially this automation could be rules based, but as more data is analysed the ML can be used to refine the decision parameters.	Investment £2 million  NPV £70.64 million	Increased operational efficiency in network operations by 2%, equating to £4.17 million /year Scheduling improvement to increase efficiency, increasing productivity by 2.5%, equating to £2.24 million /year Reduced customer minutes lost by 1%. Reduction of 2,087,264 min/year (£0.94m saving / year)

Figure SA-03.21 RIIO-ED2 Digitalisation projects

**6.83.** In addition to the table above, for each of our RIIO-ED2 projects there is a detailed Engineering Justification paper which provides additional information of scope, delivery timescales, risks and issues and customer benefits and outcomes. Each EJP contains a benefits map, which links the benefits of each project, the outcomes the project delivers and how these deliver capabilities and outputs. An example of the benefits map for the ‘Low Voltage Integrated Network Model’ is shown in figure SA-03.22 below.



**Figure SA-03.22 Benefits map for the ‘Low Voltage Integrated Network**

**6.84.** To support understanding and clarity of each of our key projects and initiatives a brief overview of each is produced, with examples provided below in figure SA-03.23. All overviews are available here.

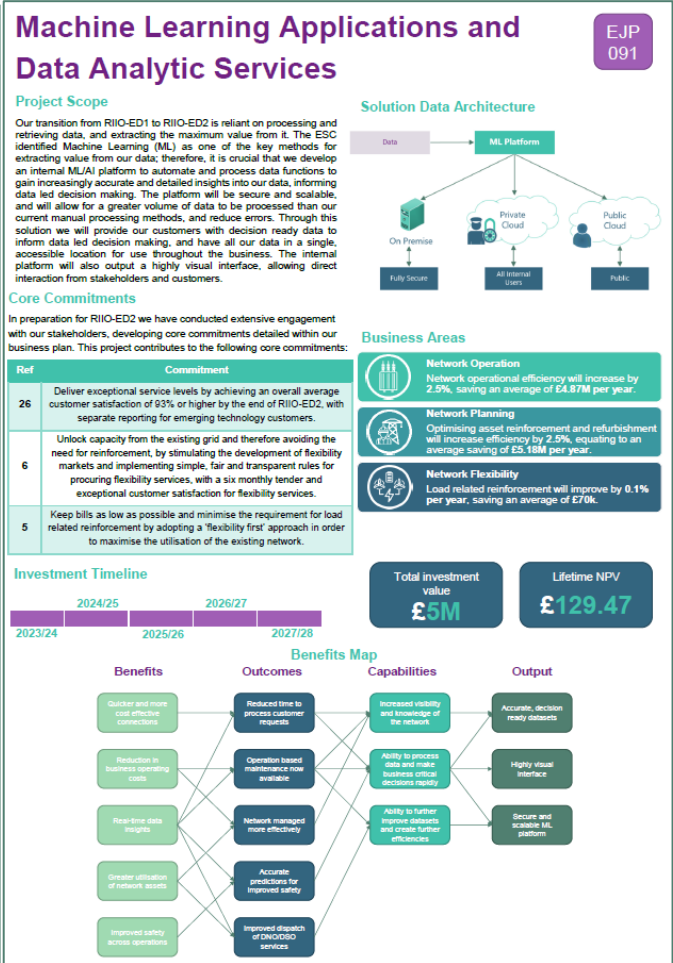
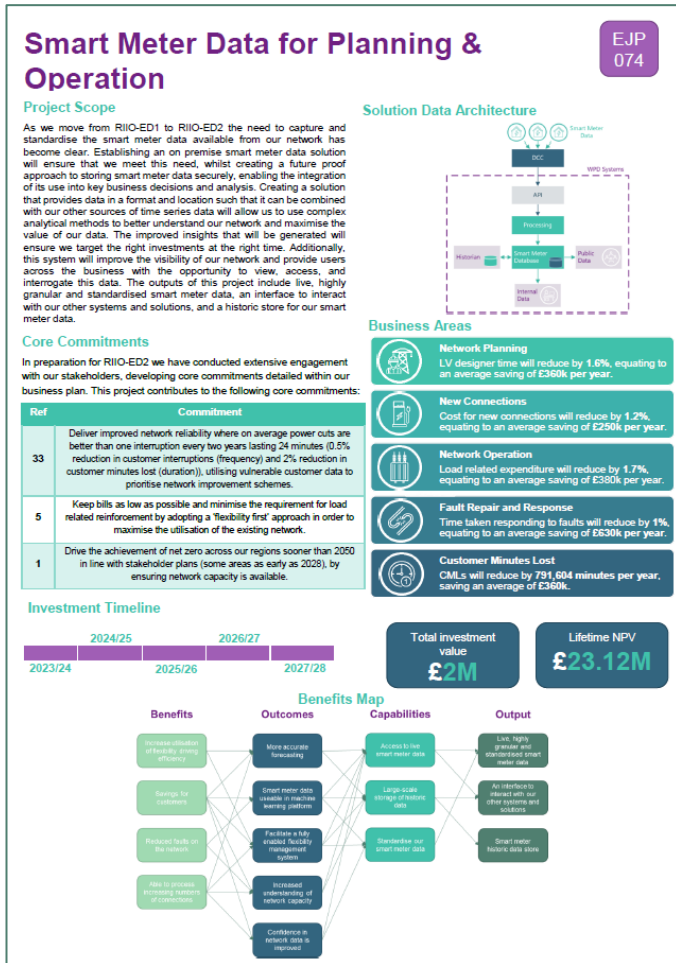


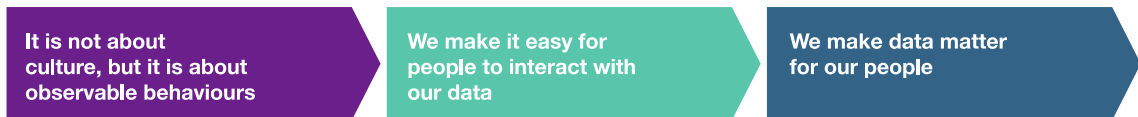
Figure SA-03.23 Examples of project on a page

## Building a data culture and developing our people

- 6.85.** To ensure that we realise the customer and stakeholder outcomes from our Digitalisation Strategy and deliver whole system benefits we need to further transform our culture, behaviours, skills and approach to attracting new talent to our business.

## Our Data Culture

- 6.86.** Investments in new technology alone will not be enough. We will continue to develop our data culture to integrate the data, the technology and our people to seize the opportunities that data presents for us. We are following three guiding principles detailed in figure SA-03.24 as we seek to continue developing our data culture:



**Figure SA-03.24 Our data culture**

- Culture only exists through the observable behaviours of our people, so we will take a pragmatic approach, focusing on shaping the behaviours around data
- 6.87.** We will develop our understanding of the way our people interact with data, carrying out interviews and design thinking workshops regularly to better understand the experiences, interactions, and challenges around data. This is not a process which will take place once in time, we will regularly track our culture by mapping shifts in behaviours over time to understand how our culture is evolving.
- We will make it easier for our people to interact with data, by improving the interactions with data we can better leverage data across our business
- 6.88.** We want to make our interactions with data as easy as possible, so we are actively seeking to simplify access to data solutions. For instance, there can at times be a lot of information for our teams to analyse, so we are developing intuitive dashboards across our business to support our people in making data driven decisions. Data literacy is not as important as making data matter for our people, so we will make sure that our people are given the opportunity to interact with data in a meaningful way.
- 6.89.** Making data matter requires us to create opportunities for data and insight to help our people when they are in the flow of their work, wherever that work takes place. We are piloting field applications to make data capture easier for our front line employees and implementing feedback loops to monitor and improve data quality using dashboards.
- 6.90.** Culture is inherently complex, and we see this as a long term journey that needs to be continually measured and incubated rather than something we achieve over a fixed period of time.

## New talent

- 6.91.** Attracting, recruiting and retaining the best talent is essential to ensuring we maintain and build on our reputation for excellent customer service and network performance. As our industry continues to evolve, new skills and capabilities are needed for us to continue to deliver on our customer promises. We have ambitions to transform our approach to recruitment, recruiting more graduates, apprentices and experienced hires to build the digital and data skills we need to deliver on our Data and Digitalisation Strategy.

- 6.92.** Our apprenticeships and graduate programmes are a great opportunity to attract early talent with a desire to learn, an ability to adapt to new technologies, while also providing a fresh perspective.
- 6.93.** We will expand our new digital and data apprenticeships significantly, such as our data science degree apprenticeship which offer our Apprentices an opportunity to develop a specialised knowledge of areas such as data visualisation, ML and predictive analytics while working towards a foundation degree as part of their training. We are also expanding our graduate schemes to develop digital and data talent across our business, including data science, mathematics and IT focused degrees. As we identify further skills our business areas need, we will expand our programmes further, building our technical capabilities in areas such as cyber security, agile and design thinking.
- 6.94.** There is an increasing demand both within the energy industry and across the UK for digital skills, which means it is increasingly competitive and challenging to hire the specialist talent we need. Recognising this, we are targeting more diverse talent from outside our industry with transferable digital and data skills which will support us as we continue to deliver on our ambitious plans during RIIO-ED2.

## Skills

- 6.95.** We are committed to ensuring that everyone within our organisation is taken on the digitalisation journey. This involves the creation of new roles with new skills and supporting staff with the development of new skills, giving them opportunities to understand new and developing data sets, the capture of metadata and the wider language of data.
- 6.96.** Historically, specific technical skills have been managed and contained within silos. Through the creation of our Data and Digitalisation team we have centralised a significant aspect of our data management resource to impact and influence the business consistently and effectively. We are developing multidisciplinary teams, bringing together a wide range of diverse skills to speed up our time from design through to build and deployment. We are also creating communities of practice, where our teams can meet regularly to solve challenges, share knowledge and develop their skills, facilitating collaboration and knowledge sharing across our business.
- 6.97.** We will continue to invest in the digital skills of our people during RIIO-ED2, continuing to develop an environment that prioritises and rewards learning. We will develop training plans for our teams, including industry recognised formal certification, allowing them to develop the digital skills we need both today and, in the future, positioning our people to thrive in an increasingly digital workplace.

## Learning Approach

- 6.98.** The way we learn is changing, as we increasingly expect to learn in the same way we engage with content in our personal lives, bite sized, engaging and available on demand. We will seek to blend traditional learning methods with more immersive learning solutions, allowing our people the opportunity to 'learn by doing'.
- 6.99.** Virtual and extended reality are two technologies we will adopt which provide a high quality and consistent level of training, offering the chance to simulate real-life scenarios such as a power cut in a safe space. Gamification is another highly immersive technique we will introduce which provides an exciting and rewarding environment, which will be especially well-suited to refresher training to allow our people to develop lasting knowledge and habits.

- 6.100.** Demonstrating the benefit to colleagues of the changes in their working processes, practices and training is critical to ensuring the full benefits are realised. We do and will continue to deliver this through regular formal and informal feedback on existing systems and new developments.
- 6.101.** For every significant development we form a group of 'super users', made up of end and key users of the new systems and solutions. All levels of the business being able to feed in to and shape our digitalisation journey ensures that we maximise the benefits. Our next phase is for solutions to be utilised externally is to implement an external 'super users' group, made up of key potential users to ensure an optimised and effective solution is delivered.
- 6.102.** Data and digitalisation are at the heart of our work during RIIO-ED2, and as such we will continue to promote our teams work and their successes across the business. We are introducing a 'show and tell', which will help regularly connect our people with our work in digitalisation to improve both awareness and collaboration, incorporating into our wider activities within the community and as part of our careers programme to further establish WPD as a 'great place to work'.

## New ways of working

- 6.103.** We will pilot cross-functional working in RIIO-ED2, which is aimed at tackling some of our biggest challenges. For example, how we can reduce the duration of interruptions to our customers. This method of working, detailed in figure SA-03.25, will reduce organisational barriers between departments, increase collaboration and bring together different skill sets to deliver better outcomes across our business and importantly will deliver a better end to end experience for our customers and stakeholders.
- 6.104.** We anticipate that this will enable designated employees to spend 20% of their time working in this fashion, which is like a 'Tribe' organisational structure. In a Tribe organisational structure, employees belong to a primary team for their day-to-day activities but also are aligned to a cross-functional team or specialty. This model is used by Technology companies such as Spotify and Google, in financial services by ING Bank, by Oil & Gas majors and in Utilities by Enel in Italy.

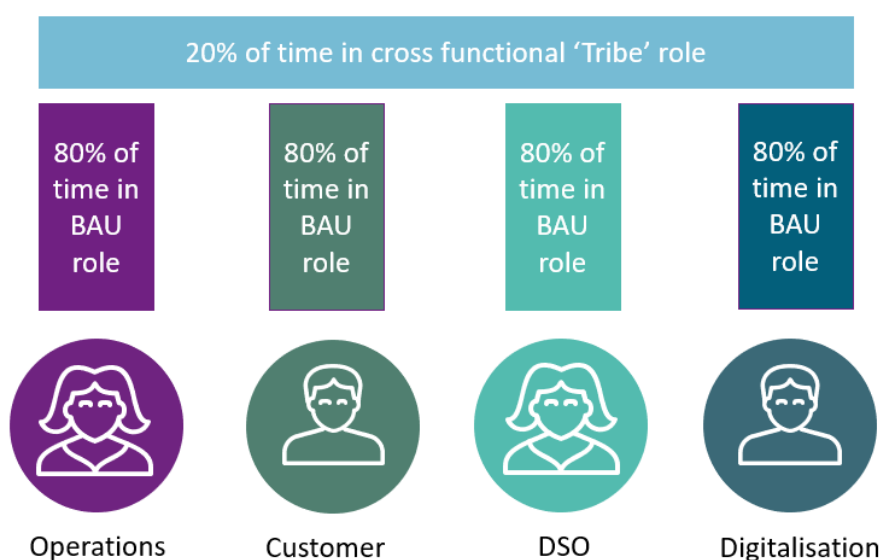


Figure SA-03.25 Pilot cross-functional working



**6.105.** The benefits for WPD we expect from implementing cross-functional teams are:

- More effective prioritisation across departments that were previously working in silos
- Communication and quality are better, with the removal of hand-offs, assumptions, and uncertainty
- Great focus on the customer experience, as a result of end-to-end organisation from a customer's perspective, and not in internal departments
- Quicker iteration and earlier delivery to customers and stakeholders
- Better use of resources and alignment around the biggest challenges facing WPD, rather than departmental priorities
- Greater innovation and creativity, as different ways of thinking and experience are brought together

## Working collaboratively

**6.106.** We know that collaboration is key to delivering best value to our customers and stakeholders and vital in supporting the work we do as WPD. We actively take opportunities to collaborate with other DNOs, cross sector partners and stakeholders, and the wider energy sector to make sure this happens.

**6.107.** Below in figure SA-03.26 is a selection of examples of where we continue to work collaboratively and we are committed to ensuring our collaboration grows as we deliver our activity throughout RIIO-ED2.

	Description	WPD Role	Customer benefit
The Open Networks Project	The Open Network Project is a major industry initiative between gas and electricity licence operators to transform the way our energy networks operate, underpinning the delivery of the smart grid. It seeks to enable the uptake of new smart energy technologies by more homes, businesses, and communities in the UK.	We work collaboratively as part of this initiative to work towards standardised processes and mechanisms for exchanging data between organisations, such as investigating the implementation of Common Information Model (CIM) and presenting data consistently to customers and stakeholders across organisations.	Allowing customers to take advantage of these new technologies to take control of their energy will lower their costs and help secure the energy we rely on every day.
Data and Digitalisation Steering Group	The Data and Digitalisation Steering Group (DDSG) is a combined gas and electricity ENA group leading on data and digitalisation, working towards common approaches to meet the key EDTF recommendations.	As a large UK DNO serving multiple regions, we are both a key contributor and beneficiary of the Data and Digitalisation Steering Group. Our contribution supports the voice of the energy networks sector and provides a vital channel of communication for the steering of data and digitalisation within the industry and the sharing of best practice.	Working collaboratively as part of this group will ensure that customer experiences with licence operator data, from the mechanisms to access to it, the formats and the contents will be harmonised.
Strategic Partnerships with Energy Industry Organisations	We understand that working with experts is key to delivering our Digitalisation Strategy and as such actively seek to build collaborative partnerships within the energy industry. One example of this is our partnership with the Energy Systems Catapult (ESC), the authors of the EDTF report.	Our partnerships enable us to develop greater insight into digitalisation, help deliver value from our existing data and create appropriate net datasets. For example, ESC is our key delivery partner on our innovation project, Presumed Open Data (POD), focused on maximising the value and visibility of data and delivering our data triage process and cataloguing activity.	These partnerships provide us access to leading industry knowledge and best practice which in turn supports the generation of greater insight from data. This insight helps us improve the services we offer to customers and increases efficiency, delivering a positive impact on the costs of running our network and therefore costs to customers.

**Figure SA-03.26 Collaboration examples**

## Increasing our collaboration

**6.108.** To build upon the success of our collaborative projects and initiatives, we will undertake several actions and initiatives to further increase our collaboration in support of data and digitalisation:

*Initiative sponsorship* - All our externally focused initiatives will have an ‘expert customer sponsor’ to drive collaborative, provide initiative representation at a senior level within our business, and ensure that customer and stakeholder service and needs are placed at the project forefront.

*Scope appraisal and collaboration invitations* - For all of our collaborative projects and initiatives, we will release the scope of these to industry peers and partners for review to gather insights that will help these projects and provide others an opportunity to assess these for further collaboration opportunities in similar fashion to the ENA Innovation process

*Data hub and portal support* - Use our data and data portals, such as our Innovation Data Hub, to support and align with collaborative projects to deliver not just for us but for the wider industry and our collaborative partners.

*Data outreach and support* - We will support all local authority driven community energy schemes with data and insights to advance their initiatives and increase the power and potential of collaboration.

*Measuring our progress* - To ensure that we are driving collaboration and building upon the success of our collaborative projects and initiatives, we have specific collaboration focused success measures to help track our progress and the impact of collaboration.

## Measuring success

**6.109.** We recognise the need to effectively track and measure our progress to ensure we are delivering benefits for all. Here in figure SA-03.27 is the high level view of how we will active this.

Understanding our employees' and customers' digital needs	Improving data quality
Demonstrating valuable and beneficial engagement through the continued refinement and development of our data user personas. We will clearly highlight our areas of development against these user personas to track progress and output for the variety of data users to ensure a balanced approach is taken and validate our deliverables.	The ability to trust data is the basis for the business to transform into a data centric organisation that make decisions based on information from many different data sources rather than historical knowledge. We will demonstrate this increased engagement, interaction, and utilisation of data internally and externally to greater impact within the energy sector and beyond.
How we will measure this:	How we will measure this:
<ul style="list-style-type: none"> <li>• Ensure there is an external representative for each relevant steering group</li> <li>• Carry out a periodic review of our customer data every 6 months</li> </ul>	<ul style="list-style-type: none"> <li>• Track the impact of data quality on the cost and timescales of connections</li> <li>• Make 60% of WPD network data available via an Application Programming Interface (API)</li> </ul>

<p><b>Industry leading data and digitalisation Strategy and Action Plan</b></p> <p>Ensuring we have an industry leading Strategy and Action Plan is key to delivering for our customers and stakeholders. We will use maturity models to measure our progress and work with data and digitalisation experts to inform our output and next steps continuously to support this.</p> <p><b>How we will measure this:</b></p> <ul style="list-style-type: none"> <li>• Demonstrate increasing year on year digitalisation using customer surveys to indicate our progress</li> <li>• Demonstrate increasing year on year maturity using maturity models to benchmark progress</li> <li>• Achieve an upper tier score on the digitalisation regulatory benchmark</li> </ul>	<p><b>Driving value from our systems and solutions</b></p> <p>We need to measure the impact of our work; understand the value it has delivered and assess our responsiveness to customer needs. For each item captured in our action plan, we will provide insight on the benefits delivered to measure its success and impact. Utilising feedback from our data users will support further developments and new system implementations.</p> <p><b>How we will measure this:</b></p> <ul style="list-style-type: none"> <li>• Each digital service will have a defined adoption target before go-live that we will measure against</li> <li>• Ensure feedback on our digital solutions is requested in 100% of customer surveys</li> <li>• Handle 20% of customer requests through self-serve channels by the end of RIIO-ED2</li> </ul>
<p><b>Collaborating effectively</b></p> <p>Continuing to collaborate effectively within the energy sector and wider will ensure we deliver optimised outcomes. Taking a lead on collaboration in this space is important to us and we will measure this through our implementation of collaborative developments. Capturing our collaborative efforts will demonstrate our continuing commitment to collaboration.</p> <p><b>How we will measure this:</b></p> <ul style="list-style-type: none"> <li>• Use an open code repository to share the methods behind our outcomes to reduce whole system costs</li> <li>• Ensure we actively support 100% of local authority led energy data collaborations and projects</li> <li>• Share the scope of all customer facing external data and digital solutions with industry peers to stimulate collaboration</li> </ul>	<p><b>Developing skills and capabilities</b></p> <p>Having the right people, with the right skills is what will allow us to deliver our Strategy and Action Plan. Sharing how our Data and Digitalisation team is developing in terms of staff and skills as well as the business wide training taking place, further improving our organisational data literacy and understanding will enable our success to be effectively measured.</p> <p><b>How we will measure this:</b></p> <ul style="list-style-type: none"> <li>• Measure the number of digital skills developed and ensure 10% of hired apprentices have a digital focus</li> <li>• Ensure each member of our executive team sponsors a digital project during RIIO-ED2 to demonstrate senior commitment to digitalisation</li> </ul>

Figure SA-03.27 title required

## Digitalisation Roadmap

Our Digitalisation Roadmap is ambitious, revolutionary and will deliver for our key stakeholders and the business of both today and the future. Figure SA-03.28. It visualises the programmes and projects necessary for the delivery of our strategy and contains a view of the dependencies between them, as well as high level timelines for delivery and the customer and stakeholder outcomes they will deliver.

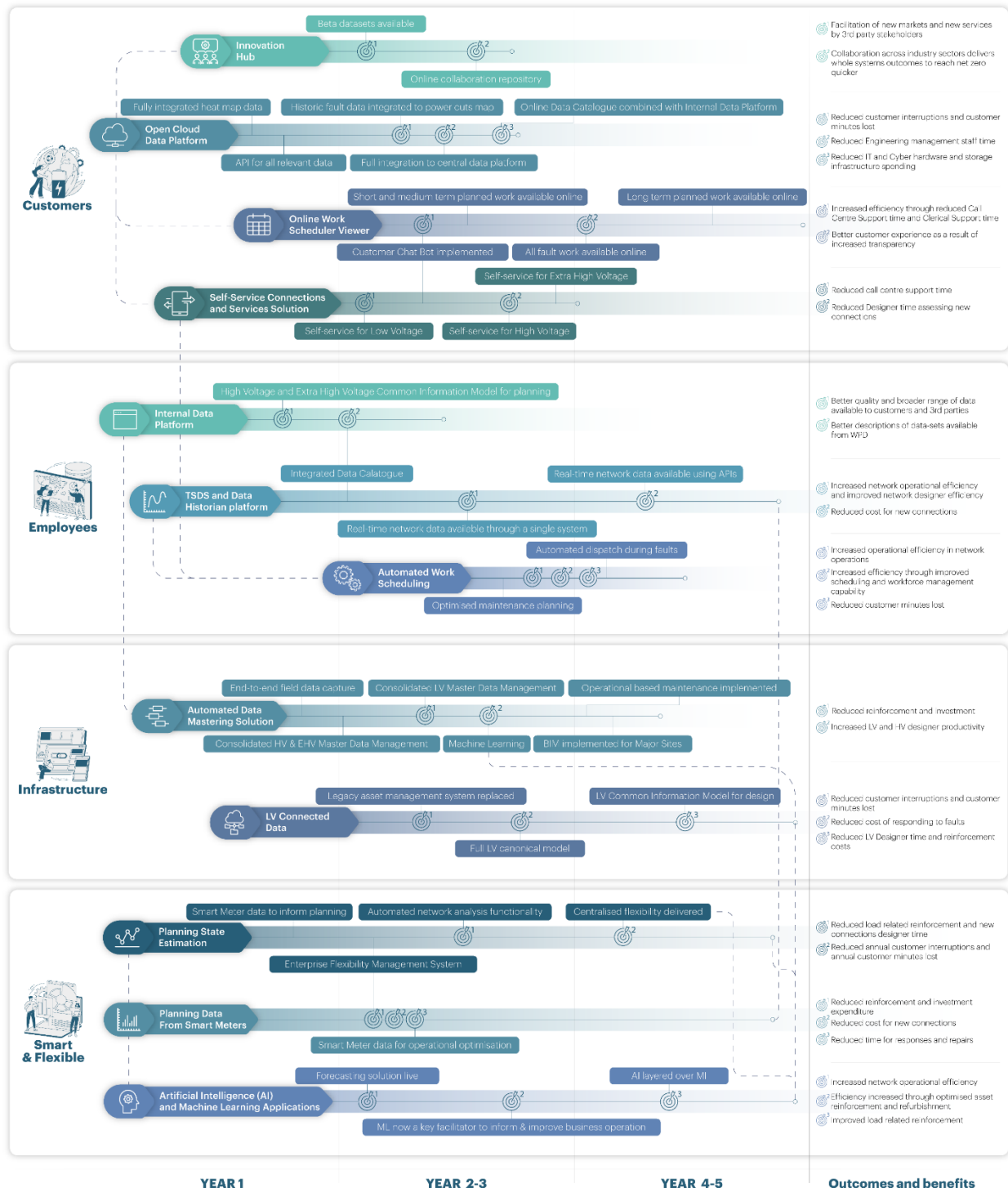


Figure SA-03.28 Digitalisation roadmap



## Delivery considerations

**6.110.** We recognise and understand the risks and changing landscape associated with data and digitalisation. To ensure we continue to deliver a leading programme we regularly and proactively review key risks at project and programme level. A high level summary of this is provided below in figure SA-03.29.

Risk or Consideration	Potential Impact	Mitigation
<b>Delivery of increased volume of Digitalisation and data work in RIIO-ED2 compared to RIIO-ED1.</b>	Work is not fully delivered, impacting customer and stakeholder outcomes and our business operations.	We have carefully developed each of our Digitalisation and data projects and considered the best delivery approach (e.g. Agile, Waterfall, Hybrid) for each. We will put people at the centre of our transformation to improve the chances of business adoption and use partners and the broader ecosystem to complement our own delivery capabilities.
<b>Increased competition for digital talent and skills within the industry and externally.</b>	A digital skills gap in our organisation that reduces our ability to introduce digitalise and affects the delivery of the key benefits outlined in our digitalisation projects.	Ensure that we actively recruit for these skills at experience and apprentice level. Ensure our staff retention activities are suitably strong to retain talent and ensure compensation for these skills is in line or above the market. We will also upskill existing talent in the organisation with digital skills and literacy to ensure the right level of skills across the business.
<b>Delivery of parts of the Digitalisation Strategy are reliant on collaboration with partners and other stakeholders.</b>	Delays to key projects if partners are unable to meet their commitments or deadlines on collaborative initiatives.	We will play a leading role in the management of collaborative projects, bringing our risk management and project management expertise to ensure that projects have clear risks documented and mitigated and collaborative initiatives are not overly reliant on a single partner.
<b>Significant regulatory or governmental policy decisions have a material impact of delivery during RIIO-ED2.</b>	Significant shifts in policy, regulation or government intervention change the course and actions of the Digitalisation strategy and associated projects.	Through collaboration and close working relationships with energy industry partners and regulatory organisations we will be able to allow as much time as possible to plan for significant changes and our governance approach will allow us to adapt quickly.
<b>There is risk that the significant volume of digital change and transformation in the organisation cannot be handled effectively.</b>	Poor change management can impact on project timelines and impact negatively on customer service and operating costs.	Our governance and change management frameworks, evolved over multiple years of capital project delivery, will be adapted to support delivery of digital change to our business. Dedicated digital change managers and sponsors within local teams and at executive level will ensure our Digitalisation Strategy is effectively delivered.
<b>Increased use of digital technology and data increases the risk of security and cyber issues.</b>	Serious data breaches or cyber-attacks could release data unintentionally and create interruptions or problems with digital systems.	Having a dedicated security team in place to prevent and handle cyber threats and ensuring our data is properly stored and managed in line with the Data Best Practice Principles will support mitigation of threats of this nature.
<b>Poor delivery of digitalisation and digital channels can impact brand and reputation.</b>	While digitalisation can have an overwhelmingly positive impact on customer service, poorly implemented digitalisation and digital channels that are hard for customers to use can have a negative impact on brand and reputation, particularly with customers whose preferences are traditional contact channels.	The implementation of digitalisation and digital channels will be managed using our project management expertise and the governance frameworks set out in this document to ensure changes are carefully managed and deployed when they are ready to benefit customers. It is also important that our digital solutions and channels will build upon, not replace, traditional channels for our customers who still wish to use them.

**Figure SA-03.29 Delivery considerations**



## 7. Delivering Distribution System Operation

### WPD at the forefront of systemic change

- 7.1. WPD has been addressing the challenges of delivering net zero for a number of years.
- 7.2. The vast expansion of distributed generation across the network has posed numerous challenges that have led to the development of alternative ways of connecting customers to the network. Active Network Management became a business as usual process in RIIO-ED1.
- 7.3. We have established markets for flexibility services and have procured the highest amount of flexibility provision across all UK DNOs. There are established processes for procurement, tendering, dispatch and payment.
- 7.4. Planning of network reinforcement considers 'flexibility first' for all networks except our Low Voltage system, where asset reinforcement will be our preference. Our flexibility requirements are signposted well in advance of need with consistent indications of where and when flexibility will be needed. The procurement of flexibility through six monthly cycles provides real insight into the scale and scope of flexibility as an alternative to conventional reinforcement.
- 7.5. We are using the knowledge gained from embracing flexibility to inform our forecasts for reinforcement for RIIO-ED2. The investment programme includes using flexibility solutions, but there is also a requirement for conventional reinforcement where the scale of flexibility will be limited and not meet the requirements for additional capacity.
- 7.6. The move to DSO highlights areas which are new to us, but also shows areas where the DNO business has a role to play in providing base information and detail to support DSO decision making. We see the Operation Enablers as an area of benefit where the DNO business will support all DSO providers. This is an essential part of the neutral facilitation of markets as they evolve with System Operator providers.
- 7.7. We also see a part for WPD to play in establishing a System Operator provision. Our role is to stimulate the market in flexibility and create the space in which third party providers can operate. When paired with our Operation Enablers, these System Operator services provide a holistic response to flexibility.
- 7.8. We have developed significant competence in a number of key areas which fall under the umbrella of Operation Enablers. They have focused on assessing network capacity in innovative ways and creating the data management and telecommunications systems to operate the network in a more real time way. The way we have integrated telecoms, data, ratings and connections is best demonstrated in our work on flexible connections.
- 7.9. Our suite of flexible connections products has developed options in two areas for customers seeking to connect to the grid. A Timed connection offers a very simple way of acting flexibly, without the need for communications or monitoring. Load Managed connections make use of ANM technology to control generation or demand behind single or more complex constraints. These are particularly useful in areas of constraint as an alternative to network reinforcement. The load managed connections suite combines both contractual and technical approaches. These methods of connection vary in cost and complexity and enable the solution to be tailored to the individual requirements of the customer. We have been able to develop these solutions

within WPD to enable our internal systems to manage transmission level constraints and provide efficient, economic and timely access for customers.

- 7.10.** Further innovative work has given us an insight into how System Operator tasks can be completed. Our FALCON, SYNC and ENTIRE projects have demonstrated our ability to forecast, manage and dispatch both demand and generation turn up/turn down services and have been designed to do so in conjunction with National Grid, allowing customers full access to a number of markets providing revenue streams, while also minimising any risk of operating conflicting services.
- 7.11.** Throughout all of our work to support DSO services, we must show neutrality and ensure that actual and perceived conflicts can be addressed. We have ring-fenced the DSO team away from our core regulated electricity asset management business which is responsible for providing the DSO enablers (such as data, monitoring etc) and core DNO business functions. The DSO team has a direct reporting line into the Operations Director.
- 7.12.** We will continue to evolve the use of flexibility, publish more data to stimulate further market developments and operate the networks in a way that continues to provide consumers with excellent reliability at an economic and efficient cost. We recognise that the change from our traditional role of Distribution Network Operator (DNO) to a more active 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.
- 7.13.** Consequently, WPD has been very active in developing DSO functions. We have come a long way since starting to explore active network management in 2012 under the Low Carbon Networks Fund. In 2017, we were the first DNO to publish a fully costed DSO transition plan and in 2018 we established a dedicated DSO business function. We have re-engineered networks that were traditionally designed for 14GW of demand, to be able to accept a total of 21GW of embedded generation and have contracted with 709MW of flexibility services.
- 7.14.** For network planning, WPD has evolved the processes for the identification of network constraints, seeking market based solutions and making investment decisions to embrace the opportunities provided by alternatives to conventional network reinforcement. Greater transparency of decision making is helping to develop the market by allowing participants to understand the reasons for decisions, allowing them to amend behaviour to benefit from the market and also provide greater scope of services to network operators.
- 7.15.** These changes are viewed as being natural extensions to the functions we perform and we firmly believe that we are best placed to operate the Distribution System Operator role.

# Distribution System Operator – A strategy and a plan

- 7.16.** WPD was the first DNO to publish a costed DSO strategy in 2017 and has updated this each year to reflect changing requirements and industry developments. The latest version is available on the WPD website.
- 7.17.** The 2021 version of our strategy was reformatted to reflect the baseline requirements from Ofgem for RIIO-ED2. Further details can be found in [appendix A06](#).
- 7.18.** The building blocks of our strategy are grouped into five workstreams which relate back to the Ofgem roles and baseline objectives of Planning & Network Development, Network Operation and Market Development.



- Planning and Network Development

As customers adopt LCTs or generate power more locally, the range of connection types for homes, businesses and generators is set to increase to meet customer needs. A DSO will also facilitate flexibility markets and make use of flexibility as an alternative to conventional network construction.

- Network Operation – network visibility and data

A DSO requires accurate and granular information on asset capability (design ratings and health/condition), how they are connected (or could be) and their actual operation (both real time and historic). A new generation of monitoring control equipment and telecommunications will be used to support market integration and the new customer propositions.

- Network Operation – efficient and economic distribution system

A DSO will look at energy in a different way to a conventional DNO. Energy flows and volumes will be more important than absolute maximums. Our systems will need to operate more autonomously and react to signals from other parts of the network. The way we dispatch DERs will become a key element of efficient system operation.

- Market Development – comprehensive market information

A DSO acts as a platform facilitator for customers, suppliers, aggregators and other participants to offer or receive services. Sharing information on network capability in multiple timeframes will enable businesses to offer customers innovative energy services. Data sharing between transmission and distribution is critical to ensuring the whole system is optimised in the interests of customers. Our use of the Common Information Model (CIM) will help data flow smoothly.

- Market Development – fair and transparent procurement

We must ensure our costings, requirements and active system details are published in advance to allow customers to participate. Alignment of conditions, terminology and products will allow customers to lever multiple markets.

- 7.19.** WPD has been developing DSO functionality in all three areas and will continue to expand capability in these areas during RIIO-ED2. This will involve increasing data acquisition from the network, enhancing established processes, developing new systems and sharing more data.

## Smarter and flexible networks in RIIO-ED2

- 7.20.** Plans for network reinforcement at voltages above LV during RIIO-ED2 will begin with ‘flexibility first’. Where flexibility is an option, the procurement of flexibility services through six monthly cycles provides real insight into the scale and scope of its availability as an alternative to conventional reinforcement.
- 7.21.** We will continue to embrace the evolving use of flexibility, publish more data to stimulate further market developments and operate the network in a way that continues to provide consumers with a reliable, affordable and efficient electricity supply.
- 7.22.** In our network planning, we have continued to develop processes to identify network constraints, seeking market-based solutions and making investment decisions which allow us to embrace alternatives to conventional network reinforcement.
- 7.23.** We have developed DSO functionality in all three areas and will continue to expand capability in these areas during RIIO-ED2. This will involve increasing data acquisition from the network, enhancing established processes, developing new systems and sharing more data.

