

DSO strategy

February 2021



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1 About Electricity North West

Electricity North West Limited is one of 14 electricity distribution network operators (DNOs) in Great Britain. We are responsible for maintaining and upgrading 56,000km of network and nearly 500 major substations across the region. We supply electricity to the diverse communities in the North West of England which extends from Macclesfield all the way up to Carlisle.

We are regulated by the Office of Gas and Electricity Markets (Ofgem) who provide DNOs with the license to operate and decide what's fair for us to charge our customers for each price control period.

Our current price control began in 2015 and runs to 2023. It's referred to as RIIO-ED1. In full, that stands for Revenue = Incentives + Innovation + Outputs, Electricity Distribution 1. Under this framework, the price we can charge our customers is fixed until the next price control, RIIO-ED2, which will run from 2023 until 2028.

Work is already underway to set the framework for RIIO-ED2 that applies to all electricity distribution network companies. The framework will determine what RIIO ED2, which begins on 1 April 2023, looks like.

The period of time which the RIIO-ED2 price control covers will see significant change in the way electricity is generated, consumed and stored, driving innovation across the whole energy system both now and into the future

2 Introduction

As part of the industry-wide transition to distribution system operation (DSO), we will take on a neutral and trusted role in proactively managing the energy system in the North West, to drive the changes needed to decarbonise heat and transport and achieve net zero carbon emissions.

This updated DSO strategy describes the progress we have made since publishing our first strategy document in 2018 and the next steps on our DSO and net zero carbon journey. We know from engagement carried out over the last year that our stakeholders support our plan and we are committed to continuing to involve them in this work in the future, so they can continue to help shape our plans.

Here in the North West, political leaders are responding to the desire of the population to go further and faster than the national target of net zero emissions by 2050 by committing to delivering net zero much sooner. To achieve this, we need to emit 60% less carbon within the next eight years. We forecast that demand for electricity will double as customers adopt cleaner, greener forms of transport and heating. Many customers already generate some of their own electricity and sell it back to the grid, a trend we expect to continue. All this will have a dramatic effect on the existing electricity infrastructure which was not designed to cope with the complex and multi-directional power flows we expect to see.

Our role is to provide a smart and flexible electricity system which will meet the evolving needs of customers and support the region's economic development. We will do this by adopting new technology, sharing more data than ever before and by working in partnership with stakeholders, customers and industry parties.

Our customers and wider stakeholders have told us that we need to do more than just operate a smarter and more flexible network. They have told us they need us to help them better understand what they can do, how we can support and guide them in terms of their own carbon reduction plans as well as explain how they can benefit from interacting with us as 'prosumers'.

They have also told us that they see it as part of our role to stimulate the adoption of low carbon technologies (LCTs) such as electric vehicles (EVs), solar generation and battery storage, which is essential if we are to meet our net zero carbon targets. To do this, we will provide the knowhow and support that our customers and stakeholders need, helping them understand and address barriers to adopting LCTs at places of work and leisure, and, we will deliver the network to facilitate their installation.

The urgency of the need to decarbonise has created local, regional and national momentum and is driving new, innovative solutions to meet and exceed our targets. Our local authorities and business leaders are making real changes and our academic institutes are showing what can and needs to be done. It's our job to support this ground swell of activity.

We will ensure all our customers are included, both those with active voices in the energy debate and those who are less well represented. It's clear that the net zero carbon challenge will affect us all and it's imperative that no one is left behind.

The scale of the challenge is clear, the urgency of making the transition is great, and the speed at which we need to see change is unprecedented.

Our aim is for customers to have the confidence to take part in that transition, embrace decarbonisation and adopt the relevant technologies with our help so we can collaboratively achieve a vision for the future that is right for this region.

Thank you for your continued interest, your involvement and your feedback.

Peter Emery
Chief Executive Officer

3 Executive summary

This DSO strategy forms part of a suite of current documents which explain how we are preparing our network to support the government's commitment to achieve net-zero emissions by 2050.