### Working across the industry

- 7.24.** WPD has been engaging heavily with the wider industry through the ENA Open Networks work programme. As part of this, we have been working on developing DSO functions. Work Stream 3 for DSO implementation has specified eight Primary DSO functions which can be mapped to the Ofgem core DSO roles as shown below in figure SA-03.30.

ENA Open Networks DSO function	Ofgem DSO role
A. System Coordination	Planning and Network Development Network Operation
B. Network Operation	Network Operation
C. Investment Planning	Planning and Network Development Network Operation
D. Connections and Connections Rights	Planning and Network Development
E. System Defence and Restoration	Planning and Network Development
F. Services and Market Facilitation	Market Development
G. Service Optimisation	Network Operation
H. Charging	Market Development Planning and Network Development

**Figure SA-03.30 DSO road mapping**

- 7.25.** This collaborative work is leading to common approaches across the companies, so that there is greater consistency across the industry making it easier for third parties to engage with new markets. The coordinated working is also enabling cross sector issues between transmission and distribution to be resolved.

# WPD's DSO four-point plan

**7.26.** At a high level, the WPD DSO strategy specifies a four point plan, figure SA-03.31 for how DSO functions will be applied across the network.

## A DSO four-point plan



**Figure SA-03.31 DSO four-point plan**

**7.27.** The four point plan is underpinned by a step change in data visibility and digitalisation of our processes and systems.

# Operating our network in RIIO-ED2

## Changes to network operations

- 7.29.** The changing role of the network operator requires new data and processes to help us analyse what is happening on the network. We also need more active ways of managing constraints, such as systems for dispatching flexibility, as well as greater coordination with the Electricity System Operator. We are already dealing with an increasing quantity of data and will need to enhance existing systems or develop new ones to enable the efficient operation of the network to continue.

## Flexible connection solutions

- 7.30.** Our suite of flexible connections gives customers the option to have their connection completed at a lower cost and to a shorter timescale, with the acceptance that some form of curtailment may be required at times of high demand on the network.

## Flexible Power solutions

- 7.31.** Flexible Power solutions are contractual arrangements where customers with controllable demand or generation are able to provide services to help us manage the capacity of the network. They are used as a lower cost alternative to reinforcing the network and are procured through a flexibility market.
- 7.32.** We have been pioneering the use of flexibility solutions during RIIO-ED1 and will be using these increasingly throughout RIIO-ED2 as more demand connects to the network.
- 7.33.** There are four types of flexibility services:
- Secure – used to proactively manage peak demand
  - Dynamic – used to support the network in case of a coincident fault during network maintenance
  - Restore – used to reduce the stress on the network during fault situations, with flexibility providers responding within 15 minutes
  - Sustain – used to allow customer to change their energy profile to reduce costs
- 7.34.** The existing IT platforms used to assess the requirements for flexibility, manage the dispatch and make payments for the flexibility provided will require development to ensure that flexibility can be used to a greater extent.
- 7.35.** In RIIO-ED2, we will continue to develop the IT systems, processes and customer information visualisations, targeting investments in areas identified by stakeholders. This will include opening live information access to other platforms, improving the cyber resilience of the IT systems and scaling up as operational volumes increase.



## 8. Performance metrics for a smart and flexible network

### Structure of metrics

- 8.1. As a more flexible network develops, the range of metrics required to assess performance must grow to support the new activities we undertake. In some senses, the metrics can draw upon the format of existing performance metrics. Existing measurements of customer satisfaction, time to quote, customer minutes lost and costs for specific works can all be adapted to draw out performance in flexibility.
- 8.2. Metrics will follow the structure of the sector specific baseline standards for DSO. A mixture of qualitative and quantitative measures will provide a holistic overview of performance. Where topics can be counted or measured, quantitative measures will be used. Where measurement is not possible, customer survey and stakeholder evidence will be used to create a qualitative view.
- 8.3. Metrics must be suitable for the requirement. This is assessed by considering their relevance, focus, robustness and transparency, appropriateness, verifiability, attributability and proportionality.

### Ensuring metrics are consistent and robust

- 8.4. In the sections below, we give details of how metrics can be established for each of the roles in the baseline standard. These offer an overall view of a set of metrics which can be used to measure performance. Metrics are being developed further by all DNOs in conjunction with Ofgem. A more detailed view can be developed on the completion of this work. To ensure our set is transparent, we would aim to focus on more quantitative indicators which can be supported by base data. We expect that the set of metrics will be refined and developed to provide the best mix for performance measurement.
- 8.5. Where qualitative metrics are used, we will aim to combine them where appropriate. Whenever we survey our customers, we run the risk of stakeholder fatigue, so single comprehensive surveys are likely to provide the best outcome.

## Role 1 forecasting and network planning

### Forecasting

- 8.6. This set of metrics looks at how we share forecasting of our network capacity to inform customer decision making and provide the market with the visibility of forecasting accuracy and therefore confidence to base decisions upon it. We must provide the customer with extra data to inform decision making in regard to connection choices, Flexible Services Assessment and the identification of constraint areas.
- 8.7. Quantitative measures can be used to assess data inputs, data gathering and forecasting accuracy.
- 8.8. Qualitative measures will include industry engagement reports and stakeholder engagement.

### Network asset data quality

- 8.9. This set of metrics assesses how sharing network asset data can make it easier for flexibility providers to engage in distribution flexibility markets, improving liquidity and increasing the opportunities to use flexibility as an alternative to investment (where it is lower cost). Improved information on network constraints not only improves participation in distribution flexibility markets but can also help network users understand where they can participate in other markets and develop innovative business models - delivering benefits across the system. Tools such as capacity heat maps enable a wide range of stakeholders (DG developers, IDNOs etc.) to self-serve by indicating capacity headroom and where they can connect at a lower cost.
- 8.10. Quantitative measures can be used to assess data quality, data volume and customer satisfaction.
- 8.11. Qualitative measures will include the definition of data types and scope, data triage systems and presumed open measures.

## Role 2 network operations

### Coordination between the ESO and DNOs

- 8.12. This set of metrics looks at how we coordinate and optimise network operations through the sharing of operational data to deliver whole system efficiency savings and benefits. Sharing allows the ESO to make informed decisions regarding dispatch of flexibility services and how they operate their own services, operate the transmission, and prevents reductions in quality of supply.
- 8.13. Quantitative measures can be used to provide counts of data exchanges and formats.
- 8.14. Qualitative measures will include industry engagement between the ESO and DNOs, reports on delivery and standardisation and communications processes.

### Efficient dispatch of distribution flexibility services

- 8.15. This set of metrics assesses how we encourage the operation of a decision making framework for dispatching DER in real time that is efficient and transparent. This will drive best whole system outcomes by promoting overall system security and resilience, coordination across services, maximising liquidity and ensuring dispatch of DER is economic and efficient.

- 8.16.** Quantitative measures can be used to count self-derogations against standards, error corrections issued against instructions and late data events.
- 8.17.** Qualitative measures will include the definition of a decision making framework and stakeholder feedback on the efficiency of DNO systems.

## **Role 3 market development**

### **Flexibility market volume and value**

- 8.18.** This set of metrics looks at how we use flexibility services that will support our ability to more actively manage the network ensuring a resilient and secure supply that is cost effective by reducing the need for traditional network investment.
- 8.19.** Quantitative measures can be used to provide market volume metrics, market value metrics and quality measures for commercial processes.
- 8.20.** A qualitative measure can be used to provide annual audit evidence of DNO transparency.

### **Efficient, user friendly and accurate processes, contracting and procurement**

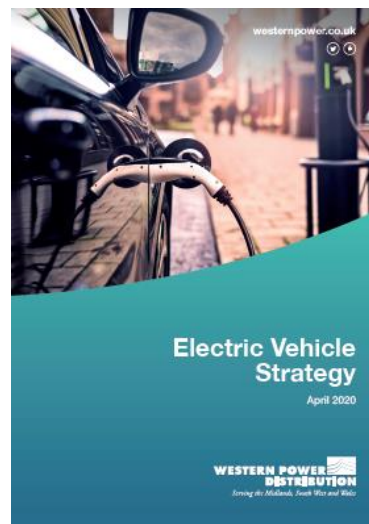
- 8.21.** This set of metrics assesses how we ensure that a wide range of participants can easily access DNO Flexible Power products and services. We aim to offer visibility of products at tender stage, allow user friendly procurement, and to ensure contracts offer customers flexibility to stack benefits from the wider market.
- 8.22.** Quantitative measures will include volume of Flexible Power offered, contracted and dispatched. A customer satisfaction index will measure overall performance.
- 8.23.** Qualitative measures will include the definition of an industry standard prequalification process and understanding of customer groups and their requirements through engagement.

## 9. Low Carbon Technologies

- 9.1. During RIIO-ED1, there has been a significant growth of distributed generation connected to WPD's network, fuelled by government incentives such as the feed in tariff. This growth is creating new challenges for the network, such as different power flows and the need to provide sufficient export capacity.
- 9.2. There are a range of other technologies being developed that will add to the challenges. Energy storage is being increasingly used alongside generation to store excess power and release it to the network at a later point in time.
- 9.3. The most significant growth is expected to be in the use of electric vehicles (EVs) for transport and heat pumps for heating properties. This is evident from the Prime Minister's Ten Point Plan and the Energy White Paper.
- 9.4. Our job is to make sure the network is ready for all kinds of Low Carbon Technologies (LCTs). Consumers' electricity needs will vary, depending on the type of LCT they own and, for EVs, whether they have access to their own charging point or plan to use a public charging facility.
- 9.5. The requirement from our customers is simple. The infrastructure for net zero LCTs requires high volumes of energy – and we need to be able to deliver that energy where it's needed.
- 9.6. We created our Electric Vehicle Strategy as EV use grew, and our Heat Pump Strategy followed suit with the emergence of heat pumps as a commonplace solution on our networks. We will develop strategies for other technologies as they develop.

### Electric Vehicles (EV)

- 9.7. WPD has published an EV Strategy that describes the challenges, along with the innovation and solutions that will be adopted to prepare our network for the millions of electric vehicle drivers who will want to charge their EVs at a time and place that suits them. Further details can be found in [appendix A07](#).
- 9.8. It describes the rationale behind our innovation projects and business initiatives as well as describing how we are already implementing some solutions into 'Business as Usual' activities.
- 9.9. We've been working closely with our stakeholders to plan and prepare for the needs of different customer groups.
- 9.10. This engagement gives us an insight into their expectations and requirements, but also informs our understanding of the scale and pace of adoption of EVs.
- 9.11. The government is becoming more ambitious in the move to EVs. In 2018, it called for at least 50% of new car sales and up to 40% of new light van sales to be ultra-low emission by 2030. In early 2020, it announced its plan to end the sale of all new conventional petrol, diesel cars, vans and hybrids by 2035. In December 2020, the end of selling new petrol and diesel car and vans was advanced to 2030.
- 9.12. Local government bodies are also influencing the move to EVs by introducing clean air zones.



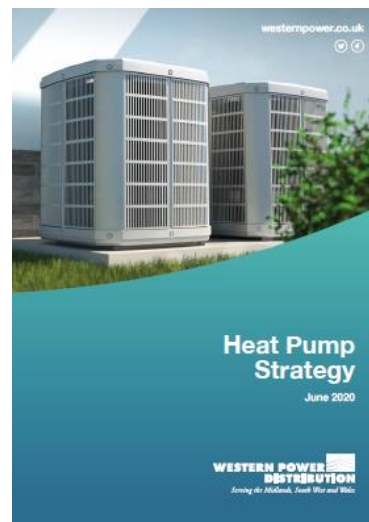
- 9.13.** The government has also signalled the move with changes to Company Car Benefit in Kind Tax. This is set at a very low level to stimulate fleet purchases, which is significant as almost half of new car sales are to fleet users. This will also create a thriving second hand market within the timescale of RIIO-ED2.

## Getting networks ready for EVs

- 9.14.** Motorway service areas are likely to see a significant change in electricity demands. As part of Project Rapid, we are working with the government to model predicted demands at each service area. This expected demand is equivalent to the scale of demand we would typically see in a small town.
- 9.15.** Chargers are set to become a common sight on driveways and for on-street parking, to enable overnight charging. They will also be installed at businesses and locations where any vehicle is stationary for a longer period, such as at a 'park and ride' site or office car park, so that vehicles can be charged during the day.
- 9.16.** Larger rapid chargers will be installed at public locations such as service stations, motorway services areas and car parks, where drivers need a faster charge. These will also be suitable for vehicle charging hubs, such as those used to charge taxis.
- 9.17.** However consumers choose to charge their vehicles, there will be a need to provide more energy through the network for EV charging. This is likely to impact the network in various ways, but the main issues will be providing additional capacity on the LV network. We expect that market-led solutions such as supplier price signals and aggregator offers will incentivise charging to avoid peak network use hours and minimise the need for reinforcement.
- 9.18.** As well as requiring energy to charge the batteries, there is the opportunity to put power back into the network. We have been exploring the impacts and benefits of vehicle-to-grid technologies and expect that these will become part of the solution.

## Heat pumps

- 9.19.** A heat pump is a device that uses a small amount of energy to move heat from one location to another. It is an energy efficient heating method. Heat pumps move thermal energy in the opposite direction to natural heat flow by absorbing heat from a cold space and releasing it into a warmer one.
- 9.20.** Heat pumps are a key part of the UK's plans to achieve net zero by 2050 because more than one third of the UK's carbon emissions come from heating.
- 9.21.** The government has announced in the Energy White Paper that it wants to increase the number heat pumps being installed by 20 times to 600,000 each year by the end of 2028 (the end of RIIO-ED2).
- 9.22.** In 2020, we became the first DNO to issue a bespoke Heat Pump Strategy document. Like the EV strategy, the Heat Pump Strategy sets out how WPD will ensure that future heat pump owners are able to connect to the network in a way that suits them. It also explains the rationale behind our current innovation projects and business initiatives, as well as how we are planning to turn early stage solutions into 'business as usual' practice. Further details can be found in [appendix A08](#).
- 9.23.** To operate efficiently, a heat pump needs to be in a well-insulated house. This means they are more suited to new builds or properties that are or can be insulated.
- 9.24.** Their primary function is space heating through radiators, underfloor heating systems, or warm air convectors but they can also be used to heat water.
- 9.25.** Smaller heat pumps are likely to be accommodated on existing supplies but larger installations of greater than 32A will often require a three phase service or other upgrades.



## Getting networks ready for heat pumps

- 9.26.** The biggest challenges when providing power for heat pumps will be linked to domestic properties, which may lead to service upgrades and capacity issues on the Low Voltage networks.
- 9.27.** WPD is currently involved with Pobl and Sero, a new build estate of 225 homes in Tonyrefail. The homes have a complete suite of LCTs and are fully monitored by Sero which will provide valuable information to us on new build homes fitted with heat pumps. We will use this estate to understand the cumulative impact of heat pumps in volume.
- 9.28.** In retrofit scenarios, it is likely this will result in a need for network reinforcement. We will also consider different ways of storing heat and energy and whether these can be incorporated as part of the network solution for providing capacity.



## Domestic level energy storage, eco homes and flexibility

- 9.29.** We have already experienced ground breaking automated eco homes in work completed in South Wales. We are also collaborating on a redevelopment project at Rugeley. We expect this area to grow with new players in the home energy management arena. This is an emerging area for us and we will build our solutions as the technology develops.
- 9.30.** We see early adopter movement in this area at the moment. In many aspects, the application of storage, energy managed homes and domestic flexibility will help us manage the network. Where energy is being generated, stored and used in a way that provides efficiency to customers, it is likely that the customer's impact on our network will be reduced by supplier price signals and aggregation markets.

## District heating and heat networks

- 9.31.** We predict that heat networks will be relatively easy for us to accommodate on our networks, with the input energy required for them being provided at one central point rather than individual homes. Where heat networks include generation elements, this may also support our network
- 9.32.** We are monitoring plans at Cardiff Council in this area. We will monitor the demands of the heat network to understand how heat networks will impact on the wider network. This will allow us to develop connection solutions for this technology.

# 10. Losses

## Losses and their causes

- 10.1.** The amount of energy that enters an electricity network is greater than the amount that is delivered to customers. The principal reason for this is that an electricity network uses energy in the process of delivering power. This is known as a technical loss.
- 10.2.** Other reasons for electricity losses occur where a connection has been made to the distribution network without authority (known as theft in conveyance), where metering equipment has been deliberately bypassed (known as illegal abstraction) or where a connection has not been properly registered and no supplier is assigned. The energy used in these circumstances is not metered and does not feature in volumes registered by suppliers. As a result, it is shown as a loss on our network.

## Losses strategy

- 10.3.** Since 2013, WPD has produced a Losses Strategy which is updated annually and available as a standalone document. Further details can be found in [appendix A09](#).

## Our work to improve understanding of losses

- 10.4.** The amount of losses on the network is difficult to quantify because it relies upon knowing the amount of energy entering a network (from National Grid infeeds and all distributed generation) and the amount being used by consumers at a specific point in time. Because the use of the network is not fixed, the current flowing through the network varies minute-by-minute. Any mismatch in timing of readings introduces an error into the calculation of losses.
- 10.5.** A key to managing of losses in the future will be our ability to manage effectively the additional demands created by all LCTs as we transition towards net zero in 2050. Our Losses Investigation project considered if it is possible to provide an accurate and consistent measured volume of losses. Amongst other things, it has demonstrated the low level of losses in relation to energy supplied. Working with other DNOs, the ENA Technical Losses Group has also completed research in this area to help us develop plans to measure this low level of total energy. It draws upon international best practice and suggests an incentive with a long settlement duration may provide smoothing of measurement errors. While measurement at all points remains one option, we will look at the potential to use scenarios, models and templates to extrapolate losses from a smaller number of measurement points or across a wider settlement period.



## ENA Technical Losses Group

- 10.6.** The ENA Technical Losses Task Group provides a forum for sharing best practice and working collaboratively across the industry. During RIIO-ED1, the task group commissioned WSP Group, a global engineering consultancy, to study the impact of LCTs on network losses.

- 10.7.** The study evaluated losses through simulations of urban and rural network models. Regional variations in LCT uptakes between the urban and rural networks were reflected through consideration of the numbers of customers, types of properties and socioeconomic conditions.
- 10.8.** The key findings of the work concluded that:
- The uptake of LCTs will significantly impact losses;
  - How networks accommodate LCTs will impact losses.
- 10.9.** Future connections of LCTs such as electric vehicle and heat pumps will increase losses. Localised generation may reduce losses by supplying local demand and reducing the amount of energy flowing through the network. However, where there is greater generation output compared to local demand resulting in a significant net export, it can increase losses by increasing energy flows across networks, albeit in an opposite direction.
- 10.10.** Methods of providing additional network capacity and how the network is used affect losses. Losses can be reduced through conventional reinforcement, which increases the size of assets to accommodate load growth. Smart solutions - which increase the utilisation of existing network assets - increase losses, due to higher loads being carried through smaller conductors.

## Our achievements in RIIO-ED1

- 10.11.** During RIIO-ED1, WPD has implemented a range of initiatives aimed at reducing losses. We have:
- met or exceeded the Ecodesign 2015 directive for all new transformers purchased;
  - oversized the 11kV ground-mounted transformers which are highly loaded enough to justify replacement;
  - replaced pre-1958 ground-mounted distribution transformers;
  - installed a minimum size of 25kVA for single-phase pole-mounted transformers and 50kVA for three-phase pole-mounted units;
  - discontinued 4 and 16mm<sup>2</sup> copper LV service cables;
  - discontinued 95mm<sup>2</sup> LV Wavecon mains cables and 95mm<sup>2</sup> Aluminium triplex 11kV cables; and
  - standardised on 185/300/400/630 and 800mm<sup>2</sup> copper single core cables for the 33kV network.
- 10.12.** WPD has also been working alongside suppliers to investigate transactional theft, to perform regular random audit checks in order to monitor supplies that appear to be unmetered and to investigate theft in conveyance by comparing the metering records to Ordnance Survey records and investigating properties without meters.

## Our key losses actions in RIIO-ED2

### Addressing losses in transformers

- 10.13.** There are actions that can be taken to reduce the losses in transformers. To reduce the variable losses the resistance of the conductors can be decreased by increasing the cross sectional area or using materials with a lower resistance. To reduce the fixed losses, the efficiency of the magnetism needs to be improved by using materials with better magnetic properties.

## Removing Pre-1958 HV transformers

- 10.14.** During RIIO-ED1, the EU Ecodesign regulations led to a step change in distribution transformer design and reduced levels of both iron (fixed) and copper (variable) losses. This allowed us to create a positive CBA for the replacement of older pre-1958 ground-mounted transformers that were manufactured to higher loss technical standards.
- 10.15.** In the RIIO-ED2 period, we will extend this proactive replacement programme to our pole-mounted pre-1958 transformers. There will be a slight overlap of activity between the proposed losses actions, asset replacement of poor condition transformers and replacement of specific cohorts for the removal of PCB contaminated transformers.

## Discontinuing smaller sized HV transformers

- 10.16.** During RIIO-ED1, we discontinued the use of 15kVA single phase and 25kVA three phase transformers, using larger sized assets as the minimum size available. This provided both a losses and capacity benefit.
- 10.17.** In RIIO-ED2, we will extend this approach and discontinue using 25kVA single phase and 50kVA three phase units. This will mean the smallest units used are 50kVA single phase and 100kVA three phase. Where amorphous core design transformers offer a better positive lifetime CBA for losses than conventional designs, they will be selected for use.
- 10.18.** Taking the combined steps of uprating the minimum sizes and using low loss units for the smallest remaining sizes in our range will lead to around 160 units per annum being installed with a higher rating and lower losses.

## Addressing losses in cables

- 10.19.** The lowest cost approach to reducing the variable losses in cables is by using cables with larger cross sectional area of the conductors.
- 10.20.** The installation of cables is a high cost activity due to the costs associated with excavation and reinstatement. It is uneconomical to re-excavate cables to increase cable sizes; therefore, the opportunity to efficiently reduce losses only exists at the time that the cable is initially installed.

## Discontinuing smaller 185mm<sup>2</sup> cable at LV

- 10.21.** During RIIO-ED1, we discontinued using 95mm<sup>2</sup> cable to reduce losses and provide additional capacity for LCT growth.
- 10.22.** We have evaluated which networks would be best suited to having cable size increased further. The greatest benefit is obtained on LV networks which have high levels of utilisation. This means that we are able to deliver a positive cost benefit on the discontinuation of 185mm<sup>2</sup> cable at Low Voltage. However, at 11kV and above, where networks are designed to be able to pick up load from interconnected circuits and therefore carry lower normal loads, the benefits do not drive a positive CBA.
- 10.23.** We therefore propose to discontinue the use of 185mm<sup>2</sup> cable to provide a losses benefit, adopting 300mm<sup>2</sup> as the standard.
- 10.24.** Using 300mm<sup>2</sup> cable will also provide greater scope for demand increases before additional reinforcement is required.

# 11. Community energy

**11.1.** Community energy is the delivery of community-led renewable energy, energy demand reduction and energy supply projects with the underlying objective of addressing climate change, whether these projects are wholly owned and/or controlled by communities or through a partnership with commercial or public partners. These projects deliver collective social, environmental and economic benefits to the local community such as fuel poverty alleviation, energy engagement and education, and community funds from renewable energy projects.

**11.2.** Community energy organisations have told us they face multiple barriers including the lack of viable business models, funding, finding sites with a grid connection, and being time and resource poor.

Because they are largely voluntary, they struggle to engage in policy and keep up to speed with changes in our energy system.

**11.3.** Many community energy organisations are determined to deliver community energy projects because they are motivated by social and environmental values, rather than profit. They want a fairer energy system that doesn't leave the vulnerable behind, and a network that enables new community-owned generation to connect.

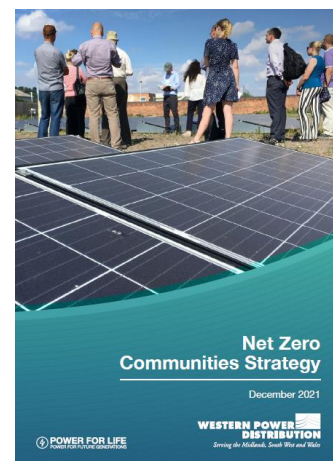
**11.4.** We want community and local energy to be a strong and resilient part of the energy sector. We are committed to ensuring our engagement with community and local energy stakeholders makes a positive impact, helping communities to collaborate with us and other local stakeholders.

**11.5.** We've been working with community energy experts Regen since 2014, who have independently facilitated events and directed our ongoing engagement programme to ensure it is appropriate and tailored to meet the needs of this unique stakeholder group. Our ongoing engagement has helped facilitate networking and collaboration, as well as build the knowledge and capacity of the sector by developing tools, resources and new ways of working.

**11.6.** We have implemented a Net Zero Communities Strategy, which outlines our enduring commitment to community energy and highlights our stakeholder engagement approach to delivery. Further details can be found in [appendix A10](#).



**Figure SA-03.32 Our engagement process**



## Community energy innovation activity

**11.7.** To help community and local energy organisations develop new business models, and to help us understand how we might best manage a decarbonised and decentralised electricity system, we've partnered with communities on several network innovation projects. As part of developing these initiatives, we aim to:

- Be ambitious in scope, while setting realistic timeframes for rolling out the project;
- Make use of existing community organisations, structures and knowledge to understand the target audience and local impacts;
- Proactively work with partners who are known and trusted in the local community;
- Leave a lasting, positive impact on the host community and share the learning of the trial as widely as possible.

**11.8.** Our extensive innovation programme has consistently ensured that a wide range of community energy focused projects have been delivered. Below is a summary of a range of our key community focused innovation projects:

<b>Smart Energy Isles</b>	The Smart Energy Islands is an EU-funded project on the Isles of Scilly, aiming to build and operate a renewable energy microgrid to increase the amount of renewable generation on the islands. Our parallel, Smart Energy Isles project helped to increase the amount of renewable energy by enhancing an Active Network Management zone, so that generation can be better managed and allow local flexibility to offset generation curtailment.
<b>SoLa Bristol</b>	This project explored the impact of high densities of LCTs on our network and helped customers to manage their electricity load. Solar panels, energy storage, and DC circuits were trialled in homes to test their impacts and cost-effectiveness, with participants also trialling a Time of Use tariff.
<b>Sunshine Tariff</b>	Local community group WREN recruited 61 participants to trial demand side response (DSR) in Cornwall, which encouraged people to shift their electricity use to sunnier times of day with a cheaper daytime tariff, using renewable energy from local solar farms. The project aimed to resolve network capacity issues in the area to enable more community energy to connect.
<b>Open LV</b>	The Open LV project provided local electricity substation data to communities to help them understand the network and plan low carbon projects. Seven community groups took part, getting data from their local substations through a web application, to show local electricity use, generation, substation temperature, voltage level and carbon intensity of electricity
<b>Cornwall Local Energy Market</b>	This is an EU-funded project led by Centrica to create a local energy market and test flexible demand, generation and storage across homes and businesses. We contributed to this project through the Visibility Plugs and Sockets project, exploring the potential for DNOs to purchase flexibility through a third party. We wanted to reach different customers that might not engage via our own Flexible Power platform, to better understand what sort of flexibility services we could buy from new customers, including domestic energy users. This project should improve our ability to provide flexibility services to domestic customers in the future.
<b>Future Flex</b>	This second-generation flexibility markets project aims to improve market design for smaller-scale and domestic customers, by better understanding the barriers in the process and increasing participation. This innovation project will make network flexibility services more accessible to homes and communities, such as groups of households with smart EV chargers, domestic electricity storage or smart, hybrid heating.

**Figure SA-03.33 Community energy projects**



## Community engagement

- 11.9.** Since 2014, we have delivered an extensive programme of community energy engagement, helping the WPD regions to become the most active areas of community energy in England and Wales.
- 11.10.** Our approach to engagement has been informed by feedback from community energy organisations, to ensure we are delivering the support communities want, and providing value for our customers. Through this, we have developed a constructive relationship with many community energy organisations, which is forward looking and solutions-focused. Between 2014 and 2020, we delivered 40 community events with over 1,380 participants.
- 11.11.** Our participatory engagement events have aimed to provide:
- Information on the latest developments in our changing energy system, such as connections, flexibility markets, support for vulnerable customers and innovation projects;
  - Sharing of learning between community groups about new business models and leading community energy projects;
  - Space for discussions so participants can ask questions, discuss innovative project ideas and give feedback to us on what support they need next;
  - Informal networking at our community energy feasts;
  - Immersive learning experiences through site visits.



Figure SA-03.34 Community engagement events

## Track record

### Working with community energy groups

- 11.12.** Our track record has been demonstrated through significant community energy engagement and support over the previous seven years, which has seen the creation of 97 community energy groups throughout our four licence areas, which accounts for 43% of all community energy groups in the UK. This has facilitated 100MW of community-owned renewable electricity to be connected to the network. Examples of these groups are:
- Burnham and Weston Energy Community Interest Company which operates a 9.3 MW Communities for Renewables solar farm providing income for the local community which funds a fuel poverty service.
  - Plymouth Energy Community which owns 33 solar arrays generating clean electricity and helping to fund PEC's extensive fuel poverty work and cost savings for schools.
  - Green Fox Community Energy, Leicester's community energy co-operative, which has the largest community-owned renewable heat project in the UK, a 2 MW biomass boiler providing renewable heat for a local secondary school. This saves 500 tonnes of CO2 per year and helps to pay for energy efficiency measures in other nearby schools.

### Providing information and support

- 11.13.** We have provided support to the communities and their representatives through accessible guides. Our 'Connecting Community Energy' guide is a 'how to' for any local energy group looking to develop its own renewable energy project and connect to our network. Supported by the Centre for Sustainable Energy, we developed our 'Community-Based Network Innovation' guide, which has supported our collaboration with community energy groups on several innovation projects with a total investment value of over £9m.
- 11.14.** Some organisations prefer to discuss matters in more detail with our engineers and therefore we have implemented community energy surgeries with our local teams. These allow us to engage more closely with groups at the start of their journey and provide guidance on how best to connect to the network and operate efficiently and effectively.

## Context for RIIO-ED2

- 11.15.** We have seen an increase in climate action groups and local authorities engaging with us, as a result of climate emergency declarations. These new local energy stakeholders are working towards carbon reduction plans that will include new low carbon energy infrastructure and we want to support them alongside existing community energy organisations.
- 11.16.** During RIIO-ED2, the energy system will continue to transform into a smarter, more flexible and responsive low carbon energy system. The associated changes will potentially change the way consumers interact with the energy system.
- 11.17.** We are committed to continuing our leading edge engagement with communities and community energy groups to support the delivery of their ambitions and in turn to maximise their support of a more dynamic and flexible network. Where community energy groups have the potential to provide significant localised energy balancing services, this enables us to further optimise the operation of the distribution network.

## Key activities/actions for RIIO-ED2

- 11.18.** Community energy organisations face multiple barriers, including the lack of viable business models, are time and resource poor and struggle to engage and stay informed about the complex and fast-moving changes in our energy system. We recognise that we need to provide additional support to communities and local energy collaborators. We are committed to working closely with communities to support their goals.

### Providing support

- 11.19.** Engagement with community energy stakeholders will form an important part of the support that we provide. We will build on our existing community energy surgeries and programme of engagement, evolving our approaches to meet the changing needs of the various groups.
- 11.20.** Stakeholders have identified that they struggle to understand the complex nature of the energy system and therefore we will look to enhance our support for local energy groups through the provision of dedicated resource. The 'Community Energy Engineers' will provide a clear focal point for communities to engage, develop and importantly deliver their plans with the help and support of WPD.
- 11.21.** We will use these interactions to build a knowledge base for community energy development and share the knowledge throughout our business. This will enable us to implement community energy training to ensure that advice is being provided consistently.
- 11.22.** Community energy stakeholders have limited resources and therefore may not be able to contribute to industry consultations. Because this places them at a disadvantage, we will capture their concerns and needs to make sure that their interests and requirements are represented in the responses we provide. We will also ensure that relevant changes are communicated to community energy stakeholders in a simple and digestible manner.
- 11.23.** Data is becoming increasingly important and providing community groups with the right level of data in the right format can empower them to maximise the value of their investments. We will ensure that our presumed open approach to data will capture the needs of this group.
- 11.24.** We have a strong track record of working with community energy groups to trial new ideas through funded innovation and we are committed to further developing this. We will use our dedicated community energy resource to identify opportunities to support community energy group-led projects. To support this, we will ensure that 'communities and vulnerability' is an explicit theme in our Innovation Strategy.

### Delivering network benefit

- 11.25.** In addition to supporting community groups to achieve their objectives, a key driver for our community energy engagement is to deliver network benefit. As we continue and develop our support for these groups, we expect to see a number of benefits such as:
- information to enhance our future energy scenarios work;
  - development of local level energy balancing;
  - development of new community energy focused solutions and implementation into business as usual activities.

# 12. Innovation

## Our track record

- 12.1.** Innovation is the process of having new ideas, developing them into practical solutions and trialling them to investigate their effectiveness. It is through innovation that we continue to improve the way we operate and develop our network in order to provide best value for money to our customers.
- 12.2.** Our innovation programme develops the solutions, skills and processes required to create a future decarbonised and intelligent electricity distribution network that is affordable for all of our customers.
- 12.3.** In RIIO-ED1, our innovation programme has transformed our network and enabled us to provide our customers with a better service, faster and cheaper network connections and opportunities to provide flexibility services. This was achieved through the rollout of solutions designed, implemented and successfully trialled in our innovation projects. For example, we are now able to offer our customers ANM connections so that they can connect to our network more quickly and cheaply than with a conventional connection. We developed new policies and solutions that enable customers to connect in areas where fault level issues would have previously prevented a connection due to high network costs.
- 12.4.** Additionally, we led the creation of new standards such as Engineering Recommendation G100, driving the use of export limitation devices in UK electricity distribution networks. We developed network optimisation technologies that enable us to maximise the existing capacity in our network and completely changed our approach to network monitoring to increase visibility in the operation of both LV and HV networks. We also responded to stakeholder feedback asking for more information on the carbon intensity of the energy mix in their local areas and developed an app for this purpose.
- 12.5.** We also developed solutions for the way we manage voltage. This helps to reduce our customers' consumption by changing the voltages at our primary substations. This has increased network efficiency, reduced losses and network costs. We are now adding advanced functions to our Network Management System to perform real time optimisation of voltages in 33kV networks to increase network capacity for LCTs and defer expensive traditional reinforcement.
- 12.6.** Reducing the costs associated with operating and developing our network is important to us as it lowers the overall costs to customers through more efficient ways of operating. The flexibility services we now offer to customers originated from one of our innovation projects and shaped the way we interact with customers commercially. Our flexibility services provide our customers with the opportunity to help us manage our network more effectively while at the same time earning additional income and making the most out of their existing assets.
- 12.7.** Not all of our projects have produced solutions that were suitable for rollout within the business for a number of projects. For example, some projects were ahead of their time and need to be revisited again in the short term future to re-evaluate their business case as technologies are more widely adopted. Some other projects, such as our Superconducting Cables NIA project, have proved that the solutions investigated should not be implemented as they would not provide any customer benefits. This has prevented unnecessary investment in the UK distribution network that would not provide value for money.

- 12.8.** Both our successful and unsuccessful projects have helped us build and continuously improve our robust framework for delivering innovation, develop the skills needed to plan complex projects and manage relationships with project partners.
- 12.9.** These skills and the experience we gained are our greatest assets, making all of our work incredibly valuable even if the outputs were not what we expected.
- 12.10.** We recognise that not all projects will be successful or produce solutions that are suitable for rollout but we remain proud of our passion for continuous improvement and our focus on extracting maximum learning out of every single project and providing the best possible value for money.
- 12.11.** It is widely recognised that dedicated innovation funding over the previous price controls has been highly effective in allowing companies to embark upon longer-term, energy system transition, whole system, or vulnerability-related innovation which deliver benefits beyond those accrued by the individual company.