- [Leading the North West to zero carbon](#) - Outlines our ambition to meet the region's carbon emissions target and sets out the range of initiatives and investments which will ensure we take a significant step on the road to achieving rapid decarbonisation
- [Analysis of DSO functions](#) - analysis of our DSO-related activities against the 19 high level DSO functions defined by Ofgem
- [Grid digitalisation & data strategy](#) - Our plans to install additional monitoring and control equipment across our network to facilitate the DSO transition
- [Distribution future electricity scenarios](#) (DFES) - used to create our forecasts for future capacity requirements
- [Decarbonisation pathways](#) - energy blueprints developed with Cadent, the region's main gas network operator for Greater Manchester, Lancashire and Cumbria.

In July 2020 we consulted on our DSO strategy, Analysis of DSO functions document and our Grid digitalisation & data strategy; this document has been updated following the feedback we received during the consultation.

We have been preparing for the low carbon challenge for a number of years. In 2018 we published our 'Powering the North West's future' document which detailed six guiding principles for our DSO transition, identified through dialogue with our stakeholders and customers. Led by these principles we have carried out research, implemented changes and developed action plans to prepare our business for net zero.

Networks have a critical role to play in the transition, as set out in our regulator Ofgem's own Decarbonisation Action Plan, which also reaffirmed the validity of our plans.

In collaboration with government and other industry participants, we have been active in the Smart Grid Forum. This forum recognised the opportunity for smart grids to deliver benefits to consumers by minimising costs, enabling participation and providing economic benefits with faster, cheaper connections and sufficient network capacity for economic growth.

We have developed new technologies and approaches, always guided by our customers. Since 2010, we have invested over £80 million in research, exploring and trialling new technologies and commercial models with our stakeholders and academic partners. We have invested a further £50 million in operational technologies to make our network smarter.

These investments have driven a whole host of improvements for customers, halving the number and duration of supply interruptions and delivering reductions in bills. Continued investment in research and engagement has given us insights into what is needed to adapt our business in future. Customers will soon see new choices in how they interact with us and how they connect to, and use, our network.

Producing the required amount of electricity in a sustainable way has seen huge growth in renewables like wind and solar, much of it connected to distribution networks. In the North West, we have developed policies and low cost commercial arrangements to transform how we accommodate more clean energy and manage dynamic power flows across the network.

We are already helping our customers save money by increasing the efficiency of their appliances as well as supporting the electricity system operator (National Grid ESO) to balance the national grid.

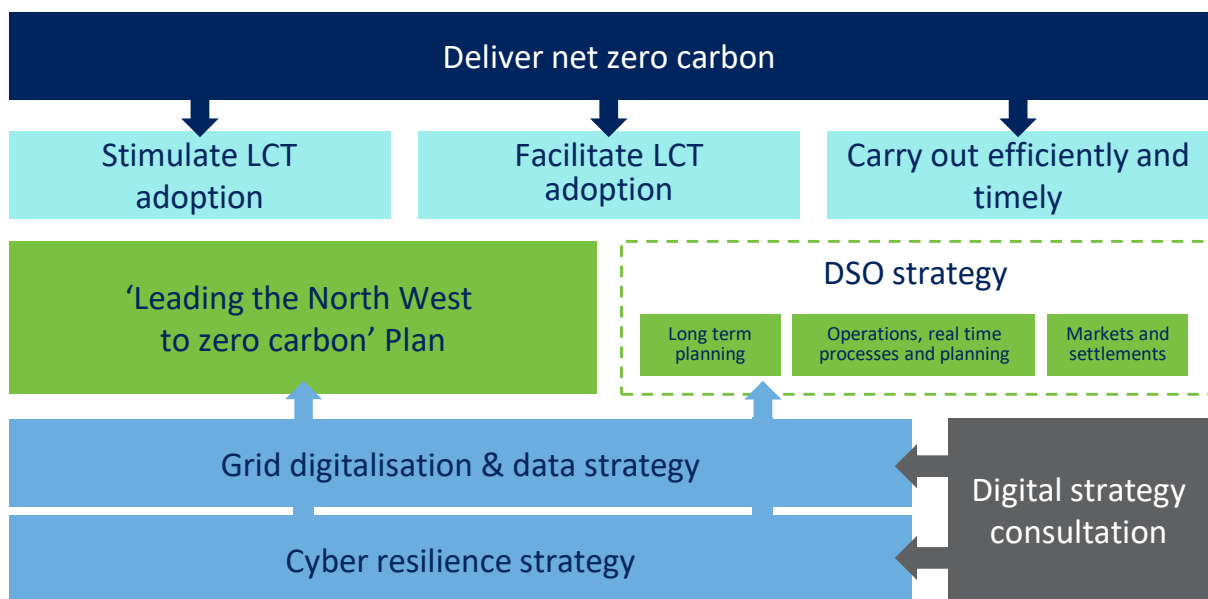
Expert groups of stakeholders, such as our sustainability panel, have helped us to understand the importance to our customers of having a trusted, neutral party who can take a leading role in helping communities achieve their aims. This leading role is new, but central to our business, and we are in the process of putting in place the guidance, advice and support required to assist the region in its ambitions.