## Innovation in RIIO-ED2

### Our innovation ambition and RIIO-ED2 innovation programmes

- 12.12.** Our innovation ambition is to drive the transformation of the industry to enable the UK meet net zero affordably. This ambition underpins our strategic innovation plans for RIIO-ED2, shapes our priorities and defines our values. Building on our successes in RIIO-ED1, we will widen our innovation programme to continue developing the solutions for a sustainable and intelligent network as well as demonstrating new ways to support our vulnerable customers throughout the energy transition, ensuring that everyone can benefit from a smart, net zero future.
- 12.13.** For RIIO-ED2, Ofgem is proposing to continue the Network Innovation Allowance (NIA) but will limit eligibility to projects linked to the energy transition and consumer vulnerability. The Network Innovation Competition (NIC) will be replaced with the Strategic Innovation Fund (SIF). We will be actively seeking to secure funds from both the NIA and SIF throughout RIIO-ED2 to continue our extensive core innovation programme.
- 12.14.** We will dramatically increase our innovation activities in the RIIO-ED2 period by delivering two innovation programmes instead of one. Our core innovation programme will deliver projects funded through external mechanisms such as NIA and SIF, while our new business innovation programme will consist of the rollout of previously proven innovation and projects to enable our business to operate more cost efficiently. Our business innovation programme will be funded through Totex.

## WPD's RIIO-ED2 Innovation Strategy

- 12.15. Our RIIO-ED2 Innovation Strategy provides detail on our innovation ambition, our values and priorities, our strategic plans for RIIO-ED2 and our approach to changing our culture to embrace and reward innovation within the business.
- 12.16. Our RIIO-ED2 Innovation Strategy will be updated on an annual basis or more frequently if required, to reflect rapidly changing external factors including government policy, stakeholder priorities and incorporate learning. Further details can be found in [appendix A11](#).



## Innovation programme delivery

- 12.17. Our innovation team is dedicated to working with our business experts, external partners and customers to identify their most pressing problems, find solutions and trial them through our innovation projects. To date, we have delivered more than 120 projects investing over £80 million in innovation.
- 12.18. Team members are drawn from internal resources including employees of all levels, as well as external support from outside the organisation to bring in fresh ideas. They come from a range of backgrounds including active transmission networks, craft skills, data science, research science, project management and customer service.
- 12.19. To achieve our innovation ambition, we believe it is important to have clear values that align with our ambition. These values determine how we deliver our strategy and projects, how we interact with others, how we work as a team and how we manage our work. Our three core values are:



**Figure SA-03.35 Our innovation core values**

- 12.20. We have developed a strong framework, documented within our Project Governance Guidelines, for creating and delivering our projects which is based on internationally recognised project management methodologies (PRINCE 2) and applied in the projects we delivered so far.
- 12.21. All projects include representatives from outside the innovation team to ensure that new solutions can safely be implemented on the WPD network and integrated into our current processes and systems. The representatives work alongside the project manager to develop policy, operating standards and practices to provide the framework for replication.



- 12.22.** The approach to rollout is developed as part of the project and detailed in project closedown reports. Where a new solution requires staff training, this is identified, developed and trialled within the project.
- 12.23.** During RIIO-ED2, we will develop a new interactive 'ideas portal' for staff, third parties, communities and other stakeholders to make their own suggestions for new projects that align with our core or business innovation programmes. Where appropriate, we will make grants to individuals or groups to progress an idea through feasibility assessment and to create a high level project scope.

## Our innovation commitments

- 12.24.** Innovation has a crucial role to play in the decarbonisation of the energy system. We need to ensure that our electricity distribution network can meet the increasing demand from the electrification of heat and transport while also allowing the connection of more low carbon generation. We will continue to innovate to find novel ways of transforming our network efficiently and effectively and operating it to meet these demands.
- 12.25.** We are committed to maintaining our industry leading standards of customer service, safety and reliability while keeping costs low for our customers and protect our most vulnerable. We will harness innovation to achieve this and develop new technologies, commercial solutions and standards that will enable us to make the most of our existing network and assets.

## Core innovation programme

- 12.26.** Our core innovation programme will deliver projects funded through external mechanisms such as Ofgem innovation funding, BEIS competitions, InnovateUK, calls and initiatives connected to the Energy Systems Catapult and other national and international schemes.
- 12.27.** We welcome the continuation of NIA funding and the introduction of the new Strategic Innovation Fund for RIIO-ED2, which will support future-facing strategic challenges. These innovation funds will be targeted at projects linked to the energy system transition, focusing on key strategic challenges. Projects will also be carried out to address consumer vulnerability.
- 12.28.** We will be requesting £30m of NIA funding for the RIIO-ED2 period, which is based on our RIIO-ED1 average spend up to now and the increase in spend we expect to have due to being able to use the allowance over the entire price control period rather than annually. We will continue to contribute at least 10% of the costs of all projects.
- 12.29.** The exact pathway to UK decarbonisation remains unclear. It is therefore important that our projects are sufficiently broad to support whatever route is taken. We use a principle of a 'balanced portfolio' of projects. Our portfolio of projects will therefore have a mixture of:
- projects that develop incremental improvements;
  - projects that are more radical or disruptive;
  - projects from 132kV sub-transmission networks to Low Voltage servicing individual customers;
  - socially focused projects to ensure we continue to improve the way we support all of our customers;
  - demonstrations for solutions involving heat, e-mobility and generation;
  - projects considering engineering technology, data analytics, competition and markets;
  - locations spanning urban, suburban and rural locations; covering a range of customer demographics;
  - trials across all four WPD regions to gain feedback from across a wide geographic area; and

- delivery approaches from WPD teams through to those delivered primarily by third parties.

**12.30.** For those solutions which involve more disruptive process change, a business impact assessment will be carried out. Organisational or budget changes will be progressed by the relevant senior management teams.

**12.31.** There will be specific emphasis on the following themes over RIIO-ED2:

<b>Decarbonisation</b>	<ul style="list-style-type: none"> <li>• Investigation and trial of new ways of reducing our carbon footprint in the various areas of our business.</li> </ul>
<b>Communities and vulnerability</b>	<ul style="list-style-type: none"> <li>• Specific projects to support energy communities;</li> <li>• Initiatives focused on consumer vulnerability, solutions to ensure communities and vulnerable groups can access new energy services and markets.</li> </ul>
<b>Behavioural analysis and probabilistic planning</b>	<ul style="list-style-type: none"> <li>• Application of statistical research and analysis of consumer behaviours to inform planning and operations;</li> <li>• Transfer of techniques from other sectors such as defence and retail.</li> </ul>
<b>Digitalisation</b>	<ul style="list-style-type: none"> <li>• Use of analytics tools and application of data science;</li> <li>• opening of data to authorised third parties and the general public; automation and artificial intelligence;</li> <li>• application of ICT to all part of the grid;</li> <li>• secure, simple integration with customer end use / equipment; data collection and aggregation technologies including cyber security aspects.</li> <li>• This work area will build on the work of the Energy Data Task Force and concept of presumed open data.</li> </ul>
<b>E-mobility</b>	<ul style="list-style-type: none"> <li>• support the mass market adoption of electric cars and vans, using innovation to solve any issues which arise;</li> <li>• further development of smart charging and V2G solutions (vehicle-to-grid technologies);</li> <li>• develop further solutions for connection of charging infrastructure as new technologies become available;</li> <li>• exploration of solutions for heavy freight;</li> <li>• inland and coastal shipping; technology tracking on on-vehicle technology for batteries and charging</li> </ul>
<b>Low Carbon Heat</b>	<ul style="list-style-type: none"> <li>• projects developing and demonstrating innovative electric heat solutions; district heat;</li> <li>• industrial waste heat;</li> <li>• hybrid customer solutions;</li> <li>• mass market scale up of heat pump adoption;</li> <li>• integration of heat flexibility and storage;</li> <li>• inter-seasonal storage and market integration</li> </ul>
<b>Distributed Generation</b>	<ul style="list-style-type: none"> <li>• technology tracking and integration of renewable generation in to the network;</li> <li>• thin film PV and falling prices;</li> <li>• rooftop and ground deploy technologies;</li> <li>• integration with community and municipality local energy schemes.</li> </ul>

High Voltage Power Electronics and Battery Storage	<ul style="list-style-type: none"> <li>• falling prices of power electronic equipment will make application at DNO level more cost effective;</li> <li>• enhancement of EHV solutions and expansion to HV/LV networks;</li> <li>• technology tracking for battery storage especially grid scale solutions used internationally</li> </ul>
Flexibility services and Energy Efficiency	<ul style="list-style-type: none"> <li>• development of DSO flexibility products;</li> <li>• expansion to lower voltage networks; optimisation techniques across multiple markets;</li> <li>• introduction of distributed ledger and peer to peer trading;</li> <li>• relationship of markets with Energy Efficiency solutions</li> </ul>

Figure SA-03.36 RIIO-ED2 innovation themes

## Business innovation programme

- 12.32.** We will strategically focus on delivering BAU innovation and innovation rollout to accelerate cost efficiencies and the adoption of innovation.
- 12.33.** We define business innovation, otherwise referred to as BAU innovation, as lower risk innovation that cannot be funded through the Ofgem driven mechanisms but can provide benefits to our network and customers by reducing our costs and introducing efficiencies.
- 12.34.** We will deliver business innovation projects through our new business innovation programme which will be funded through Totex.

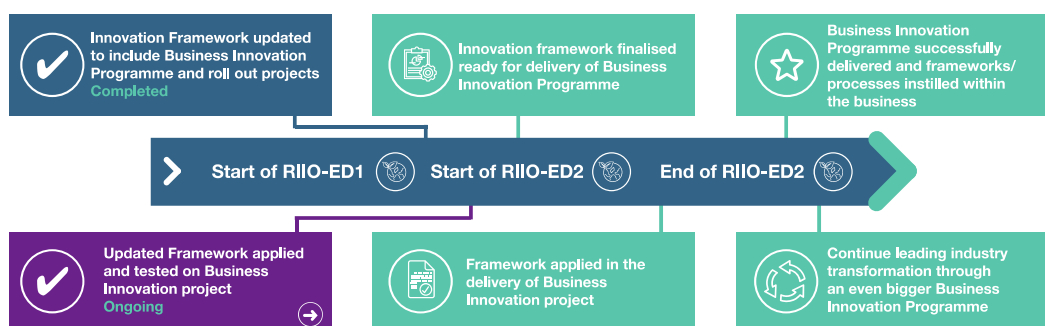


Figure SA-03.37 Business innovation framework

- 12.35.** Our innovation team will be supplemented by additional resources to support the delivery of these objectives.
- 12.36.** We have already started preparing for the delivery of our new business innovation programme in RIIO-ED2, by updating our existing framework to capture how it applies to business innovation projects (see figure 9). We have even started applying that framework in the delivery of our first business innovation project, called PrimeEV, which is now in the delivery stage. This enables us to test our updated framework and identify further changes required before applying it on our business innovation programme in RIIO-ED2.
- 12.37.** We will not limit our business innovation programme to specific areas of our business but instead ensure we have a broad portfolio of business innovation projects. Through our business innovation work, we want to drive continuous improvement and make our systems, processes

and technologies as efficient as possible in any business area where there is space for improvement.

- 12.38.** Throughout RIIO-ED2, all our business owners will be able to submit their business innovation ideas through our new ideas portal for assessment to be approved and scheduled for delivery.
- 12.39.** Although we will not limit our business innovation work to specific areas, we have already engaged with all of our senior managers and captured their initial ideas in preparation for the start of RIIO-ED2. These include network performance, asset management, customer service and new connections support, fleet maintenance and management, regional energy modelling and carbon reporting, network planning and finance.
- 12.40.** Our business innovation programme will include the rollout of successfully proven innovation delivered by us or other DNOs in previous price controls and during RIIO-ED2. As part of that, among other solutions, we will be delivering the rollout of System Voltage Optimisation (SVO), our centralised voltage control system that we successfully trialled in a previous LCNF project and our PrimeEV connection solution currently being developed as a business innovation project in RIIO-ED1.
- 12.41.** To ensure that we maximise the value for money from the innovation work we have delivered so far, we have already started re-assessing innovation projects which were completed in previous price control periods but concluded that it was too early for their outputs to be used in BAU.
- 12.42.** During RIIO-ED2, we will deliver any of these projects that now have a strong business case and continue re-assessing previous work so that no opportunity is missed to roll out proven innovation that can provide benefits to our customers.

#### **Involving third parties in business innovation**

- 12.43.** We welcome third party collaboration in our business innovation work. In fact, we believe it is necessary in order to be able to create the technologies, processes and solutions needed to drive change within our business.
- 12.44.** Third parties will therefore be able to submit ideas for business innovation projects through our new ideas portal, which will then be assessed and allocated for delivery, if successful. These ideas could be related to solutions already developed with other DNOs, ideas proven independently of any Ofgem funded projects or low risk innovation that has the potential to create a new solution, all of which would introduce cost efficiencies.
- 12.45.** Where Business innovation projects involve the rollout of previously proven innovation (by ourselves or other DNOs), it is likely we would require the involvement of the third parties that created the innovation in order to ensure it is successfully applied and used.
- 12.46.** We will therefore be open to collaborating with such organisations when delivering our business innovation programme.

#### **Overcoming the barriers to the adoption of innovation**

- 12.47.** To ensure that we develop robust plans that will enable us to successfully deliver business innovation, we start by understanding potential barriers and then shaping our plans to overcome these.
- 12.48.** From our previous experience in delivering innovation projects, we have found that sometimes staff are not comfortable with change and do not see innovation as beneficial or exciting. We are therefore focusing on changing our culture and will be running campaigns to alter

perceptions and to make all our business areas aware of the positive changes brought by. We believe that embracing change and being excited about the prospect of improving the business is absolutely essential to successfully deliver innovation in the business.

- 12.49. Even if the overall perception of innovation is a positive one for staff, there is still a risk that their interest will be low in delivering the innovation within their area. Research from the [Harvard Business review](#) has shown that engaging people from the very first stages of creating the innovation idea and ensuring that ownership of the idea is shared with all stakeholders motivates them to deliver it as they feel responsible for it when it originates from them. We will follow this approach and involve stakeholders in the initial detailed discussions but also ensure we are flexible and take on board any suggestions they have during the delivery of the project.
- 12.50. Budgetary priorities can also be a barrier to the adoption of innovation and could delay business implementation. For this reason, we will be allocating £3m of annual budget specifically to fund our business innovation programme.
- 12.51. Existing business processes such as procurement or IT development can decelerate the application of new innovation within the business. For this reason, in every business innovation project, from the idea creations stage, we will be identifying all internal teams that will need to be involved in all stages project and discussing the idea with them to determine how it can be delivered overcoming existing issues. This process will also be followed for any projects delivered within our core innovation programme so that the solutions developed will be suitable for business use.
- 12.52. Other industries have been successful in adopting innovation and we have identified how we can use their learning to shape our approach. This is demonstrated in more detail in our RIIO-ED2 Innovation Strategy.

### Embedding a culture that celebrates innovation

- 12.53. We recognise that driving business innovation and change throughout our organisation is not just about delivering projects. It is about changing perceptions so that innovation is not seen as scary, complicated or difficult. It is about rewarding innovation, encouraging continuous improvement and embracing change. We will do that by embedding a culture that celebrates innovation.
- 12.54. We plan to drive business innovation and change our culture by rewarding innovation through internal performance metrics, creating a competitive spirit between our internal teams that encourages efficient delivery and adoption of innovation, sharing ownership of business innovation projects within the business area where the project is delivered and having innovation ambassadors in each of our main business teams. Our detailed approach for this and how we plan to overcome the expected challenges that could prevent innovation adoption are captured in our RIIO-ED2 Innovation Strategy.
- 12.55. Our culture will also be shaped by the new people who join our business to become our future leaders. Attracting the best talent and giving opportunities to ambitious individuals who are passionate about making a change in the industry will be key to achieving and maintaining the culture we want to create.
- 12.56. We have already started acting on this through our most recent graduate recruitment where we changed our process to focus on getting the right people into the business able to drive innovation and change.

- 12.57.** All of our business graduates will also be spending time with our innovation team as part of their graduate scheme where they will be given opportunities to make a change and appreciate the benefits innovation can bring.
- 12.58.** We also recognise that culture change cannot happen quickly. We expect to see business engagement grow within the RIIO-ED2 period and our aim is to have new business innovation ideas submitted to the innovation team every month by the end of RIIO-ED2.
- 12.59.** We will keep monitoring our business engagement and we will be continuously assessing our innovation culture during RIIO-ED2 by taking into account the number of projects in delivery, the benefits provided through implemented business innovation and our staff's perception of innovation captured in surveys.

### Understanding the barriers to changing our culture

- 12.60.** The nature of our business means that the focus of the majority of our main business has been constant over the years with no or very little change.
- 12.61.** Although we did have some great engagement with our main business teams when delivering innovation projects, not all of our teams in all areas have had the chance to be involved in our previous innovation projects. This is because innovation trials usually take place in a specific geographical area depending on the project.
- 12.62.** This means that change and innovation are not familiar concepts for most of our staff. To explore this further, we have engaged with our business owners to discuss with them what innovation means to them and any innovation activities already completed with their teams or planned for RIIO-ED2. This exercise verified that perceptions of innovation vary within the business and that there is insufficient awareness of how innovation has already improved many of our activities when it comes to operating the network, connecting customers and increasing network capacity.
- 12.63.** Therefore, to embed a culture that embraces innovation, we need to start with the basics and first of all help our staff understand what innovation is and how it has already improved our activities.
- 12.64.** We will do that by running internal campaigns to spread the positive message and also visit our local teams to speak to them in person about innovation and how their ideas can be implemented through our business innovation programme. We will focus on ensuring that our staff know their suggestions will always be listened to and that we can help them to implement these.
- 12.65.** When engaging with our business owners, we also discovered some great, novel initiatives being carried out by local teams, such as trials of new technologies that can accelerate the restoration of supplies in fault conditions. We do believe that by enhancing the communication we have with all of our business teams we can discover even more exciting and disruptive ideas.



## Creating new projects

- 12.66.** The identification of projects arises from within WPD and from external suggestions.
- 12.67.** We capture ideas by running calls for innovation projects. These calls are run at different times of the year, when we ask individuals or organisations to submit proposals for NIA projects focusing on a specific topic. Example topics include data, communities and consumer vulnerability. Once an idea is selected, we work with the successful companies to develop NIA projects around their proposal.
- 12.68.** In RIIO-ED2, we will continue our socially focused calls for ideas, targeting community groups and organisations that support the vulnerable and fuel poor.
- 12.69.** During RIIO-ED2, we will develop a new interactive 'ideas portal' aimed at staff, third parties, communities and other stakeholders where suggestions for new projects can be made. Where appropriate, we will make small grants to individuals or groups to further progress an idea through feasibility assessment and the creation of a high level project scope. This ideas portal will be used for both innovation programmes.
- 12.70.** We will also actively explore external involvement in the generation of ideas for new projects through a variety of mechanisms such as identifying best practice development from other DNOs' projects that can be incorporated in our business or developed further through innovation trials, interacting with wider stakeholder groups and EV chargepoint operators' forums to understand their challenges, investigating innovations developed outside of our direct industry to understand what can be learnt and adopted to improve our wider business operation.
- 12.71.** We also want to discover new ways of generating ideas. We will, therefore, remain open minded in our approaches and will continuously review them. We have already started conversations with leading technology companies which have a track record of leading innovation in their sectors as we are keen to learn from their approaches.
- 12.72.** Each project idea will be assessed to determine:
- If it is suitable for our core innovation programme or our business innovation programme based on its risk level and compliance with NIA/SIF governance.
  - Its business case to show what benefits it can provide to our customers or what cost efficiencies it can introduce in our BAU operations and over what timescales the investment in the project will be recovered.
  - Its alignment with our RIIO-ED2 Innovation Strategy.
- 12.73.** Projects will only be progressed where:
- a potential cost benefit can be identified and provided within acceptable timescales
  - the project meets regulatory criteria
  - the project aligns with our innovation priorities and strategy.

## Consolidating and sharing the learning

- 12.74.** Process and policy change is usually informed by a wide range of developments and trials. It is unusual for a single innovation project to develop a standalone new policy or process. More often, several projects across the innovation programme and learning from other organisations will inform such developments.
- 12.75.** During RIIO-ED2, we will continue to track lessons learnt from projects, including capturing those things which have been tried but proven to be ineffective. We will use learning from our own projects and gather information from other network companies. We will also do more to track international developments.
- 12.76.** We will continue to run effective dissemination events and openly publish reports. All significant reports will be peer reviewed prior to publication. We will maintain a dedicated website for innovation projects. Project specific and programme level papers will be published for a variety of audiences. CIRED will be our main forum for sharing technical papers while trade and mainstream press will be used for more general audiences.
- 12.77.** We will participate in national events such as Utility Week Live, ENA's Network Innovation Conference and our own annual dissemination event. We will also participate in at least one European conference or exhibition each year. At a more regional level, we will support local events, especially in those localities which host specific project trials.

## Stakeholder engagement

- 12.78.** Stakeholder engagement is an integral part of WPD's core activity.
- 12.79.** Engagement on innovation takes many forms. It includes generic engagement with a wide range of stakeholders, specific engagement with the innovation community and targeted engagement on specific technical topics.
- 12.80.** For specific projects, the innovation team project manager will carry out dedicated engagement with focus groups to share learning and discuss project outcomes.
- 12.81.** The innovation team also acts as a point of contact and informal advice for local groups and universities. This may involve attending community meetings or delivering lectures or tutorials for undergraduates and post-graduate students.
- 12.82.** The team also responds to suppliers who ask for advice on developing their products, which may lead to collaborative work with WPD or suggesting collaboration partners.
- 12.83.** We will continue to engage with our stakeholders regularly to share the learning generated in our innovation projects, whether successful or unsuccessful, obtain stakeholder feedback on our Innovation Strategy and plans, involve them in the process of identifying the areas we should be focusing on and have informal conversations on how we can support their needs.

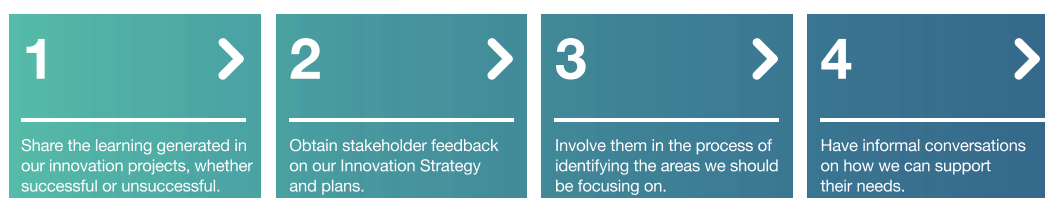


Figure SA-03.38 Stakeholder engagement

- 12.84.** We are proud of our passion for continuous improvement and therefore always look for ways to improve our stakeholder engagement.
- 12.85.** At every event, we collect feedback on how we performed and what we could do better to make our events more enjoyable and beneficial for our stakeholders.
- 12.86.** We also consider the views and interests of our stakeholders when planning our events. Our most recent innovation showcase event, for example, was shaped entirely by the interests of the stakeholders who registered for the event through information we collected at the registration stage.
- 12.87.** We want to make it as easy as possible for our stakeholders to get in touch with us if they have an idea but also to be able to collaborate with us effectively to turn that idea into a project and deliver it successfully. For this reason, we will be creating a form on our website asking our stakeholders to tell us about how they found their journey with us, starting from their initial contact, through to the stages of creating the project and delivering it. We will be continuously reviewing our existing processes and using the information collected to improve them whenever possible.

### **Collaboration with other industries within the UK and internationally**

- 12.88.** We know that in order to achieve net zero, we cannot be looking at our infrastructure in isolation. We need to be working with other key infrastructure providers and industries to find solutions that work for the whole system and provide the best overall benefit to the UK consumer.
- 12.89.** This collaboration is necessary to facilitate the energy transition in the most economical way.
- 12.90.** We are passionate about driving this collaboration to bring together all the right people and jointly, strategically tackle the biggest challenges to decarbonisation.
- 12.91.** To achieve this, during RIIO-ED2 we will be running our net zero working group with key decision makers from other industries such as transport, utilities, manufacturing. We will use this working group to keep everyone up to date with each sector's strategic innovation plans, capture any impact on other sectors and overcome barriers in regulation and governance that make collaboration difficult.
- 12.92.** We have started strengthening our links with the water and rail industries and aim to collaborate on our first innovation projects before the end of RIIO-ED1. This process has already provided us with useful knowledge on how innovation is funded in different sectors what the existing challenges and the solutions are to overcome them. For example, we have been working with water utilities and railway network operators to understand how they innovate and create our first joint innovation projects ahead of RIIO-ED2.
- 12.93.** We believe that establishing contacts and relationships early is key to be able to create larger scale whole system solutions in RIIO-ED2.
- 12.94.** Additionally, through our EPIC NIA project, we are exploring in detail how whole system solutions and integrated planning with different sectors can produce solutions that are overall cheaper to the UK consumer. This has shown the significant potential cost savings that can be achieved by looking at the system as a whole.
- 12.95.** Additionally in RIIO-ED2, we want to increase our collaboration with international DNOs which are leading the industry changes in their countries. We aim to do that by increasing our

attendance at international events and conferences in order to expand our contacts base, make connections and work with them to understand in detail how they are innovating their energy system. From our current contacts with European DNOs, we have seen that we all share the same challenges and follow different approaches in addressing them.

- 12.96.** We believe that close collaboration between industry leaders internationally is the only way to effectively address global issues such as decarbonisation.
- 12.97.** Therefore, we are committing to partnering with at least two large scale international projects within RIIO-ED2 (one in Europe and one further afield). We will also support at least one smart grid project with a developing nation.

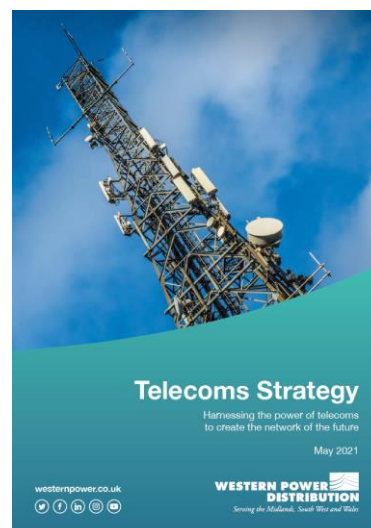
# 13. Telecoms

## Background

- 13.1.** WPD operates an extensive in-house telecoms network that delivers inter-office data communications, mobile voice communications and supervisory control and data acquisition (SCADA) between electricity assets and control centres.
- 13.2.** This approach is efficient, cyber secure and highly reliable compared to services offered by third party telecoms providers.
- 13.3.** By using third party operators, WPD would have no control over the reliability, resilience, security and availability of these networks. Third party operators provide coverage based on population rather than geographical area. By contrast WPD has a requirement for assets to be connected in more rural areas. Our network is designed to reach these areas where this is often no coverage from third party networks.
- 13.4.** Telecoms and control and monitoring technology within the electricity industry has undergone minimal change over the last 20 years. The focus has been on customer service to ensure customer minutes lost and customer interruptions are minimised. 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.
- 13.5.** 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.
- 13.6.** We have already started meeting these increasing demands of the future during RIIO-ED1, while maintaining our excellent standards of reliability and resilience. During RIIO-ED2, we will further improve systems and offer the additional levels of coverage and granularity required to support the electricity network to achieve the net zero transition.
- 13.7.** The WPD telecoms infrastructure will therefore be reinforced and expanded to be able to do more remotely, including patch updates, network switching, protection setting application and network monitoring.

## Telecoms Strategy

- 13.8.** WPD has produced a Telecoms Strategy which is updated annually and available as a standalone document. Further details can be found in [appendix A12](#). This provides an insight into the challenges and solutions that will be adopted to prepare our Telecoms network ready to support the changes in the Electricity network. We have been working closely with suppliers to identify solutions to overcome the future challenges. This describes the rationale behind our innovation projects and business initiatives as well as describing how we are already implementing some solutions into 'business as usual' activities



## Telecoms RIIO-ED2 challenges

**13.9.** RIIO-ED2 will provide a number of significant challenges to our telecoms team, particularly in relation to the increase in the number of electricity assets to be monitored. 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.

## Telecoms RIIO-ED2 deliverables

**13.10.** The deliverables cover the modernisation, enhancement, upgrade and/or replacement of existing systems and technologies, as well as the development and/or purchase of new systems and technologies.

### Power flow monitoring

**13.11.** 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.

**13.12.** This expansion of data collection and communication requirements will require connection to WPD's telecoms infrastructure.

### Communication for LV monitoring

**13.13.** Low voltage monitoring is becoming increasingly important, as customers with low voltage connections invest in low carbon technologies (LCTs) such as solar panels, electric vehicles and heat pumps, operating within a smart grid environment.

**13.14.** WPD is responsible for its 7.9 million customers and some 180,000 distribution substations as they transition to net zero. These additional demands mean that monitoring at LV will increasingly be required year on year to proactively monitor the network's behaviour in relation to these advancing technologies.

**13.15.** To facilitate this data collection, additional communication devices will need to be installed and connected onto the telecoms network.

### Private Long Term Evolution (LTE) network

**13.16.** 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.

**13.17.** This limited capability is widely recognised and a modernised private LTE radio system is currently under review by OFCOM, with BEIS and Ofgem oversight. All UK gas and electricity network operators collectively agree that an LTE solution is urgently required to support net zero



objectives. A private LTE solution will have 100 times more capacity than the current radio system and will be quicker and more cost effective to deploy.

- 13.18.** If regulatory consent is given, we propose to change WPD's radio-based telecoms system to an eLTE solution to enable improved, resilient and secure communication capability. This will overcome bandwidth constraints and be scalable for future network growth and data demands.

### Replacing Remote Terminal Units (RTUs)

- 13.19.** RTUs are microprocessor devices that are installed at substations to collect data from transducers fitted to substation equipment to enable the data to be communicated back to control systems. As electronic devices, RTUs have a relatively short asset life.
- 13.20.** During RIIO-ED2, we propose to modernise 1,900 substation RTUs, which have reached the end of life.
- 13.21.** The replacement device will be an Internet Protocol (IP) enabled RTU providing enhanced two-way data traffic that will increase system monitoring capability and allow remote administration of system upgrades. The IP-enabled RTU will also be plug and play ready for the next generation of IP-enabled switchgear and protection relays.

### Replacement of legacy PDH and SDH infrastructure

- 13.22.** Legacy telecoms equipment including Plesiochronous Digital Hierarchy (PDH) and Synchronous Digital Hierarchy (SDH) telecoms apparatus, along with other vintage bespoke items, will not support the modern IP requirements of future electricity network systems.
- 13.23.** 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.

### PSTN switch off

- 13.24.** Public Switched Telephone Network (PSTN) is the current standard for phone line connections to all homes and businesses in the UK that are not on a fibre connection.
- 13.25.** 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 will impact the whole of the UK.
- 13.26.** For WPD, approximately 1,400 third party telecoms connections will be affected and will need to be replaced with a suitable alternative. In WPD, PSTN connections are used for a variety of purposes including phone lines, alarm systems and CCTV systems at distribution asset sites
- 13.27.** WPD will migrate these affected and essential lines onto WPD's private network.

### Fibre network expansion

- 13.28.** WPD uses a combination of fibre optics and microwave for communication across our telecoms network. We will continue to use a combination of these but will increase the number of fibre optic installations, as these provide greater bandwidth.
- 13.29.** WPD is proposing to expand the fibre optic network by taking advantage of outages and excavations for RIIO-ED2 planned overhead and underground asset replacement work.

- 13.30.** This will enable new fibre connections to be made to strategic electricity assets. 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 procured services from third party telecoms operators.

### Telecom sites

- 13.31.** The expansion of data acquisition and control will require the construction of additional telecoms sites to enable communications coverage where this does not currently exist.
- 13.32.** Some existing sites will be refurbished to modernise the associated plant for enhanced cyber security and resilience to power failure.

### Backhaul upgrades

- 13.33.** WPD's backhaul communications network uses a mix of microwave links and fibre that include IP networks and firewalls.
- 13.34.** Some devices on the network need to be upgraded because they are either no longer supported or require a cyber security enhancement.
- 13.35.** In other cases, extending the reach of the telecoms network will also require additional backhaul telecoms links to be installed.


















# 14. System Operator functions



## Scope

- 14.1.** More intermittent and less predictable use of the electricity distribution system is inevitable as customers substitute carbon based fuel sources with cleaner electricity. Traditional DNO operations would require very substantial investments in passive grid infrastructure, which would be under utilised much of the time. Continued construction, maintenance and operation of passive distribution networks is no longer going to deliver the best outcomes for UK electricity bill payers.
- 14.2.** DNOs therefore need to change and provide DSO systems and solutions in order to operate and maintain efficient, economic and coordinated networks. WPD plans to be at the forefront of this transformation.
- 14.3.** We will roll out DSO competences using a top-down approach, ensuring the 132kV, 66kV and 33kV networks are targeted first, prioritising those areas which will benefit most. This enables the rest of the network to be incrementally upgraded as the customer need dictates. We aim to develop wider flexibility for the use of import/export capping as an alternative to conventional solutions, only reinforcing the networks when these solutions cannot deliver what is required.

## Meeting baseline requirements

- 14.4.** We have mapped our System Operator functions against the DSO roles and activities for RIIO-ED2 as listed in the Ofgem sector specific baseline standards for DSO. In our list, we have sub-divided some items to provide additional granularity. The list is at the end of this annex.

Planning and Network Development		Promote Operational network visibility and data availability		Facilitate efficient dispatch of distribution flexibility services		Provide accurate user friendly and comprehensive market information		Embed simple, fair, and transparent rules and processes for procuring distribution flexibility services	
Role	Progress to date	Role	Progress to date	Role	Progress to date	Role	Progress to date	Role	Progress to date
1.1.1		2.1.1		2.2.1		3.1.1		3.2.1	
1.1.3		2.1.3		2.2.2		3.1.2		3.2.2	
1.1.4				2.2.3		3.1.3		3.2.3	
				2.2.4		3.1.4		3.2.4	
								3.2.5	

 in RIIO-ED1  
 in RIIO-ED2

**Figure SA-03.39 Baseline requirement progress (system operator functions)**

## Planning and network data

- 14.5.** WPD uses numerous sources of data to establish a forecast of future network loads and constraints. Established processes take national forecasts and combine them with local information to generate local forecasts. A common cross sector scenario (used in the gas distribution and transmission price controls) has been referenced to determine an early WPD Best View forecast. This Best View has been used to identify future network constraints and inform the future work programme that forms the RIIO-ED2 network reinforcement requirements.
- 14.6.** Through forecasting using internal data sets, WPD will be able to provide instantaneous and predicted constraint levels for Distributed Energy Resources (DER) within operational timescales. This will allow the levels of constraint to be used when dispatching flexibility services and ensure the network is managed to maximise capacity and minimise constraints. We will develop enhanced forecasting, simulation and network modelling capabilities, with processes in place to drive continual improvement to meet network and user needs.
- 14.7.** During RIIO-ED1, we will have completed the conversion of WPD network models to enable switch level analysis and develop the systems to record and simulate network asset behaviour. Through RIIO-ED2, we will improve our understanding of customer behaviour, enabling the impact of consumer-led smart technologies to be modelled alongside smart grid mitigations, to better understand true network capacity needs.
- 14.8.** A core forecasting and capacity management team developed within the DSO business will drive improvement in understanding electricity system impacts on customer assets and behaviour. A system modelling team within the DSO business will develop the systems, techniques and data required to understand the electricity system impacts on network assets and behaviour.

## WPD's track record and processes

- 14.9.** Since 2015, WPD has been undertaking scenario planning work through Distribution Future Energy Scenario (DFES) reports, updating them on a two-yearly cycle to provide a forward looking 10 year window of potential low carbon technology uptakes. The DFES projections have been aligned with the latest National Electricity Transmission System Operator (ESO) scenario forecasts that are available when the DFES process is carried out. Further details can be found in [appendix A13](#).
- 14.10.** A separate process called Shaping Subtransmission determines the impact of the scenarios on the network. This process uses data from the DFES analysis to determine whether the change in use of the network leads to constraints. The information about constraints is used to inform future requirements for investment. Further details can be found in [appendix A14](#).
- 14.11.** The forecast network requirements are used to provide information for potential flexibility providers. Signposting gives a multiple scenario five year forward view of requirements and forecasting provides a single two year Best View of requirements. This information informs the flexibility procurement process which operates on multiple cycles up to the point when investment is required.
- 14.12.** The options for investment are considered in the Distribution Network Options Assessment process (formerly the Strategic Investment Options process) which determines whether flexibility, conventional reinforcement or alternative innovative approaches provide the most economical solution.