Our leading role in decarbonisation is detailed in our [‘Leading the North West to zero carbon plan’](#) which sits alongside our DSO strategy and outlines our commitment to achieving net zero by demonstrating ways to decarbonise, and leading by example in terms of our own operations.

At industry level, the debate about DSO continues and network operators are looking at new processes and standardisation around DSO and whole system coordination.

Underpinning all of our work are our Digital strategy and Grid digitalisation and data strategy.

How decarbonisation and DSO transition fit together

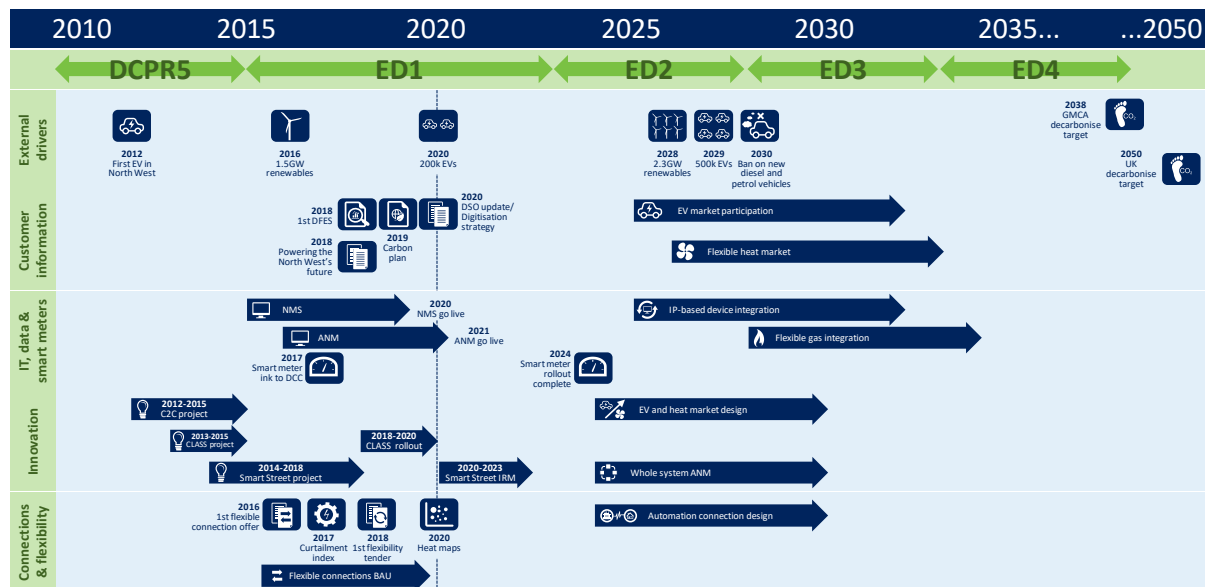


Our overarching objective is to deliver a safe, reliable network for our customers and to support regional net zero targets in an efficient, coordinated way.

Delivering enhanced DSO functionality is a key enabler to making decarbonisation affordable. This functionality is at the heart of a more active regional electricity network, fit for the changing ways customers produce and consume energy. For example, central to DSO functionality is enhanced automation of network switching, which allows us to operate the network more efficiently and allows more demand and generation to be connected to the network before any physical updates need to be made to the network.

We are uniquely placed to ensure that the changes deliver a net zero carbon electricity system for our region, attracting investment for regional economic growth, facilitating access to existing and new markets while continuing to innovate and keep bills as low as possible for our customers.

The roadmap below shows the external drivers for decarbonisation and sets out the key activities we are taking to achieve our net zero targets



4 The future

The way electricity is generated has changed significantly in recent years with many traditional, large coal power stations closing and new clean generation technologies taking their place. These new low carbon generators use renewable forms of energy instead of fossil fuels and a significant proportion are connected directly to local distribution networks or connected within commercial or domestic premises.