- 14.13.** This leads to either implementing the operation of flexibility or proceeding with conventional reinforcement, where flexibility is unavailable.
- 14.14.** The use of future energy scenarios and the associated processes are embedded as business as usual within WPD and therefore activities in RIIO-ED2 will be focused on expanding, enhancing and evolving these processes.
- 14.15.** Enhanced visibility will give us the data, not only for us to manage our network to the highest levels, but also to enable us to give the best information to customers, providing leading indicators on where distribution network capacity is plentiful and where further support from flexibility services is required. By making this information available, WPD will contribute to the neutral facilitation of regional markets for the deployment of third party owned flexibility services.
- 14.16.** The space between the Long Term Development Statement timescales and the Distribution Future Energy Scenarios forecasts will be filled with a Network Development Plan. We will use this to provide information across current and future Business Plan periods. We will ensure that our models and outputs are consistently available in all our forecasts.
- 14.17.** Distribution network options assessment will be a six monthly publication providing transparency in decision making on the use of flexibility and other competitively tendered innovative network mitigations. An industry standard tool, CEM, will be used to compare the investment options around a number of industry standard scenarios and the DSO's own Best View. Stakeholder engagement and whole system optioneering will be a crucial part of the DNOA process. The DNOA framework set out by WPD will solidify robust and transparent processes to ensure independence of decision.
- 14.18.** WPD will develop a front-loaded payment mechanism to catalyse investment in energy efficiency measures, building on the revenue potential of flexibility. Network areas which would benefit from flexibility may also benefit from energy efficiency measures which reduce network loadings at cardinal points assessed by the DSO. A specific energy efficiency proposition should deliver low risk, long term network utilisation reductions at an economic level.

## Strategic network planning process

- 14.19.** There are three main stages involved in our strategic network planning process:



**Figure SA-03.40 Strategic network planning process**

## Stage 1: Scenario planning – Production of Distribution Future Energy Scenarios (DFES)

- 14.20.** The first stage of the strategic network planning process is creating the Distribution Future Energy Scenarios (DFES).
- 14.21.** The (DFES) use national future energy scenarios (FES) forecasts produced by the Electricity System Operator (ESO) and local information to provide a distribution view of the technology volume changes across DNO licence areas.

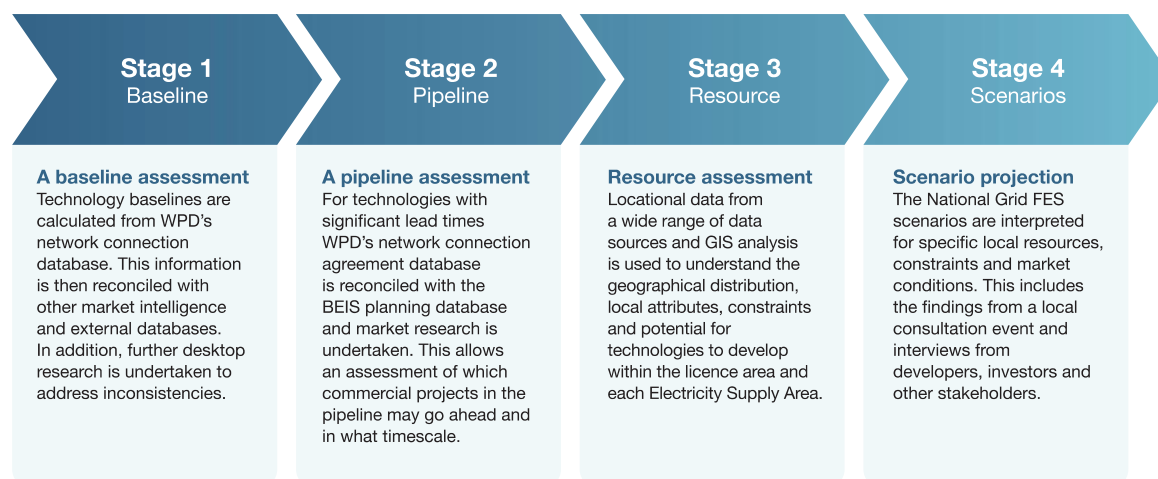
- 14.22.** WPD starting developing DFES studies in 2015 and was the first DNO group to develop DFES analysis and documentation. Since the publication of the first DFES report for the South West, WPD has continued to work with Regen to carry out the analysis which has been captured and published in licence specific DFES documents for all WPD licence areas.



- 14.23.** WPD has committed that, from 2020, a full suite of DFES documents will be produced annually. This means that by January each year there will be an updated suite of DFES documents for all WPD licence areas following release of an updated ESO FES in the preceding July.

## Considerations in DFES analysis

- 14.24.** The DFES investigates 50 different technology types and assesses the potential for growth under each of the four ESO FES scenarios. It follows a four stage process as shown in the diagram.

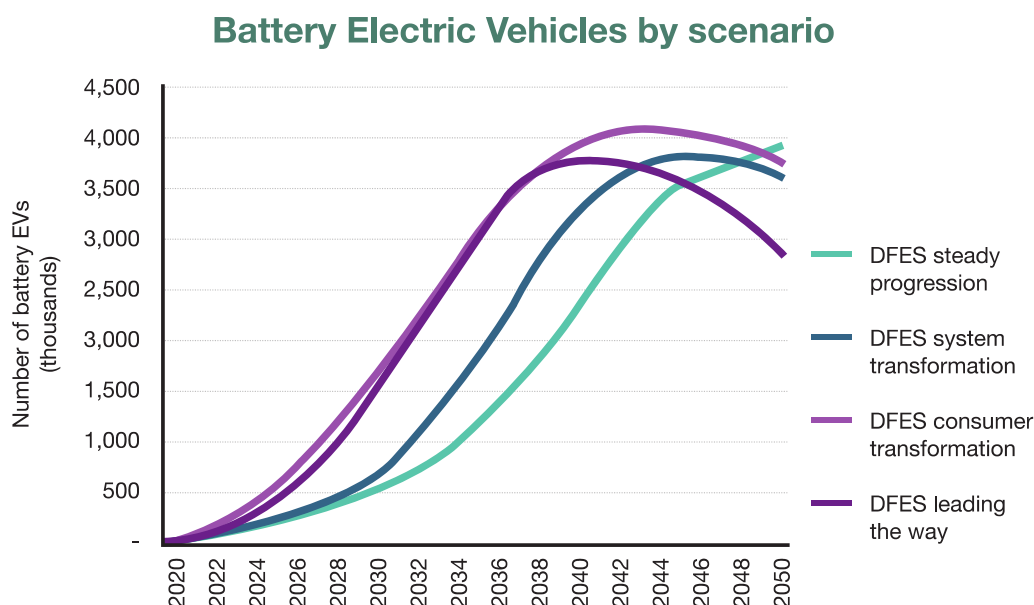


**Figure SA-03.41 DFES stages**

- 14.25.** The analysis for the DFES considers the impact of each ESO FES scenario on a range of demand and generation technologies resulting in a projection of the volumes of these technologies.

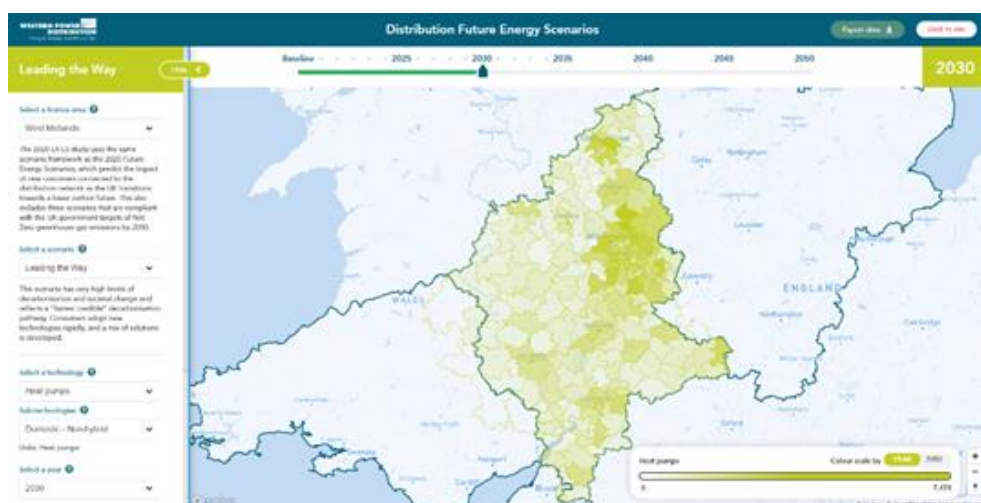


- 14.26.** This is illustrated by the West Midlands battery electric vehicle volume projections shown below. Similar projects are available for the full range of demand and generation technologies across all four WPD areas.



**Figure SA-03.42 West Midlands Battery Electric Vehicle volume projections**

- 14.27.** The DFES uses the concept of Electricity Supply Areas (ESA) to define the level of granularity of the analysis. These are aligned to primary substations, resulting in around 1,150 ESAs across WPD.
- 14.28.** The growth of each technology is considered for each individual ESA using information gathered from DNO network data, connection agreement information from local sites and other external data.
- 14.29.** The heat map in the figure SA-03.43 below shows the expected growth of non-hybrid heat pumps under the Leading the Way scenario in the West Midlands. This illustrates how much



**Figure SA-03.43 West Midlands heat pump growth**

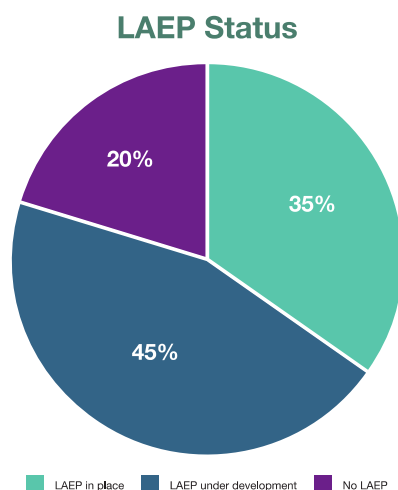
LCT uptake is expected to vary on a locational basis and how this will have a different effect on each electricity supply area.

- 14.30.** The analysis results in a report and an associated data set of scenario projections for each unique combination of technology, scenario, year and Electricity Supply Area. This data is available on the WPD website at: [www.westernpower.co.uk/distribution-future-energy-scenarios-map](http://www.westernpower.co.uk/distribution-future-energy-scenarios-map)
- 14.31.** The scenario projections for each technology are given in quantifiable units – i.e. a value that can be counted. Examples of this are MW of installed capacity (for generation and storage) and number of heat pumps and electric vehicles. Electrical behaviour assumptions are not included at this stage.
- 14.32.** The DFES is a key input to our continual assessment of the distribution network. The outputs from the DFES inform multiple business operations, including informing the electrical analysis underpinning our Shaping Subtransmission series of reports. We make this data available publically on our website through the DFES map ([www.westernpower.co.uk/distribution-future-energy-scenarios-application](http://www.westernpower.co.uk/distribution-future-energy-scenarios-application)) and also via our Connecteddata portal: <https://connecteddata.westernpower.co.uk>).

## Development of Local Area (LA) DFES

- 14.33.** As part of our extensive stakeholder engagement programme, we invited all 130 local authority stakeholders in our area to work with us to build a joined-up energy plan.
- 14.34.** We sought the following data from the local authorities:
- General data based around a local energy strategy, declaration of a climate emergency and setting a target date to reach net zero;
  - Availability and comparison of data sets;
  - Technology projections for electric vehicles, heat pumps, new industrial, commercial and domestic developments, generation including solar, wind and battery storage.
- 14.35.** As part of the interactions, WPD shared DFES projections which had the electricity supply area data in the WPD DFES analysis recut into each local authority area. WPD Distribution Managers from depots in the local areas held meetings with local authority energy representatives to review the assumptions and projections.

- 14.36.** This resulted in a range of responses, with some local authorities being more ambitious than the LA DFES and other local authorities finding the interaction helpful to assist them in formulating their LAEPs. The chart below shows the progress that local authorities are making in developing their LAEPs, with one third having established a LAEP, around half still developing their plans and a fifth with no plans under development. This is an evolving area and therefore it will be important to revisit this interaction to gain further knowledge about local energy plans.



**Figure SA-03.43 LAEP Status**

- 14.37.** The feedback from local authorities has been used to refine the allocation of growth projections across the WPD licence areas, which makes them more representative of local requirements and more certain that they will be required.
- 14.38.** It is proposed to continue the interaction with the local authorities on an annual basis to feed into the annual review of WPD DFES scenarios and also use this data to feed back regional information into the ESO FES process.

## Stage 2: Defining a single WPD Best View

- 14.39.** Having created a series of scenario projections, the next stage is to converge these into a single WPD 'Best View'.

### Determining a WPD Best View scenario

- 14.40.** To determine the WPD Best View, WPD uses an iterative process. DFES data and previous Best View is used to support stakeholder and local area engagement, which then allows the quality of Local Area Energy Plans to be assessed using criteria derived from Ofgem guidance to gauge the ambition, engagement and deliverability.
- 14.41.** The assessment is carried out by WPD's senior regional managers, scoring against the criteria matrix and a local area specific DFES scenario is selected.
- 14.42.** The DFES scenario is chosen by closely comparing the ambition of the planned volumes across all technology types within the area, and then further ranked on how close this ambition is likely to be to the needs of stakeholders (engagement completed), how accurate the modelling is and the capability of the area to deliver.

- 14.43.** A single DFES scenario is currently chosen to approximately represent all technologies, but there is scope in the future for differentiation between expected uptakes of technologies to be simultaneously assessed.
- 14.44.** This process enables these scenario volumes to be summated up to a licence area level, and checked against WPD strategic views of development to generate a new WPD Best View.
- 14.45.** Before the WPD Best View is finalised, the licence area totals are checked against national ambition to ensure WPD targets are aligned to deliver governmental policy. Scenario boundaries across the rankings may be moved to be more closely aligned, assuming incentives and policy are directed at achieving national net zero ambitions.
- 14.46.** Each primary substation also receives a disaggregation of this WPD Best View which is used to inform the growth rates required for investment across the network.

## Stage 3: Modelling expected behaviours

### Shaping Subtransmission reports

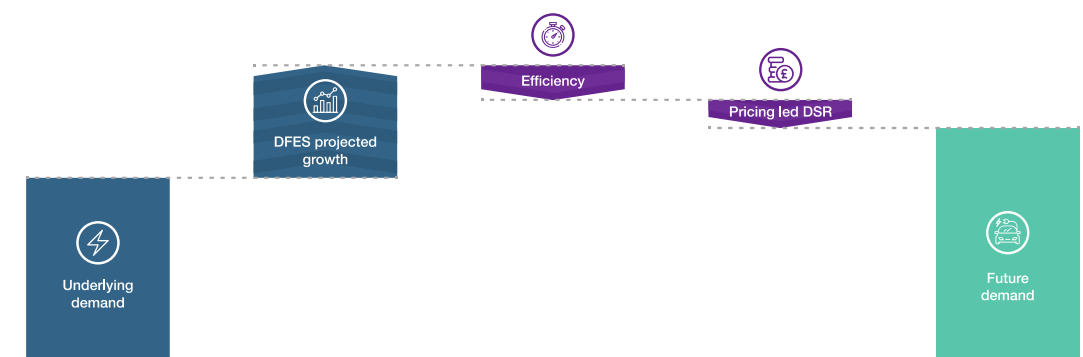
- 14.47.** This process considers the MW impact, the timing of the impact and diversity of the impact to identify where the growth will result in specific network constraints.
- 14.48.** As part of this process, we consider the impacts of various customer behaviours and responses to price signals (such a flexibility services). These are captured in our customer behaviour profiles and assumptions report. Through RIIO-ED2, we will look to strengthen our analytics process to better consider more complex behaviours.
- 14.49.** The output is published in Shaping Subtransmission reports for each of the four WPD licence areas.



- 14.50.** The constraints identified feed into WPD's longer term signposting process for identifying long term flexibility requirements.
- 14.51.** Different strategic investment options are considered to alleviate potential network constraints, which incorporates both flexibility service provision and conventional reinforcement.

## Using WPD's Best View for the RIIO-ED2 Business Plan

- 14.52.** WPD's Best View scenario is processed in a similar way to the Shaping Subtransmission process.
- 14.53.** The WPD Best View growth projections are tempered with extra characteristics that have been included to account for future changes in consumer behaviour.
- 14.54.** It is assumed that some of the projected growth will be offset by increases in efficiency. These will arise from a combination of a gradual decrease in the underlying demand and the assumption that new demand connecting to the network will be more efficient than the existing stock.
- 14.55.** There is also an allowance made for pricing-led Demand Side Response. This assumes that market-led price signals (not initiated by WPD) will be utilised to avoid electricity usage at times of demand peak.
- 14.56.** The forecast is determined using three components: WPD Best View projected growth driving demand up and efficiency and pricing-led DSR reducing the impact of the demand growth. The projections show that future demand will be higher than current demand.



**Figure SA-03.44 Components considered when calculating future demand**

- 14.57.** The results of this analysis are used to inform shorter term flexibility requirements in the forecasting process, used for flexibility procurement cycles and inform the projections of network reinforcement requirements for the RIIO-ED2 period in this Business Plan.

**14.58.** Figure SA-03.45 summarises some of the high level figures for WPD from the calculation of the WPD Best View for each licence area at the start (2023) and the end (2028) of RIIO-ED2.

WPD Best View 2023						
Technology	Units	WMID	EMID	SWALES	SWEST	WPD
<b>Solar generation</b>	GW (installed capacity)	0.971	1.922	0.772	1.676	5.342
<b>Onshore wind generation</b>		0.050	0.409	0.548	0.354	1.362
<b>Other distribution connected generation</b>		1.445	2.208	0.893	0.954	5.500
<b>Battery storage</b>	GW (installed capacity)	0.251	0.357	0.027	0.155	0.789
<b>Electric vehicles</b>	Number of vehicles	255,510	184,320	34,863	73,734	548,427
<b>Heat pumps</b>	Number of heat pumps	72,205	95,738	30,839	66,068	264,850

WPD Best View 2028						
Technology	Units	WMID	EMID	SWALES	SWEST	WPD
<b>Solar generation</b>	GW (installed capacity)	1.290	2.784	1.090	2.036	7.200
<b>Onshore wind generation</b>		0.050	0.414	0.587	0.407	1.458
<b>Other distribution connected generation</b>		1.505	2.353	0.944	1.074	5.876
<b>Battery storage</b>	GW (installed capacity)	0.347	0.430	0.065	0.223	1.065
<b>Electric vehicles</b>	Number of vehicles	859,665	739,693	168,661	318,053	2,078,872
<b>Heat pumps</b>	Number of heat pumps	248,492	352,980	109,712	181,870	893,054

**Figure SA-03.45 Expected LCT volumes in RIIO-ED2**

**14.59.** For RIIO-ED2, the data shows that there will be a significant growth in EVs, increasing from 550,000 to 2.1 million while the number of heat pumps is set to grow from 265,000 to 893,000.

## Network planning

**14.60.** During RIIO-ED1, WPD has established flexibility markets that provide an alternative means of addressing network constraints. These make use of new technology and the ability for some network users to provide flexibility in their own consumption either by increasing, reducing or shifting their net import or export.

**14.61.** This flexibility can be commercially controlled by WPD to:

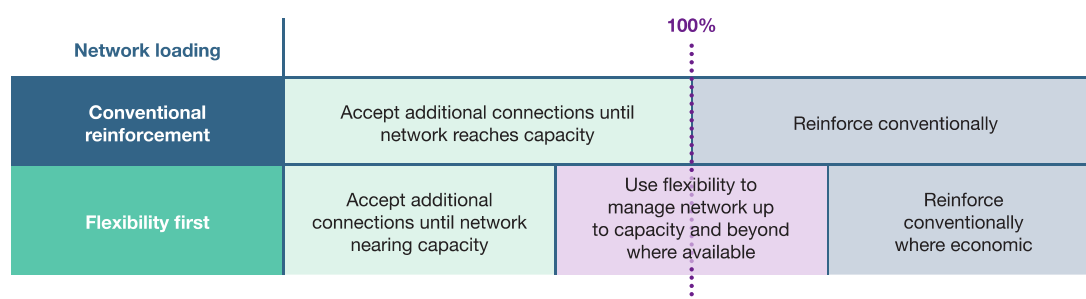
- offset the need for reinforcement;
- provide more capacity to other connections;
- improve network security or
- increase system operability.

**14.62.** When considering how to address a network constraint, WPD will consider whether flexibility provides a more economical solution. Adopting a 'flexibility first' approach will enable the network to develop efficiently and economically.



## Timing of investment and use of flexibility

- 14.63.** Ideally, the capacity of the network is increased once the network approaches its capacity limits, with work being started just ahead of need so that it is completed as the new capacity is required.
- 14.64.** Conventional reinforcement, using larger capacity assets, releases large blocks of capacity due to the discreet sizing of network upgrades. These large steps in additional capacity generally do not require further investment for a number of years resulting in longer term capacity availability. However, these large steps in capacity increases may be excessive for the anticipated future network requirements.
- 14.65.** Since conventional reinforcement can take a long time to deliver, this can cause problems and delays for customers who want to connect to heavily loaded parts of the network. They may have to wait until the network is reinforced until they can connect or accept a lower capacity connection.
- 14.66.** Flexibility can provide more granular network capacity increases, better matching the in-year requirements of network users. Flexibility has the potential to manage capacity shortfalls economically and responsively until the need for conventional reinforcement is more certain. In some circumstances, particularly where uncertainty is high, a greater period of operation of flexibility may allow for more optimal longer term investment plans to be implemented. Flexibility can also be used to allow new customers to connect to heavily loaded parts of the network without the need for reinforcement.
- 14.67.** While we will be making greater use of flexibility, we anticipate that there will be situations where it is necessary to carry out conventional network reinforcement. This will be where there is insufficient flexibility provision for the scale of network constraint.
- 14.68.** The figure SA-03.46 illustrates the different approaches that may arise.



**Figure SA-03.46 Approaches to using flexibility to improve network utilisation**

- 14.69.** Until distribution flexibility is sufficiently developed and ubiquitous enough to be relied on, the identification of flexibility provision needs to be carried out at an earlier stage compared to when conventional reinforcement work would start. This is to allow enough time to assess whether there is sufficient flexibility available and (in circumstances where it is not available) to give sufficient time to carry out the conventional reinforcement.
- 14.70.** WPD has an investment trigger for flexibility ahead of when conventional reinforcement would be undertaken. This ensures that the flexibility market is fully explored in advance of when conventional reinforcement needs to start. Generally, this will involve publishing flexibility requirements and investing in flexibility 12 months ahead of when a conventional investment decision would be made.

- 14.71.** At the time of reaching the decision for conventional reinforcement, further flexibility can be sought to determine whether the conventional reinforcement can be deferred or replaced completely by flexibility solutions.
- 14.72.** If, however, there is insufficient flexibility available in the market, the conventional reinforcement will need to take place.

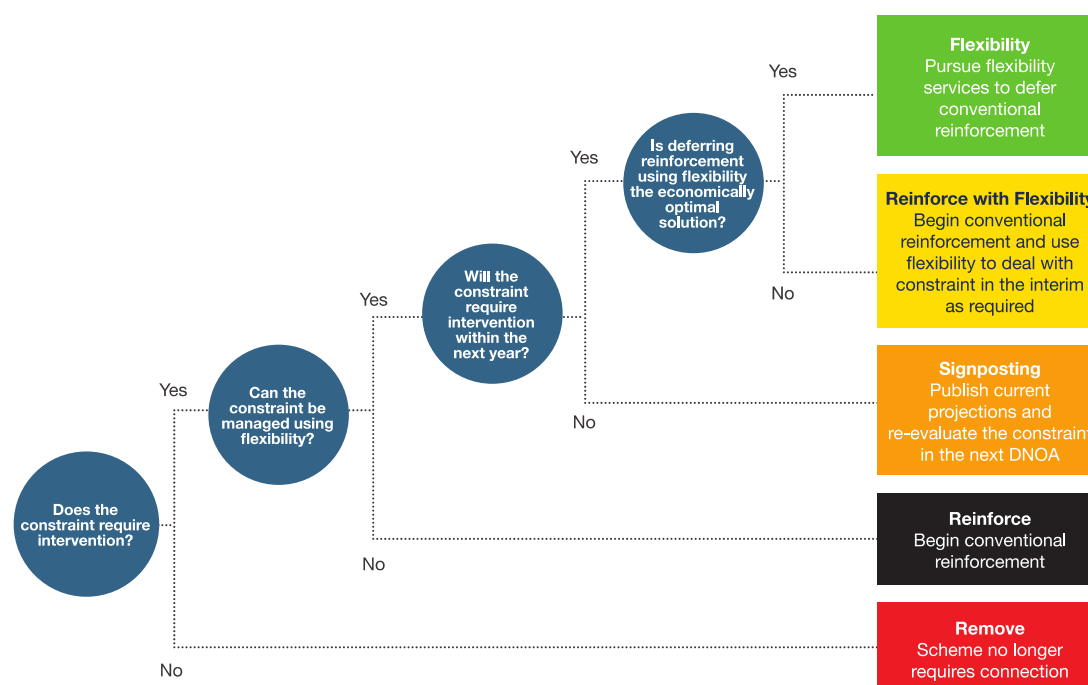
## Using flexibility to provide capacity for new connections

- 14.73.** As well as using flexibility to provide additional capacity to manage load related constraints, WPD has developed and trialled processes to use flexibility to provide additional capacity for new connections coming onto the network.
- 14.74.** In Constraint Management Zones, any flexibility that is provided from the market in excess of requirements to meet existing network constraints can be used to offer capacity for new connections. New connections that trigger the need for reinforcement will be offered the option of having a flexibility solution as an alternative to conventional reinforcement. Depending on the scale of requirement, this may allow more time for the construction of the conventional reinforcement, defer the conventional reinforcement or remove the need for conventional reinforcement. This will allow the connection to proceed more quickly and may reduce the costs for the connecting customer.
- 14.75.** WPD will take on the liability and costs associated with providing the network capacity by contracting with the flexibility provider, just as it does in the case of conventional reinforcement. This will provide confidence for the connecting customers that the network will be managed in a way that provides them with the power they require.
- 14.76.** Connecting customers will be offered two methods of paying for these costs: one option will be to pay the costs for flexibility and assets retrospectively on an annual basis; the other option will be to settle the costs upfront, based on WPD's Best View of the blend of flexibility and asset costs that will be required. The first option will be settled against actual costs incurred and will be subject to variations due to external factors such as the market cost of flexibility and deviations from assumed network loadings. The second option will be a fixed cost and benefit from a reduction due to NPV applied for future costs.
- 14.77.** Both of these options will allow the connection to be made without using Active Network Management and without any risk of curtailment and both will still have costs apportioned based on the network capacity. WPD will manage the constraints using flexibility and take on the risk and responsibility for doing so.
- 14.78.** These arrangements were piloted as part of WPD ICE plan in 2019 and the pilots have allowed the development of the commercial details.

## Distribution Network Options Analysis (DNOA)

- 14.79.** WPD's DNOA process (formerly the System Investment Assessment process) provides a systematic methodology to recommend a single investment option. We are the first DNO to have published a DNOA, demonstrating our commitment to providing transparency.
- 14.80.** Conventional network reinforcement typically requires a large upfront capital expenditure. For larger investments, which take a longer time to construct, the costs might be incurred across a number of years.
- 14.81.** Deferment of reinforcement by flexibility requires ongoing payments to flexibility providers to turn down/up import or export of power to allow other customers in the CMZ to have the power for their needs. Initially, flexibility costs may be small; however, as network requirements grow, more flexibility will need to be procured, resulting in flexibility costs rising year-on-year. Should changes in demand or generation reduce the network requirements, these flexibility costs may reduce.

- 14.82.** WPD compares the viability of the various options (Traditional Reinforcement, Innovative DNO solutions, and Service based solutions) against specific constraints by using the Common Evaluation Methodology (CEM) process, which has been developed under Open Networks. This process considers multiple factors including financial, social, losses, safety and carbon benefits to determine the right investment pathway.
- 14.83.** The decision tree below demonstrates the different choices our analysis can lead to. Firstly, the schemes that do not require any intervention are removed from future DNOAs. Where schemes require intervention but constraint cannot be managed using flexibility, reinforcement is pursued. If the constraint can be managed using flexibility but no intervention is required within the next year, signposting is published. The schemes which require flexibility services within the next year are put through cost benefit analysis to determine if flexibility can be used to defer reinforcement. This is further detailed in the latest DNOA document in [appendix A15](#).



**Figure SA-03.47 DNOA tree**

- 14.84.** The outcomes of the DNOA are published every six months to maximise transparency around our decision making. As part of this process, we collect feedback to allow us to refine the process going forward.

# Network operations

## Changes to network operations

- 14.85.** Traditionally, the operation of the distribution networks has been relatively passive. Power flows have been one directional from the transmission system to consumers. Network operation has mainly focused on responding to network faults and alarms, outage planning and coordinating access to the network for work activities. These functions will continue into the future.
- 14.86.** However, the growth in intermittent distributed generation and decarbonisation of transport and heat has led to reverse power flows, increased loads and greater need to redirect power flows away from heavily loaded parts of the network. This has resulted in implementation of Active Network Management for constraining new connections and evolution of flexibility markets, where capacity is provided by flexibility providers adjusting their demand or generation output.
- 14.87.** In addition, there are other drivers that call for optimisation of the network's operation. These include the need to manage voltages, losses and power factor that need increasingly sophisticated and smart ways of network operation.
- 14.88.** This requires new data and processes to analyse what is happening on the network and more active ways of managing constraints, such as processes for dispatching flexibility and greater coordination with the Electricity System Operator. The volumes of data will significantly increase which means that systems will need to be enhanced or developed to enable efficient and effective operation of the networks. The primary objectives of operating the network safely and maintaining network reliability will remain unchanged.

## Flexible connections and Flexible Power

- 14.89.** Traditional approaches to providing connections require customers to fund a proportion of the network reinforcement costs where additional network capacity is required. At higher voltages, this work may also take a number of years to deliver. For new connections, this poses delays and costs.
- 14.90.** WPD has developed a suite of flexible connections that offer the opportunity for the connection to be made at lower costs and with quicker timescales, recognising some form of curtailment may be required at times of high network loads.
- 14.91.** Our flexible connections suite has developed options in two areas for customers seeking to connect to the grid. A Timed connection offers a very simple way of acting flexibly, without the need for communications or monitoring. Timed connection customers schedule their load to avoid specific times. Load managed connections make use of ANM technology to control generation or demand behind single or more complex constraints. These are particularly useful in areas of constraint as an alternative to network reinforcement.
- 14.92.** Flexible Power solutions are contractual arrangements where customers with controllable demand or generation are able to provide services to help WPD manage the capacity of the network. They are used as a lower cost alternative to reinforcing the networks and the services are procured through a flexibility market.
- 14.93.** WPD has been pioneering the use of flexibility solutions during RIIO-ED1, learning from key innovation projects and deploying capability as part of our BAU process. We currently have over 700MW of flexibility services in contract and expect that these will be used increasingly as more demand connects to the network.
- 14.94.** SA-03.48 below highlights how capacities in contract have grown at each procurement round. The procurement has now impacted over £140 million of reinforcement.

Procurement Cycle	Primaries Covered	MW for Procurement	MW operational without additional procurement	Flexibility Contracted (MW Total) *excluding restore
2018	18	63	0	35.3
2019 H1	80	93	0	56.8
2019 H2	120	184	0	123.1
2020 H1	175	334	0	217.7
2020 H2	256	304	73	439.8
2021 H1	305	239	211	456.5
2021 H2	320	258	211	708.9

**Figure SA-03.48 Growth of flexibility**

- 14.95.** We have also worked extensively with the other DNOs to share the learning from our experience of operating flexibility services. As part of this process, and to increase industry standardisation, we have opened up our Flexible Power brand and processes. We are now actively collaborating with four other DNOs to deploy a more common approach to the procurement and operation of flexibility services.
- 14.96.** There are three types of flexibility services that we currently use:
- Secure – used to proactively manage peak demand
  - Dynamic – used to support the network in case of a coincident fault during network maintenance
  - Restore – used to reduce the stress on the network during fault situations, with flexibility providers responding within 15 minute
  - We do not currently procure the fourth Open Networks Service: Sustain, however our Flexibility Services Evolution paper ([A24](#)) sets out how we will be rolling this out.
- 14.97.** The existing IT platform used to assess the requirements for flexibility, manage the dispatch and make payments for the flexibility provided has limited capacity and a more enduring solution is required to ensure that flexibility can be used to a greater extent.
- 14.98.** We apply clear distinctions between the application of flexible connections and flexibility services. The first involves participants accepting restricted access to the network to accelerate or reduce the costs of connection. Technical systems are implemented to manage that access, with various levels of sophistication. In contrast, flexibility services involve participants reducing their output to below that specified in their access rights to benefit the wider network. These are services that are paid for by the beneficiary (generally the network, but can be used for new customer connection). These distinctions will be reviewed in line with the outcomes of the Access and Forward Looking Charges Significant Code Review.
- 14.99.** As flexibility becomes more critical to the running of the network it will become necessary to better integrate flexibility with existing operations teams. In order to deliver this efficiently while

also minimising perceived conflicts of interest it is proposed that this is best achieved by the creation of an Energy Management Centre (EMC). The EMC's primary responsibilities will be to:

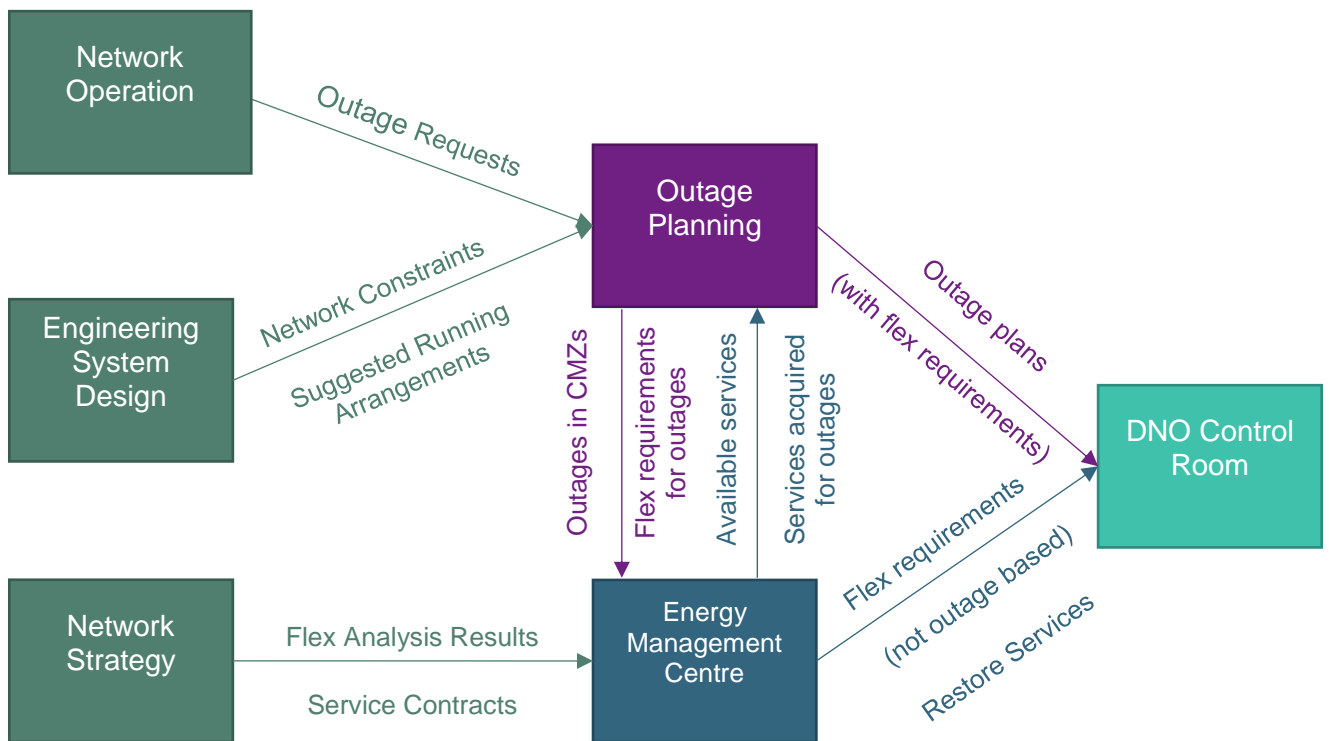
- 14.100.** Review predicted network loading within operational timescales and identify whether these can be accommodated by the existing network passively or if there is a requirement for flexibility (services or other smart grid solutions)
- 14.101.** Where there is a need for flexibility, review what is the most efficient and economical solution, following a clear and transparent decision making process
- 14.102.** Acquire and schedule the required services / smart grid solutions for planned network running arrangements and prepare appropriate contingency options for Network Control to dispatch if required.