Decarbonisation targets supported by new incentives, the falling cost of technology and the desire of people to decarbonise their lives is driving wide adoption of LCTs for heating and transport with EVs rapidly increasing in popularity.

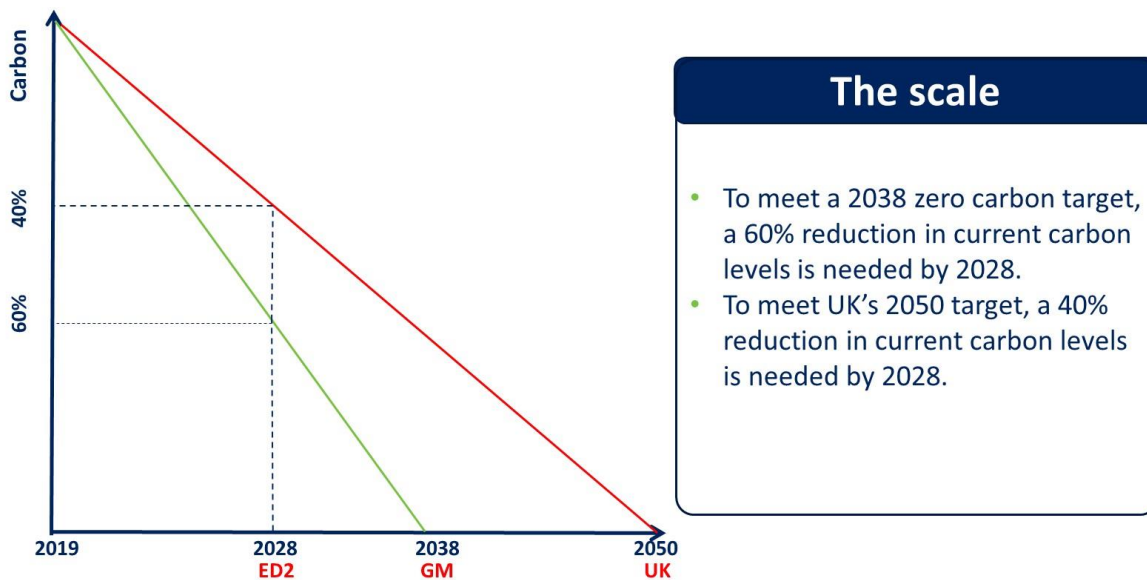
Delivering decarbonisation, improving reliability and ensuring affordability means that our role as a distribution network operator must change. Central to this change is co-operation and co-ordination with our customers, our stakeholders and industry partners. This change is called 'whole system' and will play a major part in how we solve the challenges we face together.

Regional ambition

While the UK has a net zero decarbonisation target set for 2050, some regions including the North West are planning to reach net zero sooner; Lancashire has set a target of 2030, Cumbria 2037 and for Greater Manchester the target is 2038. This means that the adoption of LCTs and behavioural changes will need to happen sooner, and the investment in our network needs to match our region's adoption profile.

Reduction in emissions required to meet net zero targets

The Size of the Carbon Challenge



Forecasting what this means for our network

We have developed sophisticated ways of anticipating the range of changes likely to occur on our network in the future. The information we gather from our stakeholders and from our data sets allows us to frame the assumptions that are used in our five distribution future electricity scenarios. These scenarios were developed as part of our innovation work under the [ATLAS](#) project and represent different views of the future. This means we can explore future uncertainties driven by different levels of regional growth and decarbonisation.

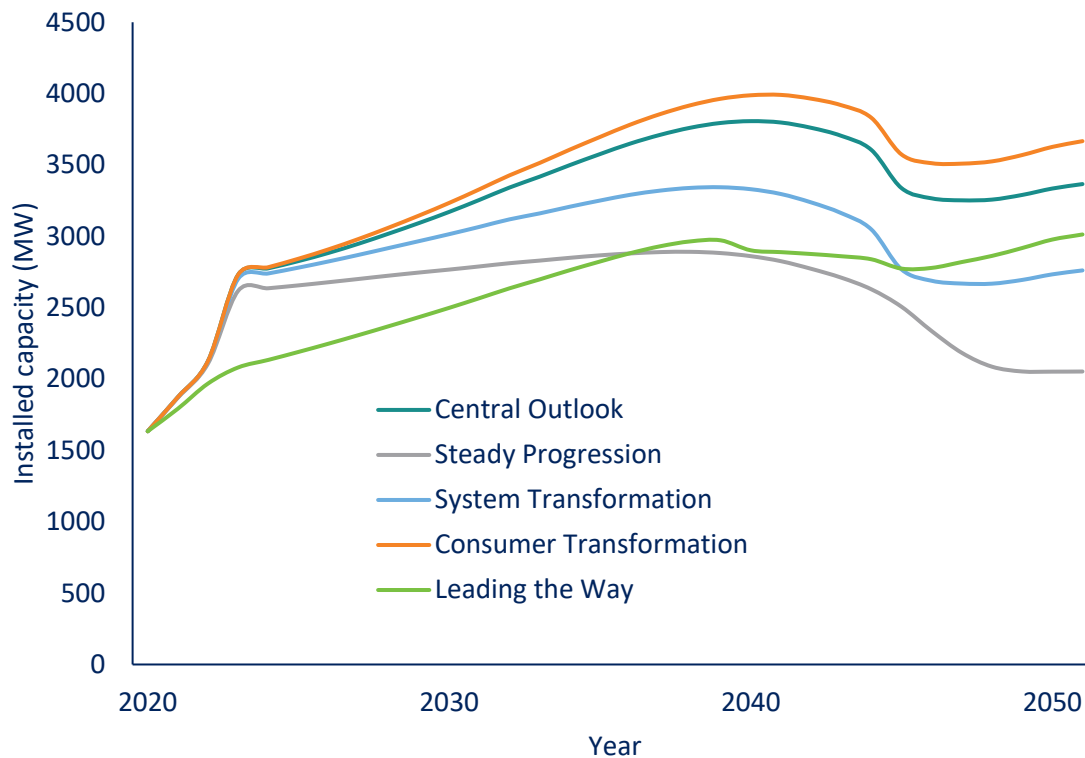
Forecasting in this way allows us to consider many changing factors including customer numbers, demand types, economic activity, the pace of LCT adoption and new generation connections. This means we can see the impact of these factors on our network and forecast the network capacity we need to make available up to 2050 at an individual asset level. Detailed stakeholder information, allows us to better understand how our network needs to change and identify how and where to target investment to meet the challenge of our transition to net zero carbon.

EVs are expected to be the most significant contributor to the future rise in electricity consumption, although the electrification of heating and cooling (heat pumps and air-conditioning) also contributes significantly in this rise. In each scenario EV forecasts show pronounced increased uptake around the year 2035 reflecting the impact of the ban on sales of new petrol and diesel cars and vans in 2030.

Our capacity forecasting and scenarios are published annually in our [Distributed Future Electricity Scenarios](#) (DFES) document which shares our view of the North West's future electricity requirements and provides visibility to our stakeholders on where we may need flexible services to address capacity issues.

We have seen a significant penetration of distributed generation (DG) in the UK in the last decade. Currently, solar/photovoltaic (PV) and wind farms are expected to continue growing as part of the transition to net zero. PV can be deployed on the roofs of domestic and large commercial premises in urban areas, alongside larger solar and wind farm installations in more rural areas. Installed DG capacity is expected to increase by between 25% and 75% within the next decade and potentially more than double the current level by 2050.

Distributed generation forecasts for all Electricity North West scenarios



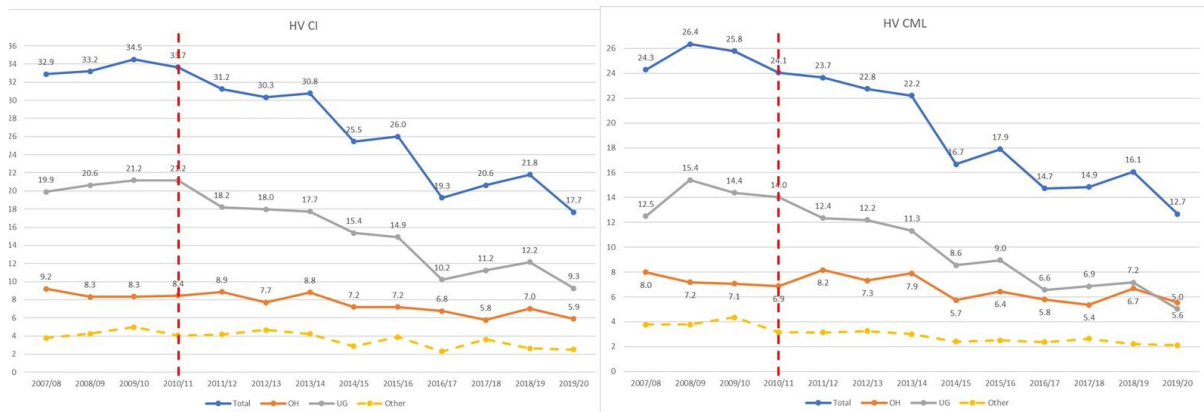
These changes present huge opportunities, bringing benefits to our customers and to the environment.