## **Independence of decisions and openness of data**

- 14.103.** Within planning timescales, independence of decision making is ensured with the Distribution System Operator reviewing emerging constraints and assessing whether it is more efficient and economical to utilise flexibility or a new asset to manage the constraint through the use of industry tools such as the CEM and publications such as DNOA.
- 14.104.** Where the decision is made to address the issue via the use of flexibility services there will also then be a need to choose which service provider(s) should provide the required services. In order to avoid the potential for conflicts of interest to occur it is proposed that, following the precedent set at the design phase, the decision as to how to manage the constraint should sit with the Distribution System Operator side of the business. This approach will also mean that the decisions of which service providers to choose where multiple options are available is always managed by the DSO, this will make it easier to develop a single, justifiable method for selection of service provider.
- 14.105.** The EMC will be responsible for running these processes aligned to dispatch principles. WPD has already published dispatch principles on its Flexible Power site and through RIIO-ED2, will be developing the data systems and processes to undertake automated real-time decisions for operational purposes. These can be found in [appendix A16](#) - Acceptance and Dispatch Principles.
- 14.106.** This approach should neatly build on the existing operational processes currently in use in DNO control rooms and will minimise the additional training and workload required. The DNO Control Engineer's focus remains on the technical requirements of operating the network, in a safe and secure manner, without the need to take on commercial decision making as well. This will prove particularly useful during periods of high network activity, such as a storm, where existing Control Engineer focus must remain on safety and customer restoration.
- 14.107.** Separation of the responsibility for selection of services will streamline the processes so that during high levels of activity on the network, opportunities to use new flexibility services are able to be integrated without impacting on restoration times.



**14.108.** Figure SA-03.49 below shows how the proposed Energy Management Centre will fit into the existing processes for network operations:



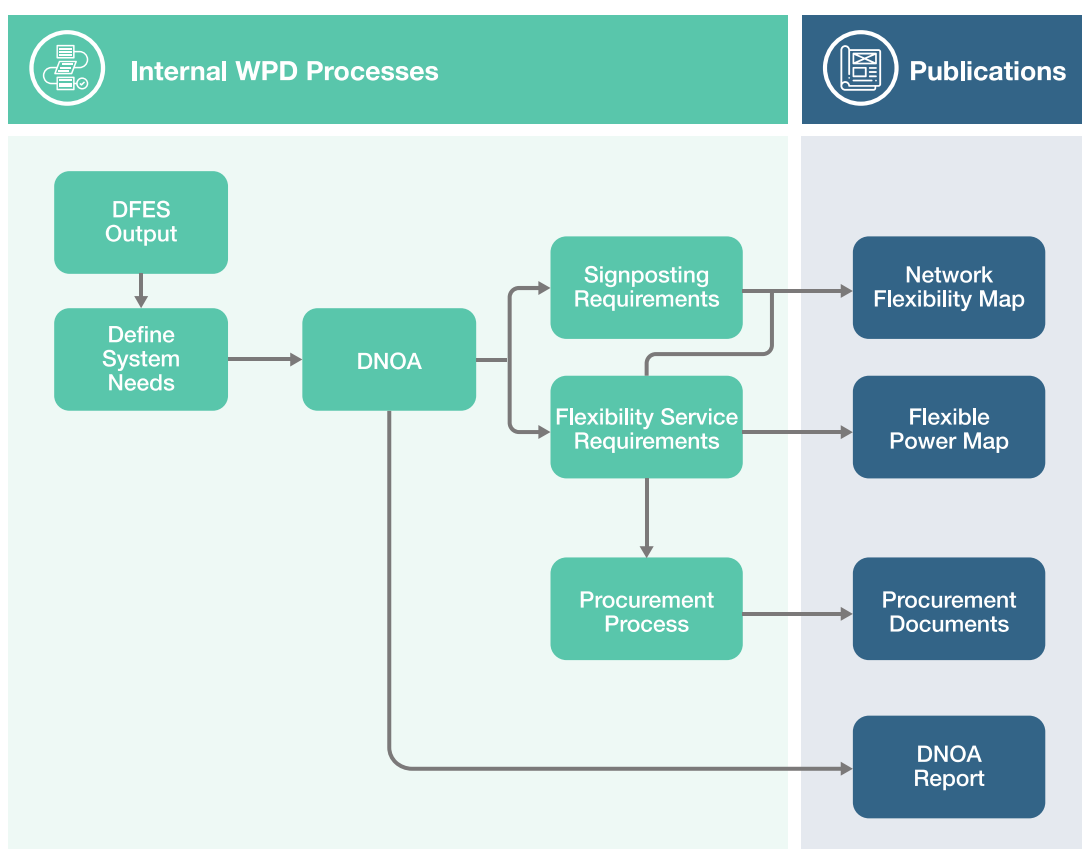
**Figure SA-03.49 Energy Management Centre**

## Market development

### Providing market information for flexibility services

- 14.109.** WPD recognises that, across the distribution network, there are many electricity consumers who have the potential to shift their demand, by amending when they use power, or adjusting their export from onsite generation.
- 14.110.** The flexibility market allows these customers to earn a financial payment for the provision of specified flexibility services.
- 14.111.** The type and amount of service required is dependent upon the nature and scale of a constraint on the network, which could be as a result of increased loads at certain points in time. Across the portfolio of zones, we have requirements in every month in the year, every day of the week and all half hours for some days. We acknowledge the requirement for comprehensive market information on our detailed procurement needs for each zone and therefore have created a suite of information to communicate our latest needs to the market. These include:
- Network Flexibility Map (<https://www.westernpower.co.uk/network-flexibility-map-application>): We publish comprehensive data on signposting and forecasting through our Network Flexibility Map. This includes the availability windows and expected market volumes required for all our Distribution Future Energy Scenarios (DFES) for a five year period under the signposting process. Visualisations of the data are available online through the mapping tool and data sets are downloadable without registration. The Network Flexibility Map also presents our firm flexibility requirements which feed into our procurement process. This shorter term view gives clarity on our needs and is refreshed every six months in line with our procurement timeline.
  - Flexible Power Map (<https://www.flexiblepower.co.uk/map-application>): The Flexible Power Map replicates much of the functionality of the Network Flexibility Map but focusses on the requirements against which we will procure. It highlights the required volumes and forecast availability windows. This map is held on the Flexible Power website and hosts data from the other DNOs which are also involved in the Flexible Power Collaboration.
  - Procurement documents (see latest here: <https://www.flexiblepower.co.uk/downloads/426>): For every six monthly cycle of procurement, we publish market information detailing the requirements for procurement at each of the CMZs. This includes information such as the MW required, expected MWh availability windows and MWh estimated utilisation volumes. More information can be found in [appendix A17](#) – Procurement timetable and [appendix A18](#) – Flexibility tender results.
  - Distribution Networks Options Assessment (DNOA) (<https://www.westernpower.co.uk/DNOA>): Our DNOA process provides a systematic methodology to recommend a single investment option for potential constraints. (See section 5.1). As part of the DNOA process, we publish the outcomes of our assessment on a six monthly basis. This highlights why we have gone out to procurement for each zone.

**14.112.** These publications link together as shown in the figure SA-03.50 below:



**Figure SA-03.50 Processes and publications**

**14.113.** Since 2018, we have published a procurement cycle results document within one month of contract award (see example here: <https://www.flexiblepower.co.uk/downloads/582>), summarising the various stages and results of the tendering process. As the tendering process has developed, more information has been published. Going forward, we expect to publish:

- Volumes of flexibility coming through all stages of the procurement process
- The counterparty, technology type, MW capacity, length of contract, payment structure and price agreed for each contracted party
- A summary of the outcomes per CMZ. This includes the volumes required, the number of bids received, the MW awarded and the zone price.

**14.114.** We are committed to engaging regularly with our stakeholders to ensure that the information provided can be as useful as possible. This is evidenced in our expanded and comprehensive engagement details as set out in our C31E statement - Distribution flexibility services procurement statement (C31E) – [appendix A19](#).

## Forecasting

- 14.115.** Forecasting is a more accurate single-scenario view of the constraint on the network across a two-year window. It explicitly states WPD's flexibility requirements and is used to advise what flexibility is being sought during procurement cycles.
- 14.116.** Like signposting, forecasting also describes the amount of flexibility required and specifies the availability window (i.e. when the flexibility is required), but over a shorter, more defined timescale.
- 14.117.** By defining requirements in a neutral way, forecasting data enables flexibility providers to respond to flexibility tenders and, as it is openly available, allows different providers to have the same opportunity to participate in the market.

## Accessibility to markets

- 14.118.** WPD expects that flexibility services will be provided by many different market participants including demand response aggregators, electricity suppliers, generation operators, battery operators, industrial and commercial customers, local authorities, community groups and electric vehicle charging operators.
- 14.119.** Because we recognise that each of these participants may wish to provide services to WPD through a variety of routes, we have established access through a number of channels and continue to investigate options for third parties to support the development of processes and functions.



The Flexible Power brand has been created by WPD to deliver the procurement of demand response services. It acts as our customer facing brand when seeking flexibility services and is implemented consistently across all four of our licence areas. As well as providing visibility and enabling routes to participation, Flexible Power also encompasses our flexibility participant portal and electronic dispatch, monitoring and settlement services.



Piclo has developed and trialled the UK's first GB wide flexibility marketplace, supported by funding from BEIS Energy Entrepreneurs Fund. WPD has displayed its flexibility requirements on the Piclo platform since November 2018. Flexibility providers with matching assets in WPD Constraint Management Zones are directed to WPD's Flexible Power site to enter procurement.



At a more local level, since July 2017, WPD has partnered on Centrica's Cornwall Local Energy Market (LEM) project, which is developing a virtual marketplace for flexibility services across the Cornwall region. The Cornwall LEM project is targeting both business and residential customers and is providing new technology solutions to enable flexibility and help unlock new revenue streams for customers.

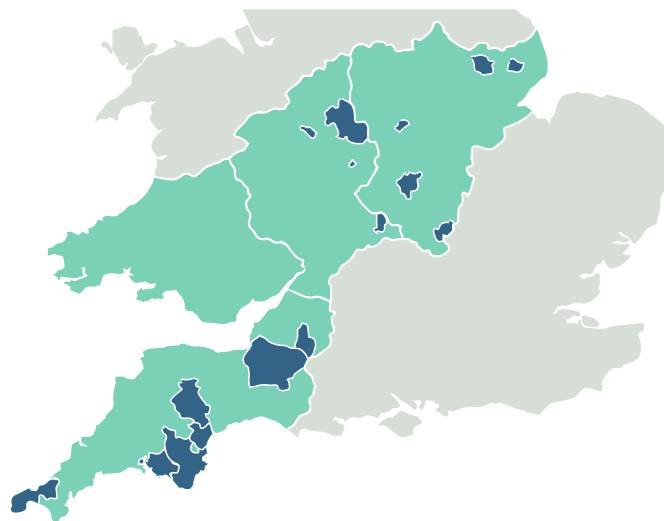
**Figure SA-03.51 Channels to access flexibility**

**14.120.** WPD's Flexible Power website provides a map of the CMZ's location, a postcode finder to allow potential suppliers to confirm their site is within the CMZ and the operational window the demand response will be required in.

**14.121.** The operational window details the time of day, day of week and month of year, MW change required and a forecast of the total MWhs. Operational windows will generally be seasonal to support the constraints within the summer and winter demand peaks.

**14.122.** To ensure that WPD is able to stimulate market participation through multiple routes, we are enhancing Flexible Power to provide better market integration. These actions are going to be completed during RIIO-ED1 and include:

- Availability of geographic and postcode information for platforms to pre-qualify and validate flexibility assets (Q1 2021)
- Standardisation of visibility and forecasting data for hosting on flexibility platforms (implemented)
- Improved sources of data for asset qualification – e.g. linking MPAN to constraint managed zones (Q1 2021)



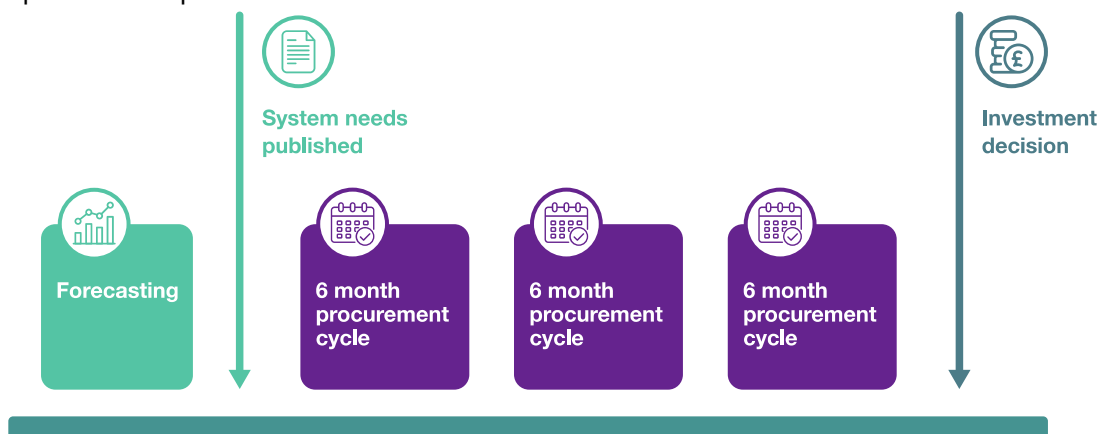
**Figure SA-03.52 CMZ map**

**14.123.** As third party platforms emerge and mature, we will aim to promote competition and coordination across these.

## Procurement process for flexibility services

### Procurement cycles

**14.124.** Since 2019, WPD has been operating a multiple cycle approach to procuring flexibility. After specific requirements have been identified through the forecasting process, there are typically three six monthly procurement cycles. This approach allows WPD to test the market every six months, enabling more participants to be involved in the provision of flexibility and refinement of flexibility requirements. This means that WPD contracts with flexibility services in three tranches between six and 18 months ahead of need. See [appendix A20](#) – Flexibility service procurement process for more details.



**Figure SA-03.53 Timetable for providing visibility of flexibility services requirements**

## Procurement qualification

- 14.125.** Potential suppliers of flexibility need to undergo a registration process but, once registered, the suppliers are invited to consider providing services at each procurement cycle, without further requirement to register.

## Technical requirements for participation

- 14.126.** In order to be able to provide flexibility services, there are some technical requirements that need to be met. These include the ability to provide minute by minute metering, integration of systems through an Application Protocol Interface (API) and ability to dispatch when instructed. The API is software based and can be set up in-house by the majority of participants without the requirement for any proprietary or specialist hardware.
- 14.127.** WPD seeks flexibility from a wide range of providers and has not set a contractual minimum limit for participation. Removing the potential barrier of a commercial minimum allows direct participation for a larger range of participants, including those connected at lower voltages. However, as there are a number of technical requirements, the route for the coordination of portfolios of smaller market participants is expected to be through aggregators.
- 14.128.** While some larger market participants will contract directly with WPD, aggregators can offer an important alternative route to market. Aggregators act as coordinators of services and enable participants to stack revenues for providing different types of service. They can use their expertise to allow more flexibility providers to participate in the market. We proactively partner with aggregators and advertise these Service Partners on our website to accelerate participation more details are found in [appendix A21](#) – Service Partner Agreement and Guidelines.

## Pricing structures

- 14.129.** Since 2019, WPD has been operating a pricing structure (see figure SA-03.54) that is dependent on the level of competition revealed through the procurement process. Each Constraint Management Zone (CMZ) is assessed independently because the number of flexibility providers and scale of flexibility provision varies. WPD has established a three phase strategy, with each phase reflecting the maturity of the market. The prices paid are based upon the availability of flexibility in each CMZ. This starts with fixed pricing for non-competitive markets, pay-as-clear arrangements for markets with some competition and excess of suppliers, with shorter term contract pricing for fully mature and liquid markets. More information can be found in [appendix A22](#) - Pricing strategy.

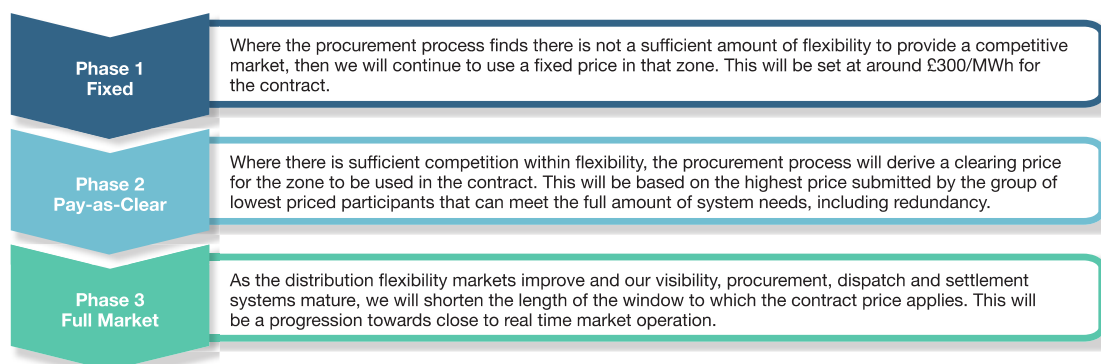


Figure SA-03.54 WPD pricing strategy

- 14.130.** Since the markets are at an early stage of development during RIIO-ED1, we expect most CMZs to be based upon a fixed price basis in the short term. However, as flexibility provision and competition grows in a CMZ, we will move towards the Phase 2 stage. More information on the Clearing Process can be found in [appendix A23](#) – Clearing process.

## Specified flexibility services

- 14.131.** WPD has developed three DSR services that each address different requirements on the distribution network. These services are: Secure, Dynamic and Restore. These have been adopted as industry standard services under Open Networks, as well as an additional Sustain service.
- 14.132.** WPD will continue to assess the requirements for new services and market timeframes, both through our innovation work and standard market development. If a new service is needed, we will follow the new product process developed by the Open Networks project, as well as our own process for engaging with stakeholders as defined in our Distribution Flexibility Services Procurement Statement.

## Sustain

- 14.133.** The Sustain service is under trial within the WPD region, specifically targeting domestic users who are able to adjust their consumption behaviour to set windows across the year. Successful delivery of this adjusted energy profile is financially rewarded.
- 14.134.** Sustain services are forecasted many months ahead of operation and provide a simple, contractual method of self-dispatch to allow domestic participation.
- 14.135.** Further trials are currently underway through WPD's FutureFlex innovation project to bring this product to a wider audience, as we have done with our main flexibility services.

## Secure

- 14.136.** The Secure service is used to manage peak demand loading on the network and pre-emptively reduce network loading. As these requirements are predictable, payments consist of an Arming fee which is credited when the service is scheduled (irrespective of whether it is used) and a further Utilisation payment awarded on delivery (related to the amount of flexibility provided).
- 14.137.** Secure service requirements are declared in advance for the following week. The week-ahead declarations are scheduled to allow providers to participate in alternative services when not required for the Secure service.

## Dynamic

- 14.138.** The Dynamic service has been developed to support the network in the event of specific fault conditions, often coincident with other outages for maintenance work.
- 14.139.** As the service is required following a network fault, it consists of an availability fee and utilisation fee. By accepting an availability fee, participants are expected to be ready to respond to utilisation calls within 15 minutes. Utilisation under the Dynamic service is usually expected to be of a longer duration compared to the pre-emptive Secure service.
- 14.140.** Dynamic availability windows are also declared in advance for the following week.



## Restore

- 14.141.** The Restore service is intended to help with restoration following rare network fault conditions. Under such circumstances, the Restore service can be used to reduce the stress on the network.
- 14.142.** As the requirement is inherently unpredictable, Restore is based on a premium 'utilisation only' fee. This will reward response that aids network restoration, but will pay no arming or availability fees. Participants who are declared available for the Restore service will be expected to respond to any utilisation calls within 15 minutes and will receive an associated utilisation fee.

## Tendering and payments for services

- 14.143.** During the procurement process, the flexibility provider must submit a preferred price for providing flexibility, as well as confirming that the fixed price basis (phase 1) is acceptable.
- 14.144.** The preferred price is a single total price for a MWh of both arming/availability (i.e. being able to provide flexibility) and utilisation (i.e. providing the flexibility). The preferred price can be higher or lower than the fixed price.
- 14.145.** Comprehensive details about pricing and payments are available in the WPD publication CMZ Payment Mechanism and Contract Assistance Notes.

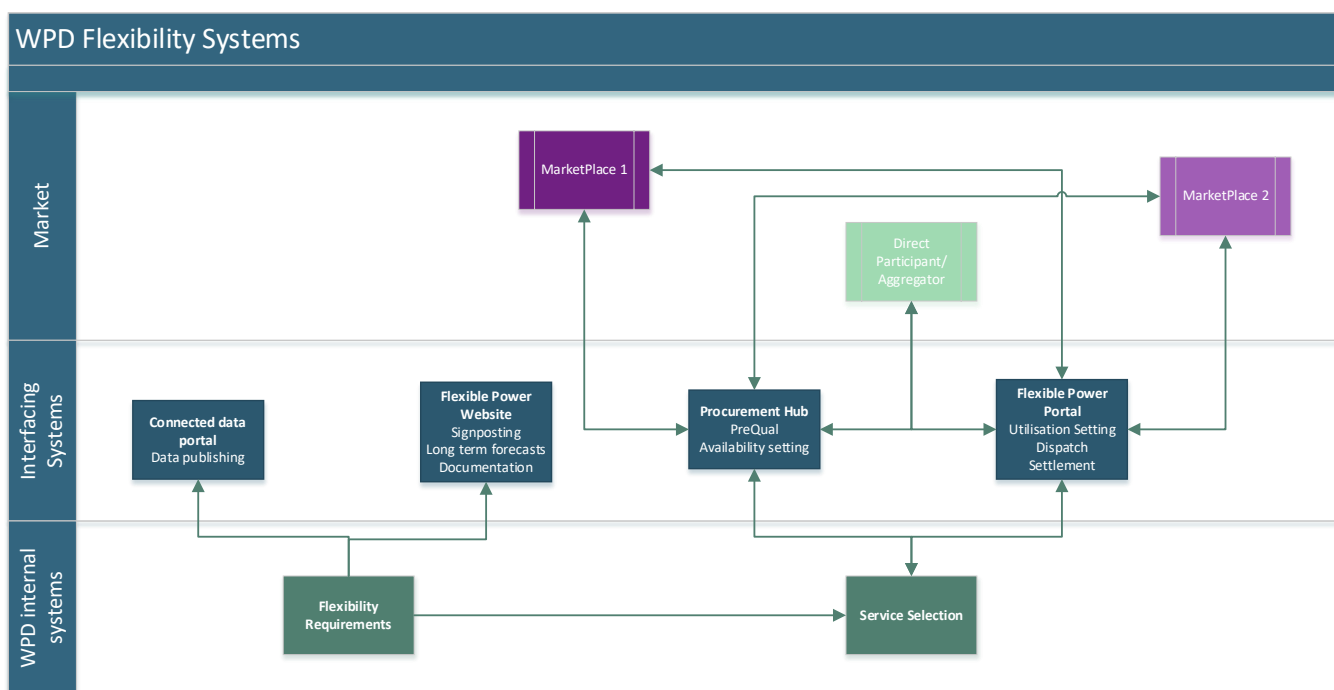
## Contractual terms

- 14.146.** All of the contract terms are available to view on WPD's Flexible Power website.
- 14.147.** WPD has worked collaboratively with the industry to develop a common set of terms and conditions and was the first DNO to adopt them. These have been written to provide low barriers of entry, maximise participation and reduce complexity. These have been informed by stakeholder feedback, are subject to continued review and include:
- Mutual and capped liabilities
  - Performance-based payment mechanisms to incentivise participation
  - No penalties for non-delivery, only loss of potential revenue
  - No exclusivity clauses
  - No obligation to provide availability
- 14.148.** WPD's contracts do not have any exclusivity, maximising the ability for a flexibility provider to increase revenue stacking opportunities by providing services to other parties.
- 14.149.** The products WPD is offering are designed to be stackable with other revenue streams and are particularly complementary with the ESO's Reserve products.
- 14.150.** The products being offered are also aligned with other distribution system operators' flexibility services and use the common terminology developed under ENA's Open Networks project.
- 14.151.** Following feedback from flexibility providers, we have altered our contractual length to give better certainty for market participants. Since 2019, we have been allowing flexibility providers to choose their optimum contract length, from between one and four years. We will continue to review the contract lengths to optimise benefits for participants and the DNO.

## Product and Process Evolution

- 14.152.** In our latest Evolution of Distribution Flexibility Services Procurement Document ([appendix A24](#)) we set out how we intend for our products, processes and data exchanges are expected to develop over the next 12 months.

- 14.153.** This includes adding further long term products, alongside clarification of our existing shorter term products and real-time opportunities through innovation projects. We have introduced our expectations of how we will introduce competition between longer term, shorter term and real-time markets, setting out a framework for how we will spread value across these different markets.
- 14.154.** We are also going to change the way we procure and contract flexibility from flexibility service providers, instead moving towards a framework-style arrangement and standardising the qualification process so that this can be digitised and undertaken by third parties.
- 14.155.** In the paper we have also set out how we are digitising our processes to expedite integration between different marketplaces, such as how is set out in the figure SA-03.55 below:



**Figure SA-03.55 Flexibility systems**

- 14.156.** New systems, such as our procurement hub, and new interface APIs will allow standardised data to be exchanged and processes to be automated to allow machine-to-machine interaction for much of our flexibility procurement process. This will better enable closer to real-time operation, which relies on much faster processes and automation.

## Operating process

- 14.157.** Once flexibility providers accept contracts and establish the API interface, they are available for providing flexibility services. They get paid when they participate and declare availability and when they respond with sufficient change in their demand or generation when utilisation is required.

## Dispatching flexibility

- 14.158.** WPD recognises that being transparent about how flexibility is dispatched is important to market participants to enable them to understand how to maximise returns and maximise liquidity across markets.
- 14.159.** Where competitive markets have developed, resulting in multiple flexibility providers being able to provide flexibility (as per Phase 2 or Phase 3 pricing), WPD needs to select the priority order on which flexibility assets are accepted and dispatched first.
- 14.160.** The approach to dispatching is published on the WPD Flexible Power website. It is based on the Open Networks standard dispatch principles of Security, Cost and Operability and will evolve as our operational experience grows.
- 14.161.** Being transparent about the rules by which WPD will dispatch flexibility allows flexibility providers to consider what service they provide and how they make these available.
- 14.162.** In the future, as the market grows and matures towards full market-led pricing, then pricing submitted for each flexibility asset will become the dominant factor for consideration.
- 14.163.** In order to maximise the value to the whole system and ensure we coordinate with the ESO, we will adopt the Open Networks Primacy rules once developed. Our RDP is feeding into this work, aiming to develop the deployment of robust information sharing, as well as to provide a use case for initial testing.

## Reporting of flexibility procurement/ utilisation data

- 14.164.** Through WPD's Network Flexibility Map, raw data on signposting and forecasting data is published. This includes the availability windows and expected market volumes required for all the DFES scenarios for a five year window. Visualisations of the data are available online through the mapping tool, and the geographic shape file data set is also downloadable without registration.
- 14.165.** Every six months, our procurement market data is refreshed, replacing the raw data on the mapping visualisation. Summary PDFs are also available for download.
- 14.166.** For every six monthly cycle of procurement, market information is published which details the requirements for procurement at each of the Constraint Managed Zones, such as MW required, MWh availability windows expected and MWh utilisation volumes estimated.
- 14.167.** A value calculation tool is available on the Flexible Power website to aid participants to understand potential revenue values.

**14.168.** Since 2018, within one month of contract award, WPD has published a procurement cycle results document, summarising the various stages and results of the tendering process. As the maturity in the tendering process has developed, more information has been published, including:

- Volumes of flexibility coming through the ITT stage
- MW capacity and technology of assets being awarded contracts per CMZ
- Pricing data bid in to the procurement process
- Prices of flexibility awarded in each CMZ

**14.169.** Annually, WPD also provides a summary of flexibility statistics across its operations, which aggregates the volumes of flexibility dispatched and costs associated with operating flexibility through the year.

**14.170.** A value calculation tool is available on the Flexible Power website to help participants understand potential revenue values.

## Secondary trading of flexibility contracts

**14.171.** The current arrangements for flexibility are bi-lateral contracts between WPD and third party flexibility providers.

**14.172.** All WPD flexibility contracts are aligned to the latest version (at the time of contract award) of the Open Networks common contract ensuring consistency of terms – see [appendix A25](#) – Standard Flexibility Agreement. The Open Networks common contract does not prohibit the transfer of contracts, but does require permission from WPD to permit the transfer.

**14.173.** The standardisation of DSO products and flexibility contract terms now in place act as enablers for flexibility contracts to be traded on a peer to peer basis.

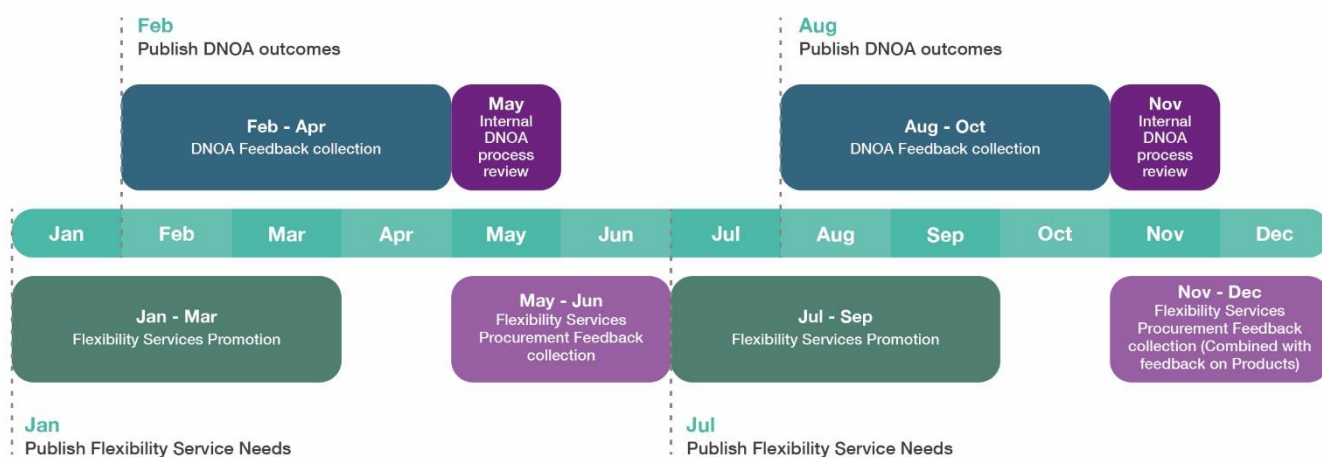
**14.174.** Standardisation of pre-qualification processes, as well as other enabling data sets, will support multiple routes to assisting the trading of flexibility contracts. WPD will work within Open Networks to ensure any learning is adopted across the industry.

**14.175.** During RIIO-ED2, WPD will work with flexibility providers, market operators and platforms to develop practices and systems that allow the secondary trading of flexibility contracts. This will include standard contractual agreements between parties, analysis methods for assessing tradability, monitoring systems for compliance and data systems for providing commercial visibility.

**14.176.** In our latest Flexibility Product Evolution Paper ([A24](#)) we set out how secondary trading will be facilitated in detail, with a view to informally consult ahead of a more formal consultation early next year. The paper sets out the proposed processes and data flows which we are looking to implement to best enable secondary trading ahead of RIIO-ED2.

## Engagement around flexibility requirements

- 14.177.** WPD operates two procurement cycles a year. These are surrounded by a mix of promotional activities to maximise participation, as well as feedback processes to allow us to continually improve our processes.
- 14.178.** The publication of our requirements are accompanied by promotion to increase market awareness and drive participation. This includes webinars and surgeries, one to one engagement and the attendance of relevant events. This targets a wide range of stakeholders to ensure all relevant parties are aware of the opportunity.
- 14.179.** Once procurement has been completed, we then focus on collecting feedback on how we could improve how we publish requirements and the Distribution Network Options Assessment (DNOA) process. The associated timings are covered below in figure SA-03.56.



**Figure SA-03.56** Timeline for our engagement around flexibility requirements

## Engagement about products and process

**14.180.** In addition to what we procure, we also seek stakeholder feedback on how we procure services. We aim to target key stakeholders including those who have been involved in various elements of the process as well as wider industry stakeholders, including the ESO and other DNOs. As well as ad hoc feedback we see two key processes;

- Our work as part of the Open Networks project we collaborate with the other DNOs to deliver more standardised processes for procurement. As part of the WS1A process, a formal consultation is conducted in July. We used this feedback to inform ON work as well as WPD internal process.
- As part of the development of future Distribution Flexibility Statements, we will create a formal process to feedback on WPD process. Informal discussions will be carried out alongside the collection of feedback following the 2nd yearly procurement. This will be used to help us assess changes needed to the statement. These will feed into a formal consultation we aim to run in January and February.



**Figure SA-03.57 Timeline for engagement around products and processes**

**14.181.** In addition to these two formal routes. We collect ad-hoc feedback which is fed into the relevant processes. Stakeholder engagement is also a key part of any new service development work

## Engagement with ESOs, DNOs and iDNOs

**14.182.** We recognise that WPD is one actor amongst many in an ever more complex energy market place. As such, in addition to our wider engagement, we endeavour to engage heavily with the other network licensees.

**14.183.** A key part of this is through our active involvement at the Energy Network Association, especially the Open Networks project, where we work with the other licensees to develop and adopt common approaches across a range of DSO related activities. Workstream 1A is focussed on the development of Flexibility Services. Its key objectives include:

- Bringing more transparency in how DNOs facilitate local markets for flexibility and make decisions to provide more confidence in independent decision making.
- Simplifying participation in local flexibility markets through standardisation of approaches across DNOs and between DNOs and the ESO.
- Addressing barriers to participation in flexibility markets and facilitate stacking of revenues across multiple markets.

**14.184.** In addition we engage actively with other licensees directly when needed. Examples of this include:

- Our collaboration with the ESO and other relevant DNOs on the Regional Development Programmes (RDPs). The RDPs look across the whole-system landscape to identify key areas of development to unlock additional network capacity, reduce constraints and open up new revenue streams for market FSPs. Building on the work of Open Networks we are developing flexibility markets to manage distribution and transmission system needs.
- By opening up our Flexible Power brand and processes to other DNOs we have looked to increase alignment and collaboration within the industry. The collaboration will help streamline the process for flexibility providers and make interfacing with DNOs simpler and easier by avoiding the complexities and resource intensity associated with liaising with numerous network operators. We intend to work in partnership to further develop the Flexible Power brand and develop the portal functionality to enable interface capability with other flexibility platforms so wider market participation options can increasingly be made available to providers.

## Engagement with stakeholders as part of RIIO-ED2 planning

**14.185.** Within our RIIO-ED2 business planning process, we have engaged with a full spectrum of stakeholders including major energy users. Research has been completed with bill paying users to understanding the willingness to pay for developments.

**14.186.** Our engagement process has started with a blank piece of paper, fluidly allowing co-creation of outcomes, which we've then checked back with those stakeholders to ensure we've heard correctly and interpreted the right outcomes.

**14.187.** The process has allowed us to calibrate the level of ambition and scope and enabled us to refine commitments – which we've taken forward within our RIIO-ED2 plans. This is fully detailed within SA-05 Giving customers a stronger voice: Enhanced Engagement our business plan.

## Governance arrangements

### WPD's track record for acting as a neutral market facilitator in competition in connection

**14.188.** WPD has a track record of working with alternative providers of services, as demonstrated by the way in which we have provided information and support for Independent Connection Providers (ICPs) and Independent Distribution Network Operators (IDNOs) to increase competition in connection.

**14.189.** Throughout the DPCR5 and RIIO-ED1 periods, there were significant changes in the way that connections activity was delivered to customers. The growth in the number of ICPs/IDNOs and the scope of works they could undertake meant that ICPs/IDNOs became established alternatives for the provision of new connections.

**14.190.** One of main areas of change that increased the capability of ICPs/IDNOs was access to network data to allow them to complete their own design work. This was data that WPD owned and, in order to facilitate greater competition in connections, was made available to ICPs/IDNOs in the same way as it is made available for our own staff. All network planners, regardless of their company, have equal access to our data ensuring that we facilitate a neutral connections market.



- 14.191.** We also worked with ICPs/IDNOs to extend the operational activities which they could carry out. In this area, WPD's network access and safety permitting systems were extended to allow ICP/IDNO operations staff access to the network on equal terms to WPD operations staff.
- 14.192.** We also worked with the other DNOs to establish common industry standards so that ICPs and IDNOs working across DNO boundaries operate in a coordinated way with the same base procedures.
- 14.193.** Our cooperation with ICPs/IDNOs in developing a competitive connections market demonstrates that we can act as a neutral facilitator and support the development of alternative ways of delivering work.

## **How we are addressing conflicts of interest and segregation safeguards.**

- 14.194.** As a regulated business with no interests in UK generation or supply, WPD views the facilitation of our customers into these neutral markets as a natural extension of our current role in managing the power across our distribution networks. We are uniquely placed to ensure simple and consistent access to new markets for our active customers by maximising the utilisation of our existing electrical and communication networks. We are also able to use the flexibility inherent in our network to ensure all customers benefit, both by receiving a resilient and secure supply and through cost effective delivery.
- 14.195.** We do not offer a direct route to our systems; all our control instructions are via API links to third party platform providers and aggregators. We actively encourage the emergence of this sector and will continue to offer 'plug-in' solutions to remain neutral in the market. All WPD's procurement data and system need information is downloadable and processable by third parties. We have previously used CLEM, NODES and PICLO for procurement routes.
- 14.196.** Throughout all of our work to support DSO services, we must show neutrality and ensure that actual and perceived conflicts can be addressed. We have ring-fenced the DSO team away from a wider electricity business systems team, responsible for providing the DSO enablers (such as data, monitoring etc) and the wider DNO business. Each team has separate and equal direct reporting lines into the Operations Director. More information on some of the options considered can be found in [appendix A26](#) – Further governance options considered.

## **Governance arrangements for the development of flexibility services**

- 14.197.** WPD's governance arrangements for the development of flexibility services include extensive stakeholder engagement, publication of information and standardisation across the industry. These are detailed in our Distribution Flexibility Service Procurement Statement.
- 14.198.** WPD has a strong track record of responding to customer requirements and developing new processes and arrangements. Innovation projects have been influential in the evolution of flexible services, resulting in development in active network management and procurement/deployment of flexibility.
- 14.199.** Flexible Power, our flexibility product, was developed through the ENTIRE innovation project where we engaged stakeholders throughout the process and have since sought to make Flexible Power a standard for flexibility across all DNOs. We continue to engage with stakeholders, taking on their feedback and evolving flexibility contracts and operational arrangements.
- 14.200.** We have been procuring flexibility services since 2018 and have the largest contracted amount of flexibility provision which is offsetting the need for conventional reinforcement.

- 14.201.** We are transparent about the needs of the network in the data that we publish about Constraint Management Zones, transparent about pricing structures, transparent about contractual arrangements and transparent about how we will dispatch flexibility.
- 14.202.** As flexibility markets develop in RIIO-ED2 for capacity constraints, network access, network design or commercial arrangements, we will continue to develop processes to ensure that we will provide neutral facilitation of those markets.
- 14.203.** This insight from WPD work has also enabled WPD to be influential in common arrangements across the industry that have been developed through ENA Open Networks. WPD supports greater commonality across the industry, so that customers and flexibility providers have clarity and consistency irrespective of which network operator they are dealing with.

## Governance arrangements for independence of decision making

- 14.204.** To determine the most economic network investment to deliver the required outcomes, WPD uses the DNOA process which recommends an investment option based on the profiled capital and operational expenditures of a range of technically viable possibilities.
- 14.205.** DNO activities are undertaken by the network design function which defines how assets are installed, maintained and repaired, including defining the applicable capacity ratings which can be delivered by those assets.
- 14.206.** The DSO function is responsible for understanding how the system operates and identifying the potential capacity shortfalls or network limitations that require additional investment. It develops the flexibility products suited to meeting those system constraints and ensures sufficient information is published so that distribution flexibility markets can be established.
- 14.207.** The DSO function will assess the different investment options identified and make recommendations based on published criteria. The resulting recommendations will also be published to ensure transparency and enable scrutiny.
- 14.208.** If the investment recommendation is to use flexibility, then the DSO will procure flexibility services through the market to meet those system needs. If the investment recommendation is to use conventional reinforcement, the DSO function will instruct the DNO function to commence conventional network build.

Distribution System Operation Enablers	Distribution System Operator Functions
Definition of asset ratings including dynamic ratings.	Guidance on how to develop networks using flexibility.
Connection quotes and offers.	Identification and analysis of constraints.
Conventional asset reinforcement.	Tendering for flexibility.
Protection design and implementation.	Assessment of investment options and recommendation.

**Figure SA-03.58 Split of enablers and functions**

- 14.209.** The decisions made leading to the recommendations will be subject to audit to ensure compliance with the agreed processes.

## Planning and network development systems – Our RIIO-ED2 projects

- 14.210.** The following projects support new capabilities within the RIIO-ED2 period. Where these provide broader whole system benefits, they are detailed in the relevant EJPs. This includes the broader benefits and their value, justifications and costs, the potential use of uncertainty mechanisms, associated engagement and coordination, details of why market based and innovative solutions could or couldn't be used, work beyond BAU and any work already carried out.

### Network analysis for DSO

- 14.211.** This project implements a set of new applications that support the increasingly complex analysis of network requirements and optioneering of solutions.
- 14.212.** Traditionally, DNOs have analysed and planned the network against a set of relatively certain external parameters such as future load growth. However, the range of scenarios for future growth of electric vehicles, heat pumps and distributed energy resources means that there is a requirement to carry out multiple sets of network analysis against the range of future energy scenarios. In addition, there are more network solutions available; WPD has a suite of smarter or flexibility based solutions which could be used instead of, or in conjunction with, conventional network infrastructure upgrades.
- 14.213.** We will need to increasingly carry out more technically complex studies. Such analysis, optioneering and optimisation will be supported in RIIO-ED2 by a new set of applications. The applications will bring together time series data for measured points on the network, DER and DSR metering data and Active Network Management/Intertrip/Protection schemes data and provide the capability to assess all the requirements together to understand where there are network constraints that require additional capacity.

### Data historian

- 14.214.** Currently, data used for network planning purposes is held within a data-logger, which has historically stored half hourly load reading for HV feeders and some half hourly metering data. The growth in availability of different types of data requires more storage capability, along with an enhanced capability to interrogate the different sources of information.
- 14.215.** The data historian will be an implementation of a specific database and tools for time series network data obtained from our Control Systems and other data such as smart metering data obtained via the Data Communications Company (DCC) Adaptor. The historian will need to be integrated with network analysis applications. The benefits of having a more powerful historian will be improved access to a wider range of data, enabling more robust longer term network planning.

### Stability analysis

- 14.216.** Traditionally, there was a large amount of inertia within the power systems, with large turbines at large power stations spinning at high speeds. This stored energy is particularly valuable when a generator fails as the spinning reserve can make up the power lost, thus maintaining the stability of the network. However, the closure of numerous large power stations and a move to more intermittent distributed energy resources means that the amount and characteristics of the inertia is changing with more of it being connected to the distribution networks.

- 14.217.** Distribution network operators have not traditionally needed to model for stability conditions on the system but, as the energy system changes, a lower inertia power system may place additional constraints on distribution network operation. When generation meets demands and all necessary conditions such as voltage and frequency are maintained, the system is stable and balanced. However, any mismatch or excursions outside required parameters can cause generators or circuits to trip, which can then cause other issues and further trips.
- 14.218.** The project will understand and model sub-second voltage collapse conditions and how these may drive requirements on the way distribution network operation can support the voltage stability of the system.

## Planning state estimation

- 14.219.** State estimation is used to provide a view of the network configuration and operational status, informed by a set of measurements and data. Within a planning context, it is used to determine representative characteristics of the network to allow network planning and development decisions to be made.
- 14.220.** Increased network monitoring and new sources of data mean that there is greater scope to improve state estimation for planning purposes. The various data sources can also be used to cross-check each other and identify data anomalies.
- 14.221.** This project will seek to merge the data streams from more accurate real time monitoring, current/historical network configuration topologies and alternative sources of network data to improve state estimation being used in network planning.
- 14.222.** Inconsistencies, errors and inaccuracies can be identified through the state estimation modelling and these issues can be fed back for resolution in the core systems to improve data quality and reliability.

## DFES data architecture and systems

- 14.223.** Distribution Future Energy Scenario (DFES) work completed within WPD uses data from local authority and other key local stakeholders, supplements it with market information on technology rollout and allows national energy system predictions to be regionalised, informing WPD investment plans and requirements for additional network capacity.
- 14.224.** As the importance of this data increases in identifying network needs, driving flexibility markets and sharing more of the data with third parties, a productionised data architecture needs to be adopted to ensure the DFES process is more efficient, consistent and repeatable, providing information that is accurate and accessible.
- 14.225.** DFES data architectures will need to be designed around third party access to the data sets. To enable this, there may be a requirement for performance aggregation, anonymisation or other reporting functions on this data before making it available publicly. This project will also develop the systems to facilitate this.

## Planning data from smart meters

- 14.226.** As more smart meters are installed and the coverage of smart meters increases, there is scope to use the information to improve assumptions about load profiles and usage patterns. The smart meter data will help to refine the usage profile templates that are currently used for network planning considerations.
- 14.227.** While the data will be provided at LV, it can also be used to inform assumptions about HV and EHV behaviour. In particular, it can be used to confirm/refine HV level data at substations by aggregating the LV information. For example, it can be used to show the impact of embedded distributed generation on network demands along a HV feeder.

- 14.228.** Various different analytical approaches will be adopted including data aggregation, statistical analysis, ML and Artificial Intelligence (AI) technology to inform better assumptions about demand profiles. These actions will be carried out in accordance with WPD's Smart Meter Data Privacy plan.

### Customer facing Network Assessment Tool

- 14.229.** During RIIO-ED1, WPD developed a new Low Voltage network assessment tool (NAT) used for designing network changes. It was developed as part of our Electric Nation project and has been subsequently implemented as a business as usual product for our planners to use. The legacy systems required a level of technical knowledge and the ability to interpret data from multiple WPD systems to develop a design. The NAT tool is far more interactive than previous systems and the majority of interpretations are now automated within the new tool.
- 14.230.** Towards the middle of RIIO-ED2, we plan to offer this design functionality to our customers. This will allow the facility for optioneering to be completed by our customers before they finalise any connection applications.
- 14.231.** By using the NAT design model, we will be able to offer customers a simple go/no-go decision for the connection of new demands and LCTs on our network. This will help customers with feasibility work at an early stage of projects and will progress enquires through to quotation more quickly when connection plans are firmed up.

### Demand disaggregation, consumer behaviour and flexibility

- 14.232.** Currently, HV and EHV demand and generation customer behaviour is normally assessed at an aggregated level. There is a limited breakdown of the constituent customer assets and their associated behaviour. This work would build a disaggregated view of existing customer behaviour to enable more accurate forecasting of future changes in behaviour; this includes flexibility and DSR.
- 14.233.** We will collate and analyse available data to determine existing customer behaviour. This will be broken down into the necessary technology and sub-technology categories to improve forecasting accuracy. Models and assumptions for each category will need creating and periodically updating with the latest available data. These models will include the impact of electric vehicles, heat pumps and flexibility.
- 14.234.** Developing processes to understand and quantify expected behaviour of customers will improve shorter and longer term forecasting accuracy.

# System Operation enablers

## Scope

- 14.235.** The DSO enablers provided by a DNO are the activities and functions which support the neutral facilitation of markets and flexibility. They relate to areas where the DNO provides data for a market, and where the DNO is involved in the connection of LCTs such as EVs and heat pumps.
- 14.236.** A DNO will also need to be able to reflect the flexibility responses of a DSO within its own systems for real time operational decision making. The network management tools must be open to input from proprietary systems used in flexibility markets.
- 14.237.** Understanding how the network is performing is key to the efficient use of the network, so data from monitoring devices is required at more places on our network. Existing maximum demand monitors need to be augmented to offer power flow direction and other metrics. We will protect the integrity and safety of lower voltage networks through a combination of advanced modelling, additional visibility and conventional reinforcement. Smart meter data will be used to enhance models which are applied to our Low Voltage networks.

## Meeting baseline requirements

- 14.238.** We have mapped our System Operator functions against the DSO roles and activities for RIIO-ED2 as listed in the Ofgem Sector Specific Baseline Standards for DSO. In our list, we have sub-divided some items to provide additional granularity. The list is included at the end of this annex. Throughout the document, we have explained our plans for baseline requirements. These have paragraph number references in the annex.

Planning and Network Development		Promote Operational network visibility and data availability		Provide accurate user friendly and comprehensive market information		Embed simple, fair, and transparent rules and processes for procuring distribution flexibility services	
Role	Progress to date	Role	Progress to date	Role	Progress to date	Role	Progress to date
1.1.1		2.1.2		3.1.5		3.2.2	
1.1.2		2.1.4				3.2.5	
		2.1.5					

in RIIO-ED1

in RIIO-ED2

**Figure SA-03.59** Baseline requirement progress (system operation enablers)



## Planning and network development

- 14.239.** The effective application of both flexible connections and DSR services is contingent on the availability of network data such as real and reactive directional power flows and voltages. On the high voltage (11kV and higher) networks, full network visibility down to primary substation level will allow WPD's Active Network Management systems to minimise the amount of curtailment customers are subject to, while maximising asset utilisation and maintaining network security. On Low Voltage networks, monitoring of distribution substations will ensure that network reinforcements are carried out when and where they are needed and provide the necessary data to enable smart solutions to be deployed where required to further optimise asset utilisation.
- 14.240.** In addition to providing WPD with the necessary real time data to actively manage its network, the installed monitoring will also provide shareable data to support emerging flexibility markets. This data can be further augmented with smart meter data to provide network information where monitoring is not available.
- 14.241.** In addition to monitoring load flows and voltages, WPD will increase its monitoring of power quality. This additional information will further facilitate the connection of Low Carbon Technologies (LCTs) while ensuring the network outages resulting from excessive harmonic distortion, for example, are avoided.
- 14.242.** Full details, including costs and benefits, of WPD's approach, have been published in our Network Visibility Strategy.
- 14.243.** Data sharing in a fast and efficient way becomes key as more data sets interact. We will ensure that our planning data is made available in a standard format to increase the efficiency of data sharing. We will use the Open Networks project to ensure that our approach is coordinated with other network and system operators.
- 14.244.** A range of changes are required to improve our data management. We view this as a journey where we need to track and measure our progress to ensure we continue to focus in the right areas. We have already demonstrated improvements in our data management processes through targeted project activity to understand our data sets, lineage, and business and third party use. We recognise the need for a consistent approach to data management, delivering standardised and effective processes to share data with other network licensees and wider customers and stakeholders.
- 14.245.** We continue to collaborate with all other network licensees through ENA to establish common data descriptions, metadata standards and approaches to sharing data to ensure that a standardised and interoperable process is taken forwards. We have demonstrated leadership in this area as the first GB DNO to share its complete asset and connectivity data, above LV, in Common Information Model (CIM) format.
- 14.246.** Historical information can help customers and participants forecast future demands, and our historical data will be made available in a proprietary form, such as PI Historian or other time based data store.
- 14.247.** Visualisation of data is key to ensure that it is used and gains maximum leverage in the transition to net zero. We hold heat maps and information on our website, with forecast DFES data being made available both in WPD specific geographical areas and in specific local authority boundaries. Presuming our data to be open goes beyond making it available through our systems and services. Our role is to enable data to be harvested, housed and utilised irrespective of specific access points. Our implementation of APIs and Client URLs will ensure that this is available and appropriate. Our ENA-wide work on the creation of an energy digital system map for GB has demonstrated our commitment to, and the availability of our, data to serve this purpose.
- 14.248.** We have already undertaken a number of digitalisation and data enhancements aligned to these principles including adoption of the Dublin Core metadata standard; providing data in a discoverable and accessible form (e.g. information maps, guiding users to key network and



supporting information); establishing data governance roles and implementing a data triage process.

- 14.249.** Our external engagement recognises that different users have different needs and expectations of the same data. That means that ensuring the right data is available in the right format at the right time will lead to different formats at different times to serve different users. Potential users include developers looking for capacity, local government bodies developing energy plans or innovative organisations looking to test new approaches.
- 14.250.** An example of where we have made different formats of data available is associated with our network capacity and future energy scenarios interactive maps, where the maps provide users with an easy to navigate geographic view, but we also make available the more detailed source data for more technical users to build their own analysis.
- 14.251.** Customers can self-serve this data using our interactive maps and download features. The base data is also available to download for use in third party models and systems. Improving and increasing data management acts as the backbone to drive insight both internally and externally to meet current and future system needs. Standard processes for creating, managing and handling data though a robust data governance process has been implemented and will continue to be developed, investing in solutions to improve our data quality and ensuring we have a single source of the truth. Our online Data Hub is already home to many sets of network data and information. We recognise the needs of different data user types vary and therefore commit to sharing data in three principle formats for each relevant data set to deliver usable and valuable data to as wide an audience as possible.
- 14.252.** Easy-to-use and visual data representations, such as interactive heat maps of network capacity data, provide the direct route to answers for non-technical data users. Downloadable, standardised and interpretable data provides opportunities for data users to interrogate and drive their own insight and value, in a different way to the use of visualised representations.
- 14.253.** Developing data into a more consistent format has meant that we can now share our data openly via the internationally recognised CIM standard for the transfer and provision of electricity network data, to allow direct access to a complete asset and connectivity model, supporting investment and operational planning for customers and stakeholders.

## Promote operational network visibility and data availability

- 14.254.** We have already established the ability to share our network information through the standard CIM format. This allows other operators and stakeholders to run their own modelling and simulations against our base network. This requires more development to encompass all of the examples of data sharing included in the Ofgem Baseline Requirement and, as an example, we do not share working network configuration in real time. We do share an as-planned network configuration. We plan to address the areas required during the RIIO-ED2 period, developing them as data becomes available and system changes are made for us to offer useful outputs. Some outputs, such as losses recorded at substation level, will rely on third party projects such as the rollout of smart meters, so we will develop solutions to make use of these projects as they are completed.
- 14.255.** This visibility will cover real and reactive power, for both import (demand) and export (generation) connections. As well as ensuring the power flows on the network are monitored with high granularity, our systems will allow the energy distribution patterns to be recorded and traced.
- 14.256.** By viewing energy flows on a temporal basis, we can forecast requirements and ensure the network is proactively managed in an optimum way. Complex data analytical tools will be deployed to allow us to visualise and interrogate the data. We will share the results of this enhanced visibility with customers, their energy suppliers and the NETSO.

- 14.257.** WPD publishes the network flexibility data for a five year window across four future energy scenarios and also publishes the procurement data for a two year window under WPD's Best View. These data sets provide information to the market, as well as supporting the planning process. A month-ahead forecast is published on the Flexible Power website to outline the expected windows of availability and utilisation needed for DSO operations. The timescales of this forecast will be updated as forecasting methods improve, with multiple iterations expected all the way up to real time.
- 14.258.** Our implementation and continuing management of a data catalogue will provide regular and reliable single point access to trusted data in a timely and effective manner. This will also facilitate a single self-service environment to its users that help them to find, understand, trust and manage data. Furthermore, it will be clear to all data users within the organisation what each piece of data means, how it's collected, and how to use it effectively.
- 14.259.** We use a common data triage process to assess the openness of data. This is applied to assess data classification and determine whether anonymisation or redaction is required to enable the data to be shared. This results in either Open, Public, Shared or Closed classification. A summary assessment is published along with the data set to provide stakeholders with an explanation of the data classification.
- 14.260.** During the RIIO-ED1 period, we established the DER owner/operator forum. This gave operators a route to discuss all matters related to DER ownership, such as Grid Constraint, Outage Management and forecasting. Details of DERs connected to the WPD network and the respective owners is well established. At future owner/operator forums, we will work to collaboratively develop the specification of detail that is required to help secure DERs. We plan to develop this specification into a solution for all DERs.

### Facilitate efficient dispatch of distribution flexibility services

- 14.261.** The real time requirement for decision making drives the activity to be completed in our 24/7 network Control Centres. This is already being completed as a look ahead task with the ESO but the network is managed in real time at arm's length from the NG network, with interactions based on forecasts, predictions or unplanned events. This interaction will become more real time and detailed through the use of ICCP links, with more DER instructions offering solutions to both. Automated systems and interfaces will help manage the efficient dispatch.
- 14.262.** Working across the industry through the ENA, we will establish base rules for the industry in conjunction with other DNOs. This level of standardisation will be important for the ESO. Innovation projects such as the UKPN KASM project will provide a useful basis for solutions. We already have our own acceptance and dispatch principles published on the Flexible Power website ([appendix A16](#) - Acceptance and Dispatch Principles); these were developed in 2019 and will be reviewed as industry level work continues.
- 14.263.** As systems become more detailed and interactive, rules will be set to ensure DERs can operate efficiently. It is important that rules are equitable to all network participants. These will be created transparently with stakeholder engagement through the WPD DER Owner Operator forum. Through the Midlands RDP, WPD is already working with the ESO to develop these primacy rules. Once developed, they will feed into Open Networks and wider WPD operations. These primacy rules are expected to grow in complexity as we gain operational experience.
- 14.264.** WPD's flexibility contracts are aligned to the Open Networks common contract and allow for the substitution or exchange of flexibility services, subject to WPD approval. As well as allowing for bi-lateral trades of these contracts, WPD will publish the data which will enable peer to peer markets to further facilitate this trading activity.
- 14.265.** Our use of clear rules for the dispatch of common DSO services, in alignment and coordination with the ESO, will allow for participants to truly understand the opportunities available and the requirements needed from them, creating a cohesive market designed to maximise liquidity, encourage revenue stacking and deliver the most efficient solution for the system.

- 14.266.** We will support the secondary trading of distribution flexibility services and curtailment obligations by providing relevant data. We recognise it's important that our data is presented in the same format, described in the same way and provides the same level of detail as that of other network operators. This allows customers and stakeholders to have a consistent view of the data across the industry to support existing, new and developing markets.
- 14.267.** While interoperability of systems is important, it is also worth noting that the WPD network management tool is established, so proprietary systems are inevitable in network management. It is important, however, that these systems can manage interfaces with generic systems. We will ensure that our instruction infrastructure can communicate with third party systems. As our use of flexibility services increases, we will expand and grow our dispatch infrastructure to meet the requirements. Scalability is a key feature of our solutions. During the RIIO-ED2 period, we will replace and scale our platforms as required, with work starting in 2026.
- 14.268.** WPD has operated and scaled up Flexible Power since its early inception in 2016 as an innovation project, through to the current day, where it regularly instructs 100s of MWhs of flexibility services and has been adopted by other DNOs. Flexible Power dispatch instructions are electronic, initiated through open APIs, which require no proprietary hardware onsite.
- 14.269.** Our Flexible Power systems are able to work with other systems, such as the interface to KIWI Power. We remain open to other providers taking signals and data from systems and inputting back into them. Although our ANM systems do not provide a DSR response, we have followed the same ethos and openness. Our control system already interfaces with ANM systems from two providers and is able to interact with other platforms.
- 14.270.** WPD generally does not implement hard dispatch controls for flexibility services. Flexibility instructions are through electronic APIs and not direct hardware control. Hard dispatch controls are used for disconnection under fault, outage system emergency conditions, or the implementation of flexible connections. As part of our RDP work, we are considering the use of SCADA enabled flexibility services to support the application of a Deep Connect and Manage process. This aims to provide simple, low cost access to markets using existing control systems and will be supplemented by more sophisticated commercial and technical mechanisms.
- 14.271.** In conjunction with participant feedback, we will continue to investigate alternative methods of dispatching assets to widen access to markets and improve commercial participation. For example, this may include the use of SCADA enabled dispatch as part of the RDP work, or the option for dispatch free services such as our Sustain-H product being trailed in our Future Flex NIA project. Clear rules will be established to provide clarity on which signals can be used in which situations.
- 14.272.** WPD does not have a hard coded system for flexibility. The flexibility service platform does not run off any DNO infrastructure. Data exchange to and from DNO control systems is limited to monitoring and real time control and is implemented through industry standard communications protocols. As such, the systems could be assigned to another party.

## **Provide accurate user friendly and comprehensive market information**

- 14.273.** Our digitalisation activity is already delivering, and will continue to deliver, change in how we plan, manage, and operate our network and interact with and provide data to customers and third party system participants. We are committed to continuing to build on our significant work digitalising our business to ensure that we remain an efficient and effective operator of our network and deliver data and solutions in the right format, at the right time to customers and stakeholders to meet their needs and ambitions. Our core principles are, and will remain, improving data management, increasing network insight and operation and ensuring data is presumed open. These principles ensure value is driven to all parts of the energy industry and wider, supporting the net zero transition.

- 14.274.** Data provision in a useful format is essential and we will develop systems that can integrate through API links and machine readable formats. The information must be easily accessible and navigable. We will tailor both their information provision and engagement approaches to reflect different needs of potential market participants, including groups in vulnerable situations. Our core principles are, and will remain, improving data management, increasing network insight and operation and ensuring data is presumed open. These principles ensure value is driven to all parts of the energy industry and wider, supporting the net zero transition.
- 14.275.** Improving and increasing data management acts as the backbone to drive insight both internally and externally to meet current and future system needs. Standard processes for creating, managing and handling data through a robust data governance process have been implemented and will continue to be developed, investing in solutions to improve our data quality and ensuring we have a single source of the truth

## Embed simple, fair, and transparent rules and processes for procuring distribution flexibility services

- 14.276.** We do not offer a direct route to our systems. All our control instructions are via API links to third party platform providers and aggregators. We actively encourage the emergence of this sector and will continue to offer 'plug-in' solutions to remain neutral in the market. All WPD's procurement data and system need information is downloadable and processable by third parties. We have previously used CLEM, NODES and PICLO for procurement routes.
- 14.277.** Through the Midlands RDP, WPD is working with the ESO to develop how the existing DSO products can serve transmission constraint needs. This will feed into Open Networks.
- 14.278.** The ESO is the key organisation for managing the wider UK network. We already interact with them when planning ahead for DNO and ESO needs. In real time, there is no detailed visibility of ESO needs within the DNO environments as a standard; this is managed by exception and when events occur. Within our ANM systems, we cross link WPD constraints with NG constraint signals to ensure that our own actions do not undermine the responses being called for by the ESO.
- 14.279.** WPD helped support the development of work around the stackability assessment of DSO flexibility products and their interaction with ESO flexibility services. The industry standard products implemented by WPD enable both transmission and distribution needs to be met. Contracts put in place by WPD also provide no barriers to serving whole electricity system needs.
- 14.280.** We will investigate the additional arrangements that are required to support DERs and the ESO in a more real time automated basis.
- 14.281.** We are committed to making sure that our data is both discoverable and searchable ensuring that we continue to collaborate with wider industry to ensure that data, irrespective of organisation, has the same meaning, format and description (metadata and data dictionaries). We continue to collaborate with all other network licensees through ENA to establish common data descriptions, metadata standards and approaches to sharing data to ensure that a standardised and interoperable process is taken forwards. We have demonstrated leadership in this area as the first GB DNO to share its complete asset and connectivity data, above LV, in Common Information Model (CIM) format.
- 14.282.** Presuming our data to be open goes beyond making it available through our systems and services. Our role is to enable data to be harvested, housed and utilised irrespective of specific access points. Our implementation of APIs and Client URLs will ensure that this is available and appropriate. Our ENA wide work on the creation of an energy digital system map for GB has demonstrated our commitment to making our data available to serve this purpose.

## Our Distribution System Operation enabler projects

### Project – Automated data mastering solution

- 14.283.** As we approach RIIO-ED2 and beyond, there is a need to further increase this level of data mastering and implement increased automation, supporting our transition to a single source of data. This will deliver operational and performance improvement, as well as flexibility, through the provision of improved quality, completeness and volume of relevant data internally and externally to enable optimised and new connection and flexibility services.
- 14.284.** Given the evolving needs of customers and stakeholders, robust and validated data sets are required to deliver operational, planning and maintenance efficiency for customers and internal stakeholders alike. It also enables our human processes and technological systems to operate effectively by delivering our business objectives.
- 14.285.** Master data management (MDM) is a technology-enabled discipline in which business and IT work together to ensure the uniformity, accuracy, stewardship, semantic consistency and accountability of the enterprise's official shared master data assets. Master data is the consistent and uniform set of identifiers and extended attributes that describes the core entities of the enterprise including customers, prospects, citizens, suppliers, sites, hierarchies and chart of accounts.
- 14.286.** Utilising modern approaches to ensure this consistency between systems is crucial in achieving our business goals and ensuring that data can be easily accessed, shared and utilised throughout the organisation and externally, enabling the effective operation of DSO services.
- 14.287.** This project will facilitate multiple outcomes including:
- Common Information Models (CIM) available internally and externally to drive consistent understanding over assets and connectivity to improve operations
  - Enabling single source of truth data to enable LV to EHV self-serve design functionality improving connections and flexibility service provision
  - Automated data sharing such as in ICCP format to National Grid and other DNOs

### Project – Time series historian analysis system

- 14.288.** A lot of work has been done during RIIO-ED1 to increase the reliability, quality and dependability of our time series data within our systems. As a result, we have shared a significant element of this in real time. During RIIO-ED2, we will ensure the same is true of time series data between systems, such as our Advanced Distribution Management System (ADMS), smart metering and Low Voltage (LV) monitoring data; this will ensure that we can both maximise the value of our time series data internally to further optimise short and long term planning and operational decision making as well as providing increased granularity of real time data to customers and stakeholders to support improvements in their planning, operational and flexibility decisions.
- 14.289.** We recognise that customer and stakeholder needs are dynamic. We also recognise that, to deliver excellent customer service, societal, environmental and system reliability, we must create value for money throughout our decision making processes. Using high quality, high resolution and confident data sets helps us to do this. As we increase the amount of data regarding customers, assets and operations, this future capability - namely to make timely decisions with high levels of confidence - becomes ever more important to us, our customers and aggregators. Our ability to contextualise and govern high volume data sets, ensuring that high quality data is informing our decisions processes, is also increasingly important. In order to facilitate the next step change in our journey to make more informed, more confident and more assured operational decisions, we are looking to develop the capture, collation and utilisation of time series data from across our various systems.



**14.290.** This project will facilitate multiple outcomes including:

- Real time and historic time series data available openly to at least primary substation level and LV where appropriate
- Enabling real time flexibility data for scheduling and settlement purposes
- Facilitating a fully enabled flexibility management system
- Optimisation of integrated DNO and DSO operational systems

## Project – Open Cloud Data Platform

**14.291.** We are the first DNO to make an online data catalogue available, providing access to our data sets in a common location, with standardised definitions and descriptions to ensure the data is usable and interoperable. Our current network operations and future operation plans are reliant on robust, reliable and transparent data to continue delivering exceptional services. Sharing this data through a secure, interactive Open Cloud Data Platform will provide benefit to customers and stakeholders, enabling them to make more informed decisions.

**14.292.** To deliver net zero, changes are required to both energy usage and delivery, as well as, more imperatively, to ensure that the data that drives these changes is effectively utilised. Building on our initial data portal, the implementation of an Open Cloud Data Platform will enable us to share data sets more quickly, reduce the risk of data errors by reducing human interaction and developing and implementing a framework embedded in a cloud architecture.

**14.293.** This improved method of providing data to customers will unlock opportunities for new processes to be developed, resulting in an expansion in the services and network activities that are facilitated.

**14.294.** This project will facilitate multiple outcomes with a number included below:

- All data centrally accessible and described consistently ensuring it is standardised and interoperable from asset information to operational data to ensure open and fair flexibility services
- Historic and database level data accessible to meet the needs of a wide range of user types

## Project – Internal Data Platform

**14.295.** Our Internal Data Platform will provide a centralised process for data systems to transfer data, which staff can trust and utilise across different systems and environments. This will help us to continue to move away from a decentralised, historic knowledge-based culture and ensure that we deliver a data centric approach as an organisation.

**14.296.** Linked to automated data mastering, the central storage and utilisation of data will be a critical step in meeting future DSO requirements and accessing benefits. At the same time, it will enable a move to probabilistic-based asset and network operation. It will ensue that the business is prepared for the future, enabling more effective decision making, and overall trust within the business regarding the accuracy and validity of data used in these decisions.

**14.297.** This solution is fundamental to delivering multiple outputs as described above as well as outcomes, such as:

- DFES Data Architecture and Systems
- Planning State Estimation solution implemented
- Network analysis for DNO and DSO functionality
- Enabling real time flexibility data for scheduling and settlement purposes
- Facilitating a fully enabled flexibility management system
- Optimisation of integrated DNO and DSO operational systems

## Project – Improved network monitoring and power flow sensing

- 14.298.** Conventional network design focused on maximum demand solutions and did not distinguish between imported and exported demand. As the network evolves and more distributed generation assets are connected, the maximum demand becomes less important than the actual power flows.
- 14.299.** Measurements of flows in demand and generation, and awareness of the cumulative effects of both working together, become key for efficient network operation. Half hour changes and forecasting will allow us to operate the network in a more fluid way and develop capacity.
- 14.300.** This project looks at the current ranges of monitors and sensors available for use on the network and assesses their future applications to support flexibility.
- 14.301.** This project will facilitate multiple outcomes including:
- Power flow visibility
  - Power quality visibility
  - Real time management
  - External influence monitors, such as temperature and weather effects.



## 15. Operational control systems

- 15.1.** We are proposing a number of significant enhancements to existing control systems. Some of these will be enhancements to the existing applications and others will require development of new systems that will interact with the existing control systems. This will require changes to hardware as well changes to the applications.
- 15.2.** In line with WPD's four point plan, the focus will be on higher network voltages, but there will be increased amounts of data and visibility of network operation implemented for lower voltages.
- 15.3.** WPD's control systems are based upon a proprietary suite of products. They also interface with SVO and KIWI products. The core modules used include:
- Network Management System (NMS) for control of the network
  - Time Series Data Store (TSDS) that records data about the state of the network
  - Historic Network Viewer (HNV) which allows playback of network status and configuration
  - Outage Management System (OMS) which enables fault management
  - Call Taker which captures the details of incoming and outgoing calls
  - Mobile module which allows field staff to access certain functionality
- 15.4.** It is possible to interface data with our control systems at a high level or with the specific modules. Currently, all operational interfaces link directly with the NMS.
- 15.5.** The RIIO-ED2 operational system projects are described below.

### Cyber security and networking

- 15.6.** It is expected that cyber security risks will continue to grow during the RIIO-ED2 period. Network and Information Systems (NIS) regulations will continue to evolve, leading to improvement actions on access control, intrusion detection and attack recovery. While many of these actions will be implemented on the control systems hardware or within the data communications network, there will also be a need to implement application level changes.

### Physical control system hardware and communications segregation

- 15.7.** We have identified a need for further physical segregation and improved network security architecture on controls systems hardware and the operational telecoms network.
- 15.8.** Physical segregation is used to mitigate risk of cyber-attack by isolating critical control systems from wider corporate networks. It requires separate servers, network points, cabling, switches, routers, telco links, etc. Connections to the wider corporate network will be made through a carefully managed firewall (and possibly a demilitarised zone where further integration to other DSO and ESO systems can take place).
- 15.9.** Improved network security architecture considers four key control measures
- Policy/standards – these define who can do what, how it is controlled, who has oversight.
  - Defence – including actions such as physical network separation, data encryption and secure communications.
  - Detection – such as network sniffing and intrusion detection which seeks to detect abnormal network traffic or irregular messages as part of our Security Operations Centre services
  - Recovery – enhance emergency plans for cyber events. Our emergency plans will be business wide and have dedicated communication channels and command structures.

## Application cyber enhancements

- 15.10. It is envisaged that, as a result of expanding NIS requirements, cyber enhancements will be needed for our control systems applications, the growing number of distributed control systems supporting DSO solutions (such as Active Network Management, Demand Side Response and System Voltage Optimisation) and network analysis systems using ML and artificial intelligence.
- 15.11. We also expect NIS to be extended to encompass all network connected devices to ensure end to end security covering the whole chain of communication from the our control system application through to the connected devices (plant) in WPD substations. There is also the possibility that the scope of NIS will be expanded to include customer side DER and equipment.

## Remote updates and patching

- 15.12. The data networks supporting the network control systems are evolving, and will continue to evolve, to support more real time intelligent electronic devices within the electrical network. This will include providing the ability for engineers to access relay settings, control system configuration and connected plant (eg. transformer or tap changers for health information). It will also provide a facility for cyber vulnerability patching to be done remotely to the OT network and electrical plant.
- 15.13. As a result, the communications networks and associated protocols will need to evolve to obtain the benefits from modern protocols and software, ensure that the protocols used remain within the support of manufacturers, have high levels of resilience and make efficient use of communications resources.

## Control systems core IT server hardware

- 15.14. The hardware used by our control systems typically has a five year life. We refresh the hardware estate every five years; the last hardware refresh for our control systems was in 2018. The next is due in 2023, with another due in 2028 during RIIO-ED2.

## Distributed Energy Resource management – Hardware/hosting

- 15.15. There are a number of systems that interface directly to the core Control Systems Management System (NMS). Currently, they tend to have standalone applications and servers.
- 15.16. During RIIO-ED2, we are expecting increased requirements for existing applications as communication expands to more devices on the network. We also expect an expansion of the range of different applications that will require to interface to the NMS to support further real time analytics, optimisation and control.
- 15.17. At present, these applications perform certain functions (such as demand side response) or collect specific data (such as cable low pressure alarms and earth fault indicator alarms) and link to the NMS via a system called ihost. The current installation of ihost has limited capability and therefore new hardware is required for the NMS related applications.
- 15.18. We propose to use more powerful hardware to consolidate a range of existing separate servers onto a single platform. The new hardware will use a process of virtualisation to allocate memory and processing capability from the main server to individual applications. This will enable greater flexibility for the applications, because more memory and processing can be easily provided as it is required. It will also support both Linux and Windows applications, enabling a larger range of applications to be interfaced to the NMS.

## Connecting our systems to other operators

- 15.19.** In VED2, we will need to integrate with more trusted third parties in the energy system such as the transmission ESO, all five neighbouring DSOs, aggregators and energy suppliers or service providers.
- 15.20.** We expect that some of these links will use ICCP, an international standard for control systems, enabling data transfer capability between control centres for different organisations.
- 15.21.** Organisations which require less inter-operability will make use of our third party integration data digitalisation platform.

## Cloud architecture for Digitalisation Strategy

- 15.22.** As part of our commitment to make more data open to third parties, we will be storing large quantities of data for use and access by third parties. This work will include establishing and supporting the hosting of open data, including
- access control,
  - data security and
  - self-serve access.

## Control systems application enhancements

- 15.23.** WPD's Network Management System is continually enhanced to ensure it remains capable of delivering outstanding network performance. Requests for new features, functionality and reports arise regularly with small enhancements being developed in-house and deployed when ready. Larger changes may require development by the manufacturers GE with updates deployed as patches.

## Pseudo analogues

- 15.24.** We are making greater use of state estimation within our control systems. A Distribution Power Flow (DPF) module has been deployed during RIIO-ED1 and can run at HV and LV. In RIIO-ED2, we propose to deploy the Power System Analysis (PSA) module which runs at voltages above HV. Both modules provide the capability to have pseudo network analogues at any point on the network. DPF and PSA can be used to drive other processes such as Active Network Management, to optimise network access and manage network capacity in exactly the same way as using real measured analogues.
- 15.25.** Historically, there has been very limited data available for the operation of the LV network. But going forwards, it is anticipated that there will be a need to have much greater visibility of the status of the Low Voltage network. WPD has started deploying monitoring at distribution substations and data is already being pulled back for each phase of every LV network feeder. (where monitoring is available and data privacy allows). It is proposed to have an LV layer within our control systems that will display the LV data. This will be based upon the direct readings from site or state estimated data based on pseudo analogues or aggregated smart meter data where the real time demand is derived from a combination of smart meter data and state estimation.
- 15.26.** This project will enable the following:
- Display of actual LV analogue data
  - Derivation of pseudo analogues
  - Alerting of alarms for LV assets
  - Aggregation of the LV analogue data to show the load at HV substations

## System Voltage Optimisation

- 15.27.** The technique of System Voltage Optimisation (SVO) was initially developed as part of WPD's Low Carbon Network Fund Equilibrium project. It showed that capacity for generation and demand can be created by changing the voltage on the primary 33kV network. During the first three years of RIIO-ED2, the SVO system implemented as part of the LCNF project will be replaced with an enterprise scale platform which will be fully integrated with our Network Management System. This will allow the expansion of SVO to any area within WPD as required.

## Control systems enhancements

- 15.28.** There are a range of control systems enhancement projects that will be implemented during the RIIO-ED2 price control. Some of these enhancements are already known, whereas others will emerge as additional functionality requirements are identified.
- 15.29.** WPD anticipates growth in the amount of ML and AI during RIIO-ED2. We already use basic ML to assess the state of the network, determine where it is possible to restore supplies from (by considering loads and network ratings) and initiate the operations in a logical sequence that restores supplies to non-faulty parts of the network.
- 15.30.** In the future, we expect the system to self-learn optimum fault restoration, minimise/eliminate alternative connection constraint triggers, minimise losses and maximise capacity. The dynamic way in which loads may fluctuate on the network in the future, especially where there are intermittent DER connected, will mean that optimisation of network running will need to be more automated.

## RTU replacement

- 15.31.** Remote Terminal Units (RTUs) are installed at substations and act as an interface between equipment being monitored locally and the communication with control systems.
- 15.32.** These are electronic microprocessor based devices which have a relatively short life compared to the electricity network assets. During RIIO-ED2, WPD proposes to modernise 2,400 RTUs, which are now end of life.
- 15.33.** The replacement device will be an Internet Protocol (IP) enabled RTU, providing enhanced two-way data traffic that will drastically increase system monitoring, allow the remote administration of system upgrades and be plug and play ready for the next generation of IP-enabled switchgear and support cyber security.

## Distributed energy resource management – Applications

**15.34.** To support new DSO functions, the following requirements have been identified:

### Demand Side Response

- 15.35.** Demand Side Response (DSR) is a new/enhanced customer facing system which will be used for WPD's Flexible Power arrangements including contracting, monitoring, dispatch and settlement.
- 15.36.** It will be used for the dispatch of curtailment (for ANM) or other flexibility actions when authorised by the DSO control team. It will also take information, such as alerts or alarms, from the DER which declare the DER unavailable; these will be passed through an interface to our Network Management System to make control engineers aware immediately and to enable the proposed Future Network Viewer tool in our control systems to inform outage planning and near-future flexibility requirements.
- 15.37.** This project is for the enhancement or replacement of the existing KIWI Flexible Power Application Programming Interface platform with a system capable of managing more DER and having more functionality and features.

### LV geo-schematic representation in our control systems

- 15.38.** Our Network Management System currently does not incorporate visibility of the LV network.
- 15.39.** This project will develop the schematics of each distribution substation and link the data to the HV layer in our control system. It will also provide the geo-schematic background to show how the LV network is interconnected.
- 15.40.** Once in place, this will enable data about the LV network to be displayed to control engineers. This will include the information being directly monitored at distribution substations as well as pseudo analogues where monitoring has not yet been installed.

### TSDS enhancements

- 15.41.** WPD's Time Series Data Store (TSDS) module has the ability to store operational data taken from other modules such as the Network Management System. The way that data is stored within TSDS enables rapid access to operational data at a granular level of detail. This gives control engineers quick access to the data and enables automated processes to operate quickly.
- 15.42.** As new functionality is required for operating the network (e.g. growth in LV monitoring), there will be a need to make incremental enhancements to the TSDS system.
- 15.43.** The architecture of the TSDS is not suited to extracting or analysing large amounts of data over many years for investment purposes. These functions are being implemented in a separate data historian.

### Technology refresh of early ANM systems

- 15.44.** ANM provides a low cost alternative for new connections to be made quickly and for a lower cost, avoiding the cost of reinforcement. These systems have been evolving since being trialled during DPCR5 and early implementations are installed on bespoke hardware, some of which is standalone.

- 15.45.** WPD is rolling out ANM to all areas which therefore calls for an enterprise-wide.
- 15.46.** While some of the ANM systems are linked into our control systems via an ICCP link, only simple ANM functionality is available. There is a need to improve the integration with our control systems and ensure that all ANM schemes can communicate with the Network Management System.
- 15.47.** It is proposed that there will be an Advanced Distribution Management System that will act as an orchestration layer sitting above and directing a number of systems. This will integrate with the Demand Side Response system, System Voltage Optimisation and the ANM systems to ensure that network actions are coordinated and conflicting sub-system requirements result in appropriately balanced actions.

### Homogenisation of our control systems

- 15.48.** WPD operates a Network Management System across all four licence areas. However, the nomenclature and symbols used differ, due to the retention of legacy approaches from previous company acquisitions.
- 15.49.** These differences prevent staff familiar with a specific system in a licence area from working on the systems in other areas.
- 15.50.** This project proposes to homogenise the diagrammatical representations, operating processes and data structures between the systems by redesigning the application and database architecture. This will provide three main benefits:
- Greater staff flexibility, giving better coverage between control rooms (especially during storm situations or for business continuity) and opportunities for efficiencies through changing working arrangements.
  - Simplification of technical support, with standardisation meaning that upgrades or patches need only be tested once, rather than numerous times, for each instance.
  - Common data architecture for interoperability, allowing easier import and export capability which is currently made difficult by having four different data structures.

### Development of 'Future Network Viewer (FNV)' forecasting system

- 15.51.** A prototype tool for looking at the state of the network in the future was developed under the Electricity Forecasting and Flexibility System (EFFS) innovation project.
- 15.52.** The Future Network Viewer project will implement an enterprise-wide system that will give visibility of the network configuration and operation for up to a year in the future. This will provide short term information about upcoming outages, as well as a slightly longer term view of network requirements to accommodate known future work activity or availability of DER.

# 16. Appendices

## Appendix A01 - Ofgem Sector Specific Baseline Standards for DSO

### Role 1: Planning and network development

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
1.1.1	<p>DNOs to define and develop enhanced forecasting, simulation and network modelling capabilities, with processes in place to drive continual improvement to meet network and user needs.</p> <p>We expect increased monitoring equipment to be rolled out across their network where it has demonstrable net value for network planning.</p> <p>We expect demonstrable value to include a rigorous presentation and analysis of needs and use of data for networks and non-networks parties, well established functional and technical specifications, and cost effectiveness analysis.</p> <p>DNOs should also explore all reasonable options to use data from third parties, including harnessing smart meter data subject to data sharing agreements, to improve their simulated forecasting.</p>	<p>Our master electrical models are maintained to reflect existing connected position, as well as a future pipeline of our connections activity. We have recently migrated out models to full switch-level models (SLMs) to enable advanced automated analysis techniques that will be required to deliver DSO solutions effectively.</p> <p>We will continue working collaboratively with other DNOs, GDNs and NG via RDPs to identify and address boundary issues and find the best Whole System solution. Taking a broader approach to whole systems, this also includes, transport planning authorities, transport operators and other major energy users identified in the areas.</p> <p><b>Output: EHV networks to be assessed using switch level model automation by May 2024.</b></p> <p>We were the first DNO to publish longer term forecasting in 2015, initially out to 2032, but latterly aligning with industry to 2050. Our DFES data is used alongside the customer behaviour to understand the electrical impact, which is then modelled in power system analysis software to determine constraints. Volume data is made available on our DFES map.</p> <p><b>Output: Annual DFES in December throughout RIIO-ED2.</b></p> <p>Our Best View is a blended scenario built from DFES data at a granular level and informed by stakeholder engagement to determine the most credible</p>	<p>Through RIIO-ED2 our modelling capability will be improved through new software functions with will build on our switch level modelling and enable active system solutions to be modelled to understand impacts and benefits above the level which traditional power system analysis software packages are able to provide, as it includes operational post-fault network behaviour.</p> <p><b>Output: May 2024's NDP will include a security and resilience assessment using the new tooling developed.</b></p> <p>We have been the first DNO to publish a comprehensive report on customer behaviour assumptions for all DFES technologies (2021), demonstrating we not only use data to inform modelling, but are able to provide the assumptions behind that transparently. The publication of our customer behaviour assumptions benefit other DNOs and stakeholders by providing valuable learning and encourages standardisation across the industry. This has been informed by a mixture of innovation project data and network monitoring data.</p> <p><b>Output: Ahead of RIIO-ED2, DFES Customer Behaviour Assumptions report to be updated to include specific insights using data derived from smart meters.</b></p> <p>Our DFES volume data is already available externally via API on our Connected Data Portal.</p> <p><b>Output: DFES data available via API now at a local authority</b></p>



BPG Ref	Activity Description	WPD Meets	WPD Exceeds
		<p>scenario for the local authority area.</p> <p>We have set up process for how forecasting activities are used throughout the wider business, including regulatory reporting, business planning and flexibility.</p> <p><b>Output: By 2024, a DFES toolkit will be developed to provide external stakeholders the ability to use industry building block data to derive their own scenarios.</b></p>	<p><b>level. By 2024 granularity will be improved to LV substation level.</b></p> <p>We will work with stakeholders to ensure our forecasts are informed by and used by relevant stakeholders. We will use power system analysis techniques built in house to inform our Network Development Plan and use this to drive visibility and agility in our RIIO-ED2 investment programme. This data will be used to present a consumer-friendly version of our investment requirements and capacity needs to customers.</p> <p><b>Output: Consumer-friendly version of investment requirements developed during 2024.</b></p> <p>We will use the annual update of the DFES in conjunction with stakeholder engagement to ensure we are forecasting the credible scenario range of local growth and feed this back into our constraint identification programme. Our investment will be kept agile, responding to net zero growth and delivering the capacity needed for any scenario using our ex- ante allowances and uncertainty mechanisms.</p> <p><b>Output: Every NDP consultation to support the identification of strategic investment based on stakeholder feedback gained from DFES engagement.</b></p> <p>We will develop a periodic backwards looking assessment to examine how accurate forecast uptake (in terms of volumes, energy and peak demand) has been to include in the DFES. Our DFES data will also be improved to provide energy consumption forecasts to be used by local authorities for the wider study of GHG emissions within the LAEP process.</p> <p><b>Output: LA electricity carbon content energy reporting to be available in Summer 2025.</b></p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
			We have planned the necessary software and data development to enable us to run dynamic/stability analysis on the network to ensure that the increased connection of STATCOMs and equipment operating in voltage control or powerflow control are not going to cause stability issues. These outputs will be shared with generators and the ESO to support system operation.
1.1.2	We expect DNOs to submit a network visibility strategy and this should cover the use of all sources of network data including direct measurement from monitoring roll out, smart meter data, data analysis and modelling, and any other third party data sources. The strategy should explain how network monitoring for planning purposes will inform planning decisions, including the use of flexibility; clear justification for where and when monitoring is rolled out, including explanations of any targeting for equipment deployment; and the specification of equipment, including detail on the data captured, frequency of polling, and the mode of communicating data. Note, companies may wish to combine this strategy with network monitoring and visibility for network operations under role two.	WPD has published a Network Visibility Strategy which consolidates all monitoring solutions, both measured and derived. Where monitoring equipment is deployed it has a CBA related to the deferral of asset replacement which is realised with more granular detail on substation loadings and profiles. <b>Output: All monitoring proposed to be installed by March 2028 and installed volumes to be reported annually.</b>	WPD is now routinely collecting smart meter data for all substations with more than 80% smart meter penetration. This data will be used to generate derived profile information for the substations. These profiles will negate the requirement to fit monitoring equipment until demand grows or external factors lead to installation. This layered solution allows us to make the most efficient use of smart meter data and measured data. <b>Output: Smart meter informed profiles will be updated and published annual under our DFES Customer Behaviour Assumptions report from the beginning of RIIO-ED2.</b>
1.1.3.	DNOs to have in place standard and eff processes for sharing network planning information with other network licensees, including the ESO, network users and other interested parties, for example to enable innovation and support the development of	We proactively engage with bordering DNOs to share network data to ensure model interactions are captured. This enables a Whole System assessment between DNOs to be undertaken, ensuring it provides best value to the customers. Evidence of this will be recorded on the Whole System coordination register. We take data provided by our network users (e.g.	In developing the Network Development Plan output, we will exceed the minimum requirements by developing an 'NDP heat map'. This will increase the frequency and granularity of the proposed outputs and improve the Network Capacity visibility layer through a map. Network Capacity will be calculated, not just via a simple DC

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	<p>local authority and devolved government plans for decarbonisation. As part of this, we expect DNOs to liaise with their network users to collate and share data, to publish comprehensive and comparable heat maps that provide network users high value information about where to connect, and to inform their operations. These geographic information system datasets should be available for download or for access independently of DNO websites (for example, via Web Map Service server connections). Ofgem-led reforms to the LTDS will seek to licence minimum standards against these improvements.</p>	<p>G99 form data) and accurately represent their equipment in the network model, this includes updating any new information on the back of other whole system efforts such as the accelerated loss of mains protection change programme (ALOMPCP).  <b>Output: Whole system coordination register updated annually through ED2.</b>  Through Open Networks we have established an LAEP library to store information gathered by licencees (gas &amp; electricity distribution) ahead of requesting this information directly, so commonality of data is facilitated.  <b>Output: Reduce stakeholder fatigue by using the LAEP library throughout ED2.</b>  We have the existing week 24/42 data exchange with NG to share model data for planning purposes and the OC2 2-week ahead model from the ESO for operational and design stage planning.  We will continue to engage with NG to get future and other seasonal loading NG equivalent models for increased accuracy of assessments.  We have continually developed and improved our heatmap activity throughout ED1 and lead collaboratively activity to ensure that in ED2 a common metadata and data dictionary approach is taken for all electricity heat maps. We will integrate current and historic network data as well as committed and planned activity to ensure the most relevant and accurate detail is provided in a standardised format.  <b>Output: Common metadata and data dictionary approach for heatmaps before end of 2023.</b>  Our current heatmap is available in three ways currently, highly visual, for download and via API, meaning it is accessible independently of our website. This has been demonstrated through the recent NESM activity through ENA. This ensures that we're delivering</p>	<p>load analysis in excel, but will be out-performed by using robust electrical engineering analysis in power system software as an output and ensure consistent output with the connections planning processes.  <b>Output: NDP heatmap available by May 2024.</b>  We were the first DNO to publish a CIM model of an entire licence area, demonstrating early commitment. Through ED2 we will improve the granularity, accuracy and coverage of our CIM data.  <b>Output: CIM data available for EHV networks from now. By 2024, HV networks made available. By 2026, LV networks made available.</b>  The implementation of our Open Cloud Platform will provide an industrialised platform to store, access and utilise our heatmap and other relevant data. We will use this to create an energy data community to not just make data available in a technology agnostic manner but to drive collaborative energy sector and beyond insight from our and others' data.</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
		against the DBP principles and specifically, making data assets discoverable to potential users.	
1.1.4.	<p>DNOs to have in place transparent and robust processes for identifying and assessing options to resolve network needs, using competition where efficient.</p> <p>This should include demonstrable cross-sector engagement, optioneering, and planning with sectors or vectors other than their own.</p> <p>DNOs should consider flexibility and promoting energy efficiency in addition to innovative use of existing network assets and traditional reinforcement. The process of identifying options should include engaging with other network licence holders and current and prospective network users. Options must be fairly compared against one another, with flexibility used where it is economic and efficient compared to investing in traditional reinforcement or technological solutions. We expect a consistent approach for valuing flexibility, taking into account the option value it provides in the context of uncertainty. DNOs must ensure transparency in their approach to allow scrutiny of decision making.</p>	<p>During ED1, we have established internal and external flexibility related processes, both technical and commercial and we have demonstrated a robustness of process through internal audit being carried out. Through the end of ED1 and beyond, we will extend the audit process to include external audit and the scope of these will be expanded as standardisation of processes internally and across industry matures.</p> <p><b>Output: External audit of DFES in 2023.</b></p> <p>Our Sustain product for flexibility being considered as part of the C31E consultation process in late 2021 is a turn down to service, which allows reductions in energy consumption based on baselines derived from our standard network planning assumptions allows energy efficiency and flexibility to be treated equally in resolving potential constraints. Sustain will provide an ongoing revenue for customers providing lower contributions to demand peak compared to their peers, enabled either through active shifting or energy efficiency.</p> <p><b>Output: Sustain product specifically targeting domestic flexibility procured as business as usual before end of ED1.</b></p> <p>Through our procurement process, as detailed in our C31E statement, we run technology agnostic tenders to determine which flexibility options should be contracted with and at what cost. These costs are compared against a conventional reinforcement option to understand which the most preferential option is. The CEM (common evaluation methodology) tool is used which allows us to compare flexibility against other network capacity provision techniques and the results are published in our DNOA alongside the comparative analysis</p>	<p>Through ED2 we will continue to develop our approach to engaging with network users, through a variety of channels, as set out in our C31E statement.</p> <p>Work with stakeholders to present capacity requirement and options in a way that can be easily integrated with wider LAEP process. Our DNOA document will continue to provide transparency of decisions and we will develop the information provided within the publication with our stakeholders and industry. The DNOA will be assured by our independent scrutiny panel, which is being implemented ahead of ED2.</p> <p>Through a robust governance process, we will ensure the panel has the relevant skills to methodically assess the independence and performance of the DSO. We've been the first DNO to publish a DNOA and have so far published two iterations, and we are supporting other DNOs in beginning to undertake DNOA analysis.</p> <p><b>Output: External audit of DNOA in 2024.</b></p> <p>Development of a specific energy efficiency flexibility product which enables payment for energy efficiency measures to be front loaded, will support improved uptake of these types of measures. Sharing our flexibility data and combining this with our Social Indicator mapping to better target fuel poor and vulnerable will assist in rolling out a fair and just transition.</p> <p><b>Output: Energy efficiency flexibility product developed before end of 2024.</b></p> <p>We will develop the DNOA outputs to be used to estimate the wider cost implications of energy system transition, for instance, incorporating DFES outputs into pricing runs to estimate future DUoS charges to deliver scenario</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
		<p>of other options, including the recommended investment strategy. To date we have published two iterations of our Distribution Network Options Assessment document which uses the industry developed CEM (common evaluation methodology) tool to provide insight into the chosen investment option. We've been the first DNO to publish a DNOA in 2020 which allows us to demonstrate the transparent approach to optioneering we are taking.</p> <p>Our approach to forecasting has taken into account the latent benefits of energy efficiency and non-DSO flexibility provided by supplier time of use tariffs and other market interventions not driven by WPD. The assumptions behind this have been published in our customer behaviour assumptions report for dissemination to third parties.</p>	<p>pathways.</p> <p>Having procured the largest amount of DSO flexibility in the UK, we have a wide reach of active participants delivering flexibility products for us and ensuring we are developing a rich, competitive and deep flexibility market. We continue to monitor performance and manage the relationship through our Flexible Power Commercial Officers, who can support Flexibility Service Providers to improve their delivery efficacy. This ongoing dialogue also enables further operational barriers to be identified and improvements to be proposed. Our stakeholder engagement programme run through the C31E includes a number of formal and informal touch points for us to consult and consider views of market participants. This complementary mixture of engagement channels affords us the richest picture of how we have improve the value of our offering across adjacent customers, participants and system operators.</p> <p><b>Output: Comprehensive stakeholder engagement programme run throughout ED2 and reported on annually.</b></p>

## Role 2: Network operation

### Activity 2.1: Promote operational network visibility and data availability

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
2.1.1.	DNOs to improve network visibility and identification and sharing of operability constraints, including publishing this data to help avoid conflicting actions being taken by other network and system operators. DNOs must take reasonable steps to access and subsequently share, including by publishing, data and operability constraint information in a timely manner.	<p>Planning timescale data on the system needs for flexibility is shared via our Connected Data Portal.</p> <p>We also share a retrospective monthly looking backwards review of availability and utilisation accepted and dispatched for every active CMZ on the Flexible Power website</p> <p>Our Regional Development Programmes in both South West and Midlands are supporting the work on operational data exchange with the ESO and the primacy work needed to ensure conflict between ESO and DSO operations is minimised our reduced.</p> <p>As part of the RDP work we are developing processes to share more data about the operation of our network, including the flexibility services we are using and our best view on ANM systems.</p> <p><b>Output: By the end of 2023, ANM operational data will be publicly provided in real time.</b></p>	<p>We will use our experience built up during the ED1 period as a DSO to support iDNOs within our region to also develop capabilities. This will include sharing processes, documentation and systems to support iDNOs with DSO activities.</p> <p><b>Output: Shared collaborative tools developed by end of 2025.</b></p> <p>We will continue to develop the learning found from RDPs to improve the data sharing needed between DSOs and ESO/FSO into ED2 to allow us to better share real time information, and coordinate in scheduling timeframes.</p> <p>Before the end of ED1 we will be publishing flex service dispatch actions taken on the network with pricing and cost data and updating this not just annually as per the C31E process, but in much shorter timescales, aiming for near to real time.</p> <p><b>Output: Data on flexibility service dispatch to be published as open data, in as close to real time as possible, ahead of ED2.</b></p> <p>We have published month ahead availability and utilisation forecasts on Flexible Power. We are developing the data tools to enable this to be a week ahead acceptance and scheduling activity which will be accessible in a machine readable format via API. Both aid with network visibility and providing data to avoid operational conflicts.</p>
2.1.2.	We expect DNOs to submit a network visibility strategy and this should cover the use of all sources of network data including direct measurement from monitoring roll out, smart meter data, data analysis and modelling, and any other third party data sources. The strategy should explain how network	See 1.1.2	See 1.1.2

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	monitoring for operational purposes will inform operational decisions, including enabling the management and delivery of flexibility services; clear justifications for where and when monitoring is rolled-out, including explanations of any targeting for equipment deployment; and the specifications of equipment, including detail on the data captured, frequency of polling, and the mode of communicating data. Note, companies may wish to combine this strategy with network monitoring and visibility for network planning under role one.		
2.1.3.	DNOs to provide the ESO with information across timescales about the DER it is planning to instruct to dispatch. Data should include contracted parties, availability and information on scheduled and unscheduled utilisation. Sharing this information in a timely manner should enable the ESO to identify which DER are available for its own needs and improve the ability of DER to stack value across markets.	<p>Realtime power flows for our licence areas are already available via API on our Connected Data Portal. Month-ahead forecasts are published on the Flexible Power website to outline the expected windows of availability and utilisation needed for DSO operations in each active CMZ. <b>Output: Real time data available across all voltage levels by 2027, with industry leading coverage.</b></p> <p>The embedded capacity register is updated monthly and includes large generators or demand side response assets which are providing flexibility. Post-tender information is published regarding the contracted parties' assets and pricing. Through the RDPs we are working with the ESO on joint procurement and joint dispatch principles, as well as information exchange and visibility. Our procurement reports and post-tender award reports detail the MWs of flexibility contracted in each CMZ, along with the contracted party and pricing. We have designed our products to be as stackable as possible, acknowledging the benefits to participants and the DNOs. We will</p>	<p>Through our RDPs in South West and Midlands, the data exchange in both planning timescales and real time will be supplemented by co- developed primacy rules which will enable the DSO and ESO to jointly agree a merit order stack which will be the lowest cost solution to deliver the network capacity required for transmission and distribution needs. This will be trialled before ED1, but further developed and automated during ED2. Full rollout of this across the entire network and voltage levels will be put in place as the system becomes more active. <b>Output: By the end of 2023, service dispatch will be automated to industry principles.</b></p> <p>We will work with the ESO to make the sharing of planned DER dispatch a bilateral data sharing arrangement, enabling increased visibility of service availability and utilisation. Use of the ENA standard flexibility agreement may reduce the amount of flexibility procured as services can be jointly utilised. Our approach to joint procurement and dispatch will be developed in line with ENA Open Networks primacy principles.</p>



BPG Ref	Activity Description	WPD Meets	WPD Exceeds
		<p>continue to engage with providers to investigate how to better align with the wider market whilst retaining value for WPD. This is tied to our C31E processes. We expect this work to feed into the Open Networks project and work on stackability, ensuring that products were able to be scheduled in adjacent timescales to most other industry flexibility products.</p> <p><b>Output: Annual report on the stackability of flexibility services against other industry services.</b></p>	
2.1.4.	DNOs to gather sufficient information on DER characteristics and parameters to provide information and inform decisions to secure against events that could lead to disconnection of DER.	<p>We already gather significant information around DERs connected to and looking to connect to our network to ensure we understand their operation to mitigate disconnection. We are committed to working collaboratively across the industry to increase consistently the level of information we gather around DERs and importantly move to a digitalised capture and interaction process with DER operators. The ALoMP activity has demonstrated the value of greater DER asset information and we will continue to expand our Asset Management System to capture greater levels of customer asset information.</p> <p>We will use our data platforms to continually assess DER connected on our network to understand its operational parameters and performance to inform our optimised operational regimes. Our Network Visibility Strategy encapsulates how these aspects will be effectively implemented in more detail.</p>	<p>To ensure the transfer and sharing of relevant DER characteristics and parameters we will implement an API solution appropriate for individual operators and large scale developers alike to automate as far as possible the sharing of relevant DER information and providing regular audit capabilities, e.g. generator protection settings and outage window information.</p> <p><b>Output: API for generator characteristic data exchange by 2026.</b></p>
2.1.5.	DNOs to make available operational data that supports network users and other relevant stakeholders to make better decisions about how to use the network. Data should be readily available in agreed and common data formats. This could include, but is not	<p>We have led the UK DNOs in the adoption of the Common Information Model standard for network asset and connectivity data. Starting with the 2016 NIA project we have developed business processes to align data to the CIM standard. In 2020 we became the first UK DNO to utilise the CIM format to share network</p>	<p>Medium and long term forecasting is now well established and throughout ED2 we will further invest in short-term forecasting, five to 60 minutes, to ensure that future DER operation is effectively considered in the operation of the network, link to weather and other factors to mitigate the risk of DER</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	<p>limited to:</p> <ul style="list-style-type: none"> <li>• Working network configuration data.</li> <li>• Losses recorded at substation level.</li> <li>• Outages both planned and unplanned.</li> <li>• As recorded historic Feeder MW/MVA Utilisation and calculated headroom/footroom.</li> <li>• Utilisation and curtailment of areas under the control of capacity management systems such as Active Network Management systems.</li> </ul>	<p>asset and connectivity data externally.</p> <p><b>Output: Throughout ED2 CIM data to be published and regularly updated.</b></p> <p>In addition, we have taken a number of critical steps to harmonise the terms used both internally and externally. For example, all data published via the Connected Data Portal has consistent metadata and data dictionaries (discussed in further sections) and we have standardised our process to ensure common terms are used wherever possible.</p> <p>We are committed to extending our use of the Common Information Model to include all our assets and network connectivity and we will continue to work with industry partners to agree on common terminology wherever possible. We will seek to identify, use and build on industry standardisation initiatives such as the Energy Systems Catapult (ESC) developed glossary and Open Energy.</p> <p>We have implemented the Dublin Core metadata standard, as recommended by the EDTF. This has meant that we already consistently capture our metadata. This has enabled us to drive consistency in the presentation of data externally as well as linking related datasets and common data tags to support data discovery. We recognise that the Dublin Core metadata standard is useful to standardise the capture of information around data, however, we know that even greater value can be delivered through the expansion of standard metadata elements. We are supportive of delivering these expansions as a wider energy sector community to ensure consistency remains and serves customers and wider data users' best.</p> <p>Our current data access, sharing and processes mean that we have made significant steps towards</p>	<p>disconnection. This will be effectively supported through our Machine Learning and State Estimation Platforms.</p> <p><b>Output: AI derived short term forecasting implemented by the end of 2023.</b></p> <p>Making more data as visible and interactive for our customers as possible is key for the value of our data to keep increasing, therefore, we are committed to delivering greater data through visual means. This will include a centralised data mapping functionality with a number of overlays so the right information can be provided at the right time without the need to utilise often complex GIS systems. This will support new connections and flexibility propositions as well as data users such as local authorities; continuing to support their net zero ambitions.</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
		<p>this, namely sharing of planned outage information for relevant market participants and customers, real time data at licence area and GSP level and this will continue throughout ED2 as well as increasing the granularity in terms of voltage levels and specific network points.</p> <p>Sharing ANM and Flexibility historic and live operational data will also ensure optimised DER operation. We will engage with our stakeholders and market participants to ensure this data is made available in the right format at the right time.</p>	

## Activity 2.2: Facilitate efficient dispatch of distribution flexibility services

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
2.2.1.	<p>DNOs to have and regularly review a decision making framework for when DER are instructed to dispatch in real time. The decision making process, including alternatives considered, should be transparent. This should promote coordination across services (including curtailment as part of non-firm connection agreements and ESO flexibility services), maximise liquidity, avoid market fragmentation and ensure dispatch results in the best outcome for the whole system; this includes service provision to the ESO and other distribution networks. As part of this decision making framework, there must be rules in place for coordinating dispatch instructions for DSO and ESO flexibility services. This could be through primacy rules or more comprehensive optimisation processes that better enable stacking of</p>	<p>We receive and utilise the NG OC 2-week ahead model for planning/operational purposes, ensuring our flexibility dispatch programmes are cognisant of any transmission outages.</p> <p>We were the first DSO to have published a pricing strategy, to foster the market in areas of low competition and drive greater competition in areas of over-supply of flexibility.</p> <p>Pricing and value is one element that is considered when accepting availability and dispatching utilisation for operational purposes.</p> <p>We were also the first DSO to develop and publish acceptance and dispatch principles which cover security, cost, operability, competition and fairness. We have done and will continue to update these principles based on stakeholder feedback and system operability requirements.</p> <p><b>Output: By the end of 2023, service dispatch will be automated to industry principles.</b></p> <p>We have published monthly data on flexibility dispatched per zone, for</p>	<p>As part of our integration of flexibility services we have now established an Energy Management Centre within the DSO. This ensures that the operational decisions to utilise flexibility and the choice of services selected maintains the same level of independence from the DNO as the original design decisions to address network constraints with flexibility.</p> <p>The Energy Management Centre will also take the lead on developing the interactions between the DSO and DNO for operational purposes. This will ensure efficient use of flexibility and lead to the development of new processes and products to enable the DNO to make use of flexibility to address other operational issues, whilst retaining the competitive market considerations within the DSO.</p> <p><b>Output: Energy Management Centre established ahead of ED2.</b></p> <p>As part of our C31E process we are seeing feedback on our proposal to develop longer term flexibility products. This will establish a deep and wide market framework for</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	revenues for DER. The rules should be transparent, objective, and promote whole system efficiencies.	<p>both availability and utilisation. Through ED2 we will expand this datasets, using our connected data portal, enabling this information to be updated more frequently and closer to real time, as well as being able to be machine readable and accessible via API. As part of the RDP work we are developing processes to share more data about the operation of our network, including the flexibility services we are using and our best view on ANM systems. Initial processes, based on the sharing of planning data and basic real time information should be in place by 2022.</p> <p>We will continue to develop this data sharing into ED2 to allow us to better share real time information, and coordinate in scheduling timeframes. We will explore how secondary trading might be supported in these areas.</p>	<p>flexibility across ED2. These follow the same structure as our existing products acquired at the week ahead, with the key difference being that they will be acquired several months in advance. By acquiring some services further in advance we provide a greater degree of certainty to customers about the utilisation of their assets and reduce the operational risks we take into the week ahead process. These new products will also allow us to develop experience of the processes and data required to operate products in multiple timeframes and will build the knowledge we need to develop closer to real time products in ED2.</p> <p><b>Output: Long and Short term flexibility markets established ahead of ED2.</b></p> <p><b>Real time flexibility used for operational security in 2027.</b></p>
2.2.2.	The DNOs shall facilitate secondary trading of distribution flexibility services and curtailment obligations. In this context, facilitating means providing the relevant operational data, ensuring the DNO has processes in place to collect the relevant data about the trade, and making the operational parameters clear (and justified in the context of network reliability and efficiency).	<p>Our existing contracts for flexibility are novatable and secondary trading, with permission from the DSO, can be enabled manually. Our post-tender reports detail all contracts awarded and the parties involved with those contracts.</p> <p><b>Output: Secondary trading implemented manually before the end of ED1.</b></p> <p>We will develop more methods of sharing information around traded activity to stimulate secondary markets.</p> <p><b>Output: Data to inform secondary trading markets implemented as open data by end of 2023.</b></p>	<p>Our recent flexibility product evolution paper aligned to the C31E process explains our proposals for the delivery of basic secondary trading capabilities for flexibility services to be delivered in the next year. We expect this to help providers better manage any nonavailability and potentially trade positions to more economically efficient, but less certain assets. We will continue to develop our capabilities into ED2 to deliver more digitised support to secondary trading markets.</p> <p><b>Output: Standardised processes for secondary trading implemented by end of 2023. Secondary trading automated through APIs in 2024.</b></p> <p>Based on our experiences from secondary trading of flexibility services we will then look at how to expand this platform to enable secondary trading of curtailment obligations in a fair and transparent manner. We will also explore if forecasting processes developed for identifying flexibility service requirements can be reworked to</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
			assess if curtailment obligations are required based on current expected network conditions.
2.2.3.	DNOs to introduce clear processes for the design, development, and communication of the decision making framework. These should include transparent and participatory processes for stakeholder input.	<p>Our current processes for service selection align with the ENA Principles of Dispatch established in 2019 which set out a methodology for decision making in relation to service selection. These principles ensure fairness, transparency and market stimulation.</p> <p><b>Output: By the end of 2023, service dispatch rules set which governs the decision making framework will be published.</b></p> <p>We will be carrying out extensive engagement as part of our C31E process. Service selection will for a part of this. This will extend into ED2 as we improve our processes.</p>	<p>In order for us to select flexibility services consistently and efficiently (in line with C31E) we are developing an operational system which will automate the selection of flexibility services in line with our principles published in C31E. The newly developed service selection system will make efficient service selection recommendations to network operations staff and allow them, where necessary, to adjust these recommendations in response to real network conditions. Data on the decision making can be provided in real time to third parties, enabling transparency of decision making to be maintained and the assumptions underpinning service value to be understood.</p> <p><b>Output: By the end of 2023, supporting data of operational decisions will be published as open data.</b></p>
2.2.4.	DNOs to develop efficient, scalable dispatch instruction infrastructure and avoid proprietary systems. We expect clear definitions of different types of dispatch instruction for distribution flexibility services and transparent rules about when and in which markets they should be used. Circumstances for different dispatch instructions should be welljustified. Definitions of these circumstances should be developed with input and cooperation from network users. The application of hard dispatch controls shall be for the improved reliance on market-based mechanisms, not to the detriment of their development.	<p>To allow the scaling up of use of flexibility services and the move to more real time decisions to utilise services we are developing additional APIs to the Flexible Power Platform for the dispatch and monitoring of flexibility services. These will be integrated with WPD systems to allow real time dispatch of services by DSO staff. Additional integrations will then be developed with our existing network management systems to provide visibility of dispatched services to DNO operations staff and provide them with the capabilities to call on contingency services to support the network following unexpected events.</p> <p><b>Output: Real time flexibility used for operational security in 2027.</b></p> <p>WPD's approach to flexibility services has been to remove any requirements for hard dispatch mechanisms and reduce barriers by implementing software API monitoring and dispatch protocols.</p>	<p>The centralised flexibility data store is expected to be completed and deployed by the end Q1 2022. This is a significant milestone making technical, commercial and operational data externally available in real time within ED1. This approach will not only promote the potential value of the data, but it is our commitment continually drive value from this data.</p> <p><b>Output: Data on flexibility service dispatch to be published as open data, in as close to real time as possible, ahead of ED2.</b></p> <p>The experience gained in developing and using this flexibility data store will define the specification for the next generation data store which is planned to be deployed in ED2. The next generation data store will further unify flexibility operations across the business and ready us to respond to changing network and market needs as the UK transitions to net zero.</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	Capabilities in network operations, for example in dispatch instructions and associated system architectures shall not be hard coded to the DNO. These must be developed so that they can be cost effectively assigned to another party in future, if this is needed.	<b>Output: Electronic dispatch APIs for key flexibility functions available ahead of ED2.</b> ANM, network access and system security functions have made use of hard-wired dispatch via Connections Control Panels where these have been agreed in connection agreements.	<b>Output: Data on flexibility service dispatch improved in terms of scope, granularity and accuracy by 2026.</b>

## Role 3: Market development

### Activity 3.1: Provide accurate, user friendly and comprehensive market information

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
3.1.1.	<p>DNOs collate and publish as much relevant data and information as reasonable that will help market participants identify and value opportunities to provide network services to DNOs and take market actions that support efficient whole system outcomes. Relevant data and information include planning and operational data (such as that set out in Activity 1.1 and 2.1). This should be provided with sufficient lead times to enable wider participation in distribution flexibility services markets. It also includes information on historic and future distribution flexibility services market actions. This should include tender results, prices bid and paid, the carbon content of aggregated units, how often DER is dispatched (and volumes) and other actions taken by the DNO (with anonymisation as required), including curtailment as part of non-firm connection agreements. The information should include all requirements set out in licence conditions to support DER to identify revenue opportunities. This increases the accessibility of tendering for distribution flexibility services for flexibility providers (while also taking account of DNOs flexibility needs).</p>	<p>We have been providing a rich suite of market and technical data to flexibility markets since 2018 - a significant portion of ED1. This information has been made publically available through our Network Flexibility Map and the Flexibility Service Value Calculator, available on both the WPD website and Flexible Power Website.</p> <p><b>Output: Flexibility market stakeholders annually consulted on provision of data, tools and publications annually.</b></p> <p>The Network Flexibility Map provides comprehensive flexibility Signposting information about potential, future, network constraints. Network constraint geographic information and flexibility service forecast information can be viewed graphically through the web-based interactive map. Alternatively, the data is available to download in commonly used formats such as excel and PDF documents. Since late 2020 the entire flexibility and Signposting mapping data set has been made available as a single download on our Energy Data Hub and Connected Data Portal.</p> <p>We will continue to engage with our stakeholders to maximise the value of the data we publish. We are engaging with Ofgem on our regulatory requirements (via C31E), but see these as a minimum. We will engage via our C31E process. We publish tender results, including price information and contracted technology type within 30 days of each tender closing. Utilised forecast data to signpost where market opportunities for flexibility services may become available, demonstrating requirement.</p>	<p>We will provide market information on a regular - monthly or even weekly basis, subject to stakeholder feedback, by the end of ED2.</p> <p>The Flexibility Service Calculator, available through the Flexible Power website, was first deployed mid-2019. This allows prospective Flexibility Service Providers (FSP) to obtain an estimation of the potential annual earnings for their asset in a particular Constraint Managed Zones (CMZ). Anyone can access the tool through the website and it is simple to use, only required an assets capacity to be inputted. The Flexibility Service Calculator is updated in line with our Flexibility Service tenders. As the tenders become more 'dynamic' or 'near real time', the pricing and value information in the valuation Flexibility Service Calculator will also be remain synchronised with Flexibility Service tendering time frames.</p> <p><b>Output: Data on flexibility service dispatch to be published as open data, in as close to real time as possible, ahead of ED2.</b></p> <p>We are developing systems that will enable us to publish tender/trade outcomes within 24hrs of closure. We expect to be able to provide information on the carbon content of assets in a machine readable format at a similar rate of refresh.</p> <p><b>Output: Data on flexibility trade data to be published as open data, in as close to real time as possible, by end of 2023.</b></p>



BPG Ref	Activity Description	WPD Meets	WPD Exceeds
3.1.2.	DNOs should, with stakeholder input, develop robust strategies for how they will collate and publish more helpful information, wherever possible consistently and in coordination with other network licence holders, and communicate this clearly.	As part of our annual engagement with stakeholders on services we buy and the processes we use (our Evolution of Distribution Flexibility Services document), we ask for feedback on the data we publish and how it can be improved. This then feeds into our formal C31E consultation and ultimately our Procurement Statement, stating what data we will publish. This sits alongside the minimum obligatory reporting set out in licence condition C31E.	We will publish all the relevant information on our Connected Data portal so that it is easily accessible and machine readable. Where possible we will look to align the rate at which we publish data, to when we create it, rather than just the minimum regulatory requirements. This will enable a greater level of data refresh than as required by the regulator. <b>Output: Data on flexibility service dispatch to be published as open data, in as close to real time as possible, ahead of ED2.</b>
3.1.3.	DNOs should regularly and actively engage with market participants to understand what data and information is helpful to support market development. While there will be minimum legal requirements set out in licences, we expect DNOs to use their stakeholder engagement to consider the most effective format and frequency of publishing that data to ensure it is user friendly. The information must be easily accessible and navigable. We expect this includes publishing data in machine readable formats.	Our flexibility service provider performance management is administered automatically. We proactively seek feedback from market participants through the circulation of surveys. This includes identified touch points and performance management. We engage with flexibility stakeholders on a bi-annual basis through webinars and engagement events and encourage feedback through these events. Our recently published C31E consultation has questions targeted at understanding what data market stakeholders and participants current use and what additional data they require access to. <b>Output: Flexibility market stakeholders annually consulted on provision of data, tools and publications annually.</b>	Our Connected Data Portal ( <a href="https://connecteddata.westernpower.co.uk">https://connecteddata.westernpower.co.uk</a> ) already serves data up in a machine readable format which is also accessible by API. Our Flexibility Service Evolution paper sets out how we're engaging with stakeholders to design new products, services and systems to further develop markets. This includes data systems and information to more regularly and accurately serve the data. Annually, our C31E document will be updated to reflect the widening level of stakeholder engagement reaching the many publications and touchpoints we have with flexibility participants, such as DFES, DNOA, procurement cycles, current participants, major energy users and fuel poor/vulnerable customers.
3.1.4.	DNOs should, where reasonable, tailor both their information provision and engagement approaches to reflect different needs of potential market participants, including groups in vulnerable situations. In many instances, collaboration across DNOs in engagement is expected to reduce duplication, make it easier for stakeholders to engage	We publish our information in a number of ways to help tailor it to different stakeholders and their needs. For example the information on our Flexibility procurement needs is published in a Map for (to provide an overview and simple interface), via a formal document (to support the procurement activities) and in raw format on our connected data hub (for bulk download). We will continue to collect feedback on how we share data and expect to publish the same data in a multitude of ways. We are engaging in all the relevant Open Networks work to help align	In addition to tailoring our information provision and engagement approaches to target different potential market participants we are also working on developing new flexibility products that are targeted towards different types of participants. Our current C31E consultation includes our plans for launching a Sustain product, this will be based around participants delivering predetermined behaviours set at the contract stage. This new product will provide a simplified option to participate in

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	and avoid stakeholder fatigue.	<p>our publications.</p> <p>We also tailor our engagement methods for different users. Starting with different routes through the information on our website, through to webinars, face to face surgeries and tailored community engagement.</p> <p><b>Output: Reduce stakeholder fatigue by using the LAEP library throughout ED2.</b></p>	<p>providing flexibility services to potential market participants that are not able to commit the resource required to take part in the weekly processes associated with our existing products. In particular our new Sustain H product, which has already been trialled through an innovation project, is targeted towards domestic customers and will allow them to take part by making simple changes to their demand patterns. <b>Output: Sustain product specifically targeting domestic flexibility procured as business as usual before end of ED1.</b></p>
3.1.5.	DNOs should seek to ensure the information they publish is as accurate and unbiased as reasonable (ie correct at time of publication, as close as possible to the actual value and not skewed in any direction).	<p>The information we publish will be subject to our standard Data Assurance processes.</p> <p>Through the end of RIIO-ED1 and beyond, we will standardise our internal processes undertaken to derive this information and extend the internal audit process to include an externally appointed auditor. The scope of these will be expanded as standardisation of processes internally and across industry, starting with DFES and DNOA.</p> <p><b>Output: External audit of DFES in 2023 and DNOA in 2024. Audits repeated based on the publication cycle through the price control.</b></p> <p>Much of the data we will be publishing will be extracted from core business systems and we will automate the process of publication – i.e. information on trades and dispatched flexibility will be directly reported without aggregation or manipulation, removing the likelihood of errors being introduced. To ensure the information published is unbiased, our independent DSO scrutiny panel will provide robust challenge and review.</p> <p><b>Output: Independent DSO scrutiny panel established ahead of ED2.</b></p>	<p>Information published under our Connected Data portal is leading the industry in terms of accessibility and openness.</p> <p><b>Output: Data on flexibility service dispatch to be published as open data, in as close to real time as possible, ahead of ED2. Flexibility trade data to be published by end of 2023.</b></p>

### Activity 3.2: Embed simple, fair, and transparent rules and processes for procuring distribution flexibility services

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
3.2.1.	<p>DNOs to have clear processes in place for developing and amending distribution flexibility services products, contracts, and qualification criteria, that are, wherever possible, standardised. The processes should be transparent and participatory, involving other DNOs, the ESO, and current and potential distribution flexibility service providers. DNOs should also coordinate and engage with third party platform providers, who can offer system value by providing new routes to market and driving whole system outcomes. DNOs should not prevent the emergence of this sector and should enable third party platforms to 'plug-in' to DNOs' flexibility procurement processes. Products and contracts should be adaptive to reflect prevailing system needs, type, and availability of flexible resources. The objective of these processes is to enable as wide participation in distribution flexibility services markets as possible.</p>	<p>Within our C31E statement, we set out the defined cycles for engaging with industry, market participants and other stakeholders when amending our approach to flexibility. We acknowledge our role as a neutral market facilitator, and as such are looking to make our products as accessible as possible. We expect third party market platforms to play an important role in future markets and so are keen to facilitate them where possible. We have experience of this through the use of different platforms to date, but this will be more embedded in our interface standards going forward. This includes the provision of standard data (already in place in ED1) and the enhanced digitalisation of our processes to simplify integration. Through ED2 we will digitalise more interactions with the Flexible Power Portal and provide standardised systems and processes which enable activities to be undertaken by others as part of their business activities. This will include aggregators, platforms and marketplaces.</p> <p><b>Output: Standardisation of data exchanges to enable third parties to serve data on our behalf by end of 2023.</b></p>	<p>In our Evolution of Distribution Flexibility Services Procurement document, we have set out how we see services evolving.</p> <p><b>Output: C31E consultation completed annually and documents published to timescales.</b></p> <p>The document sets out our intended direction in both the long and short term to products and processes. It also sets out our approach for interfacing with exchanges and marketplaces as well as other issues which need further exploration for a mutually agreeable approach in a mature market – such as grandfathering rights and non-deliverability penalties. This is being engaged on and will feed into our formal C31E consultation. We expect to update the document yearly.</p>
3.2.2.	<p>DNOs should identify the optimum combination of longer and shorter term lengths of markets and contract lengths reflecting the network need. Needs should be neutrally defined, to allow for a range of flexibility providers to participate. This will help</p>	<p>We clearly state how we currently procure, operate and dispatch flexibility services in our Procurement Statement. In our Evolution of Distribution Flexibility Services Procurement document, we have set out how we are proposing to build a rich, competitive and deep flexibility marketplace. Our proposals cover proposed additional products and</p>	<p>We have consistently been the first DNO to implement the ENA standard agreement, leading on the adoption of good practise.</p> <p><b>Output: All flexibility contracts awarded to the most recent ENA standard flexibility agreement at the time of award.</b></p> <p>We will also be deploying a coordinated service with the ESO via our Regional Development</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	<p>improve market liquidity and the opportunities for innovation and dynamic competition. Individual decisions and frameworks for deciding market timeframes and contract lengths should be transparent, informed by stakeholders and justified as being the most economic and efficient solution.</p> <p>Notwithstanding, deviations from the standard should be justified with clear governance processes for managing change that should be clearly communicated.</p> <p>DNOs should have clear, comprehensive and transparent mechanisms and associated commercial structures for coordinating distribution flexibility services and ESO flexibility services procurement.</p> <p>DNOs shall not act as the commercial route for DER accessing ESO flexibility services.</p> <p>Transparent (and possibly tripartite) commercial agreements may be required to reflect the potential effects of DER dispatch on distribution system operability and the role of DNOs in setting dispatch parameters (as set out in Activity 2.1 and 2.2).</p> <p>These agreements should remove exclusivity clauses as far as possible, including with regard to non-firm connections.</p> <p>Coordination on dispatch parameters should enable a closer to real time understanding of what DER needs to be armed and available for a particular service, and what</p>	<p>processes which would enable long term, short term and real time markets to sit alongside each other.</p> <p><b>Output: Long and Short term flexibility markets established ahead of ED2. Real time flexibility markets widened in 2025.</b></p> <p>Having implemented the ENA standard agreement, this removes any exclusivities clauses, enabling any connection to our network to participate in providing flexibility services.</p> <p>We have led on work to better understand the stackability of products and continue to lead on the work on ESO coordination via Primacy Rules (which builds on our experience in the RDPs).</p> <p><b>Output: Annual report on the stackability of flexibility services against other industry services.</b></p>	<p>Programme.</p> <p>We will establish real time markets and use these markets to improve the security and resilience of the network.</p> <p><b>Output: Real time flexibility used for operational security in 2027.</b></p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	can be available to provide other services. DNOs should consider arrangements to support DERs to provide services that meet both DNO and ESO needs.		
3.2.3.	DNOs should make available the necessary data to enable secondary trading, for example capacity and other peer-to-peer trading. Enabling includes defining, communicating and justifying the parameters in which these trades can take place for operability purposes.	<p>We are engaging on the delivery of basic secondary trading capabilities to be delivered ahead of ED1 within our C31E flexibility evolution paper. This focusses on the DSO role as a neutral market facilitator rather than a full trading platform. In 2022, a manual trading capability will be established, allowing trades to be processed between qualified parties.</p> <p>Existing contracts allow this to happen due to our DSO flexibility contracts not having terms of exclusivity and being able to be novated at our discretion.</p> <p><b>Output: Data to inform secondary trading markets implemented as open data by end of 2023.</b></p> <p>Our Flexibility Product Evolution Paper explains how we will be standardising data and processes and through digitalisation we will enable platforms to directly and automatically undertake secondary trading of contracts.</p> <p>We aim to further develop these requirements through our innovation portfolio, and then implement fully digitised systems in ED2.</p> <p><b>Output: Secondary trading implemented manually before the end of ED1.</b></p>	<p>We have included an EJP for the development of a robust system for the sharing of data needed to facilitate secondary trading. This sets out the timescales, systems and costs needed to enable this functionality.</p> <p><b>Output: Standardised processes for secondary trading implemented by end of 2023. Secondary trading automated through APIs in 2024.</b></p>
3.2.4.	Market support services, such as pre-qualification, credit checking and settlement must enable simple and cost efficient participation in markets. DNOs should enable, and never prevent, the opportunity for third parties to provide these services where they could do so more efficiently.	<p>Within our Evolution of Distribution Flexibility Services paper, we have set out our vision of a procurement hub, which will standardise and automate the capture of data required in the pre-qualification process, aligned to Open Networks good practice and enable the opportunities for third parties to undertake this function on our behalf.</p> <p><b>Output: Standardisation of data exchanges to enable third parties to serve data on our behalf by end of 2023.</b></p>	<p>Using our proposed procurement hub, platforms will be granted access to automatically register assets onto our system as long as they meet the pre-defined criteria. This criteria can be built into the platform's own processes to ensure a seamless route to procurement handled by a third party.</p> <p><b>Output: Pre-qualification data to be able to be served to WPD by third parties over API by end of 2023.</b></p> <p>As part of our commitment to share best practice within the industry we have since opened up the Flexible</p>

BPG Ref	Activity Description	WPD Meets	WPD Exceeds
		<p>When first developing the Flexible Power Portal, we utilised third party developers to build and host both the website and the Flexible Power dispatch system as it proved more efficient to bring in the outside expertise required to develop this than attempting to do this in-house. For any future functions we require we will continue to consider whether these could be more efficiently delivered by a third party.</p>	<p>Power brand to become a joint initiative involving the vast majority of the UK DNOs. Expanding this initiative to be a multi-DNO project has not only proved more efficient for all involved but will also make it easier to achieve a degree consistency across the industry and reduce the work required by potential market participants to provide services to multiple DNOs.</p> <p><b>Output: Best practice and flexibility process development shared with other DNOs ahead of ED2.</b></p>
3.2.5.	<p>DNOs to introduce other proportionate measures, developed with robust stakeholder engagement, to identify and address actual and perceived conflicts between its DSO and network ownership roles or other business interests. The introduction of such measures should enable DNOs to efficiently plan, develop and use their network, taking into account and using flexible alternatives to network reinforcement where efficient for the system, in a visibly neutral way. At a minimum, this should include demonstrable executive level accountability and board level visibility of key DSO decisions across the planning, operation and market facilitation functions. This should also include clear and separate decision making frameworks, supported by independent oversight, such as external auditing, to promote transparency and enable scrutiny. Additionally, to support the justification</p>	<p>In early 2021, functional separation of the DSO was completed, reporting directly into the WPD Operations Director, providing executive level accountability and board level visibility. During the ED2 business planning process, options for DSO governance were testing with stakeholders and there was strong agreement for the options taken forward.</p> <p><b>Output: Functional separation implemented ahead of ED2.</b></p> <p>Our forecasting framework is aligned with ESO and CCC scenarios enabling direct comparisons to be drawn and benchmarking to occur. Forecast volumes are supplemented with customer behaviour data from smart meters, innovation projects and network monitoring to derive the MW impact, which is transparently shared. Network requirements are identified and described in reports such as Shaping Subtransmission and the Network Development Plan, enabling the oversight on requirements. These requirements are also signposted as flexibility requirements on our network flexibility map, across a number of DFES scenarios, which feeds the market. Using market system need data and procurement out-turn data, the decisions behind our investments</p>	<p>We have exceeded baselines for the ED2 by carrying out many of the expected mitigations ahead of other DNOs, within ED1. We will commit to going faster and further with DSO maturity to benefit our customers. Our DFES, DNOA and Shaping Subtransmission publications have been industry leading and set up a solid ground work to improve at a rapid pace of change. Through setting up an independent DSO scrutiny panel before the end of ED1, we will have established rigorous governance arrangements for the whole of ED2, with further improvements being undertaken as the scope of DSO increases and as the processes, roles and responsibilities become more formally codified within the industry.</p> <p><b>Output: Independent DSO scrutiny panel established ahead of ED2.</b></p> <p>WPD will also take a leading role in formalising the role of the DSO, both by developing internal policies and processes within WPD as a model for DNO-DSO interaction, but also through the Open Networks programme so these can be more widely shared and adopted.</p>



BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	<p>of DNOs' proposals as proportionate, we expect DNOs to set out conflict mitigation options that were considered but not proposed, including legal separation if this is not part of the DNO's suite of proposals. As part of their justification, DNOs should include the available supporting information on the likely costs, timings and implications of these alternative options or a narration of initial views. In parallel to the business planning process, Ofgem will continue to explore the value of alternative governance arrangements to help us meet government's net zero goals. Whilst the options we explore in this parallel governance work will consider local arrangements more broadly, in the short term we are keen to assess a range of options for conflict of interest management beyond what we have set out in this document, including legal separation. We know that the extent to which companies have already considered legal separation varies substantially and therefore the available information or narrative that could be submitted in their final Business Plan will range from a narrative of views, up to more detailed costs and benefits. The information in the plans will be useful starting points. Prior to our determinations on the RIIO-RIIOED2</p>	<p>can be replicated using public datasets. We explain our decisions, the methodology tools used and the outcomes in our DNOA document for transparency.</p> <p><b>Output: DNOA published throughout ED2 on a six monthly basis.</b></p>	



BPG Ref	Activity Description	WPD Meets	WPD Exceeds
	<p>price control, we will separately be seeking detailed cost and benefit information from companies to inform our view about governance arrangements. For the avoidance of doubt, any subsequent information provided would not form part of our decision relating to the Business Plan incentive. If we decide the baseline DSO conflict of interest requirements set out in this document are not sufficient, any costs associated with further changes beyond the baseline would be addressed separately through the appropriate mechanism, which will be confirmed as part of our determination process.</p>		

## Appendix A02 - Smart Meter Strategy

- 16.1. Our Smart Meter Strategy outlines how we will harness the data provided by the use of smart meters in order to further improve service delivery and prevent power cuts.
- 16.2. The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/42012>

## Appendix A03 - Network Visibility Strategy

- 16.3. In April 2020, we published an initial Sensors and Measurement Strategy. As part of our Business Plan work this has been revised and re-issued as our Network Visibility Strategy, which identifies the monitoring requirements needed to develop smart networks, improve network design and enhance network security.
- 16.4. The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/42009>

## Appendix A04 – Whole Systems Strategy

- 16.5. We have produced a Whole Systems Strategy which details how we will partner with other organisations to ensure we always deliver the most effective solution to meet our customers' net zero aspirations.
- 16.6. The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/42006>

## Appendix A05 - Digitalisation Strategy and Action Plan (DSAP)

- 16.7. We have developed a comprehensive Digitalisation Strategy and Action Plan which are central to our plans for a smarter energy system and increased sharing of data.
- 16.8. The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/42003>

## Appendix A06 - DSO Strategy

- 16.9. We were the first DNO to publish a costed DSO Strategy in 2017 which has been updated to reflect changing requirements and industry developments.
- 16.10. The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/42000>

## Appendix A07 - Electric Vehicle Strategy

**16.11.** The EV Strategy describes the challenges, along with the innovation and solutions, which will be adopted to prepare our network for the millions of electric vehicle drivers who will want to charge their EVs at a time and place that suits them.

**16.12.** The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41997>

## Appendix A08 - Heat Pump Strategy

**16.13.** In 2020, we became the first DNO to publish a bespoke, annually updated Heat Pump Strategy document. The strategy sets out how WPD will enable heat pump owners to connect to the network in a way that suits them, using innovation and other initiatives to make this happen.

**16.14.** The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41994>

## Appendix A09 - Losses Strategy

**16.15.** Since 2013, we have produced a Losses Strategy, which is updated annually. This strategy supports our commitment to reducing losses associated with our network.

**16.16.** The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41991>

## Appendix A10 - Net Zero Communities Strategy

**16.17.** We have implemented a Net Zero Communities Strategy, which outlines our enduring commitment to community energy and highlights our stakeholder engagement approach to delivery.

**16.18.** The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41988>

## Appendix A11 - Innovation Strategy

**16.19.** Each year, we publish an ambitious Innovation Strategy to reflect rapidly changing external factors including government policy, stakeholder priorities and to incorporate learning from the previous 12 months. The strategy looks ahead to 2035, but provides more detail on shorter term priorities, requirements and proposed initiatives.

**16.20.** The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41985>

## Appendix A12 - Telecoms Strategy

- 16.21.** We have produced a Telecoms Strategy which is updated annually and available as a standalone document.
- 16.22.** The strategy can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41982>

## Appendix A13 - Distribution Future Energy Scenario (DFES) Reports

- 16.23.** Since 2015, we have been creating Distribution Future Energy Scenario (DFES) reports. From 2020, our System Operator team is producing reports annually to forecast rapidly changing low carbon technology uptakes up to 2050. The DFES projections have been aligned to the latest National Electricity System Operator (ESO) scenario forecasts which are available when the DFES process is carried out.
- 16.24.** The reports can be found on our website at:
- East Midlands Report: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41979>  
South Wales Report: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41976>  
South West Report: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41973>  
West Midlands Report: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41970>

## Appendix A14 - Shaping Subtransmission Reports

- 16.25.** The scenario information data from the DFES analysis is used to create demand, generation and storage load sets which are then modelled to identify the impacts on the network which could lead to constraints. These are published in our Shaping Subtransmission document series.
- 16.26.** The reports can be found on our website at:
- East Midlands Report: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41967>  
South Wales Report: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41964>  
South West Report: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41961>  
West Midlands Report: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41958>

## Appendix A15 – Distribution Network Options Assessment

- 16.27.** The Distribution Network Options Assessment (DNOA) outlines investment decisions made by WPD in order to deal with constraints that arise across our license areas. This includes demand side response procured through WPD's Flexible Power, conventional reinforcement schemes and innovative solutions such as active network management. To determine the economically optimal solution, cost benefit analysis is carried out which is described in the DNOA. By

outlining our analysis process stakeholders and customers can be assured that WPD is giving them the best possible value for money while maintaining a secure and sustainable network.

- 16.28.** The DNOA also works in tandem with Flexible Power in helping inform flexibility providers of the potential for future opportunities to provide flexibility services with signposting data for the next 5 years.
- 16.29.** The DNOA is published on our website at <https://yourpowerfuture.westernpower.co.uk/downloads-view/41955>

## Appendix A16 - Acceptance and Dispatch Principles

- 16.30.** During the operational phase of flexibility, the DSO decides which flexibility services are accepted from the flexibility service provider's declarations, and closer to real-time, decides on which services are selected for dispatch and activation. To ensure transparency of actions, acceptance and dispatch principles have been published which outline the criteria used to select these functions.
- 16.31.** The principles are published at: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41952>

## Appendix A17 – Procurement timetable

- 16.32.** WPD runs a six monthly procurement process and has established regular periods for signposting, qualification, tendering and award. A two year forward looking procurement timetable is published to signal future intentions to the market.
- 16.33.** The timetable can be found at: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41949>

## Appendix A18 – Flexibility tender results

- 16.34.** The results of concluded flexibility tender results have been openly published since 2017.
- 16.35.** The results can be found at: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41946>

## Appendix A19 - Distribution flexibility services procurement statement (C31E)

- 16.36.** As part of licence condition C31E, we have published a statement detailing the various routes to procurement we intend to use to seek flexibility services in the coming regulatory year. This document sets out our approaches to procurement, the products being sought and the methodology used to award contracts.

- 16.37.** The statement can be found on our website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41943>

Procurement Results: 2017/18, 2018, 2019 H1, 2019 H2, 2020 H1, 2020 H2, 2021 H1, 2021 H2

## Appendix A20 – Flexibility service procurement process

- 16.38.** This report details the full process all interested parties are required to follow in order to be eligible to tender for participation in WPD flexibility services.
- 16.39.** The report can be found on our Flexible Power website at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41940>

## Appendix A21 – Service Partner Agreement and Guidelines

- 16.40.** Aggregators who have integrated with the Flexible Power platform may wish to become a registered service partner of Flexible Power. This allows their contact details and logo to be added to our service partner webpage, directing flexibility service providers to them if seeking aggregation routes to participation.
- 16.41.** The service partner agreement and guidelines can found at:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41937>

## Appendix A22 - Pricing strategy

- 16.42.** The pricing strategy describes the competition tests undertaken when procuring to decide whether sufficient competition exists to move to a “best offer” pay-as-clear price discovery or whether fixed pricing is required.
- 16.43.** The strategy can be found here: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41934>

## Appendix A23 – Clearing process

- 16.44.** To inform zonal pricing when in a competitive zone, a clearing methodology is employed to select the amount of flexibility service providers and the aggregate amount of capacity taken forward to determine the clearing price.
- 16.45.** This can be found here: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41931>

## Appendix A24 – Evolution of Distribution Flexibility Services Procurement Document

- 16.46.** We are evolving the way our flexibility products, processes and systems are aligned to maximise participation, stackability and competition.
- 16.47.** More details can be found at: <https://yourpowerfuture.westernpower.co.uk/downloads-view/41928>

## Appendix A25 – Standard Flexibility Agreement

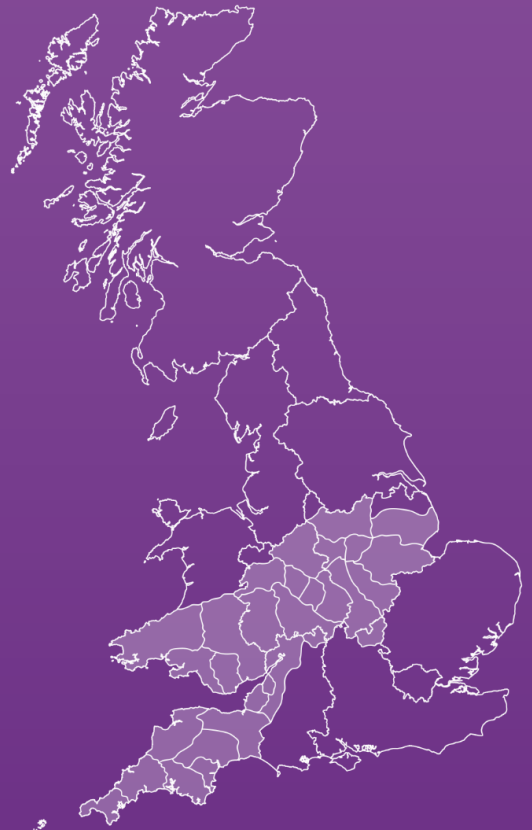
- 16.48.** A standard whole system flexibility contract has been created by Open Networks. WPD has committed to adopt and use the standard contract, including swift implementation of any future changes. Since the original publication of the version 1 contract, we have used these in our subsequent tenders.
- 16.49.** The latest version of this contract is published here:  
<https://yourpowerfuture.westernpower.co.uk/downloads-view/41925>

## Appendix A26 – Further governance options considered

- 16.50.** The governance options proposed within RIIO-ED2
- 16.51.** The following options were considered but further separation was discounted due to the additional costs required and the lack of delivered benefits without licence separation:

		<2020	2021	ED2
Combined activity	<ul style="list-style-type: none"> <li>Perceived conflict remains</li> <li>No additional costs</li> </ul>	✓		
Functional separation	<ul style="list-style-type: none"> <li>Costs include future provision in system builds for further separation</li> <li>Costs for management structures and internal management processes</li> <li>No additional facilities or staffing required</li> </ul>		✓	✓
Assured compliance	<ul style="list-style-type: none"> <li>Additional costs for internal and external audit</li> <li>Independent DSO scrutiny panel member costs and costs incurred in setting out governance framework</li> </ul>			✓
Codification	<ul style="list-style-type: none"> <li>Time and staff costs for upfront development of SLAs, contractual codification of data exchanges</li> <li>Costs for resources to consult with industry and stakeholders</li> </ul>			✓
Physical separation	<ul style="list-style-type: none"> <li>Additional ongoing staff required in shared functions to remove any split roles and inter-business communication</li> <li>Impacts on management of wider DSO and DNO departments involved</li> <li>Includes physical development works to remove shared office facilities and duplicate</li> </ul>			
Legal separation	<ul style="list-style-type: none"> <li>Further costs for establishing a directorship, debt financing</li> <li>Additional ongoing costs for duplicate head office functions – finance, HR, IT, comms or creation of a legal shared service entity with costs passed through DRS</li> <li>Shared service function contracts/SLAs</li> <li>Regulatory burden on setting out new licences for different functions</li> </ul>			
Separate ownership	<ul style="list-style-type: none"> <li>Additional upfront costs for further diversification and other ownership models</li> <li>Further costs for purchase and transfer</li> </ul>			





Western Power Distribution (East Midlands) plc, No2366923  
Western Power Distribution (West Midlands) plc, No3600574  
Western Power Distribution (South West) plc, No2366894  
Western Power Distribution (South Wales) plc, No2366985

Registered in England and Wales  
Registered Office: Avonbank, Feeder Road, Bristol BS2 0TB

[www.westernpower.co.uk](http://www.westernpower.co.uk)