At Electricity North West we been working with our customers and the industry to understand our evolving role in supporting these changes. These changes will mean improving what we already do and taking on new responsibilities to address new challenges and unlock the benefits for our region and the people we serve. We are investing in digital and technical enablers, as well as the skills of our people, to facilitate and stimulate swift decarbonisation in the North West. We are guided in this work through working closely with our customers, communities and stakeholders to understand their needs and ensure everyone has the chance to participate in developing a system which is fit for the future.

Reliable networks

Our stakeholders and customers consistently tell us that they expect us to improve the reliability of our network. In response to this we have invested an additional £18 million in network automation technology during the current price review period (RIIO-ED1). This, together with similar investments in our previous price control DPCR5 (2010-2015), has enabled us to halve the number of supply interruptions experienced by customers.

Since 2009/10, performance in high voltage customer interruptions (CIs) and customer minutes lost (CMLs) performance improved by around 50%



Our stakeholders have told us that certain vulnerable groups are particularly sensitive to loss of supply and hence we have invested in additional improvements in areas with significant numbers of vulnerable customers such as clusters of care homes. This, coupled with investments to improve supply reliability to the region's hospitals and care centres, has delivered real benefits for these groups.

Our stakeholders continue to tell us this need will increase and we are therefore investing a further £20 million in additional measures during RIIO-ED1. All of this additional investment is funded through efficiencies we have made in other areas of our business and has not affected customer bills.

We are using what we have learned from our customers to inform our investment plan for our next price control period which starts in 2023. We recognise that reliability is the number one priority for our customers; our business plans will therefore target investments that improve reliability. These measures will ensure our customers and wider stakeholders enjoy one of the most reliable networks in the world.

5 A national challenge

Open Networks Project

Our stakeholders have been clear that the scale of the required change is significant and coordination across all network operators is necessary to ensure a UK-wide co-ordinated plan, incorporating the best available measures. The Open Networks Project was established to address this need, established by our industry body, the Energy Networks Association (ENA). The project is a key initiative which responds to the government's [Smart Systems and Flexibility Plan](#), [Industrial Strategy](#) and [Clean Growth Plan](#). The project has placed stakeholder engagement at the heart of its activities, establishing a stakeholder advisory group to inform and shape the project and its deliverables. Our own DSO functions and activities have in turn flowed from this national work and are aligned with the Open Networks stakeholder engagement programme.

As a member of the project we are working with the industry, our regulator and government on how new energy technologies, commercial models and emerging markets are facilitated by network operators. This will define the future smart grid and ensure the energy system as a whole is properly equipped to deliver the energy we will all rely upon in the future.

The key objectives of the overall Open Networks Project are to:

- Work collaboratively with network operators, Ofgem, the Department for Business, Energy & Industrial Strategy (BEIS) and other stakeholders to progress the transition to DSO, in a consistent way across networks to improve outcomes for customers
- Keep the customer at the centre of any development to ensure that their experience can be improved
- Bring consistency in approaches across networks through existing and new processes to support the transition to DSO, interactions with each other and interactions with customers
- Enable data visibility and better access to non-confidential data
- Ensure conflicts of interest are proactively identified and appropriate measures are put in place to address them appropriately and assure a whole system approach to system operation.

In collaboration with the other Open Networks Project organisations, in 2020 we helped to form a [DSO implementation plan](#) and supporting materials, which provide an industry roadmap for the DSO transition. This plan maps out the key milestones in the transition to DSO. The roadmap and accompanying support materials will be refreshed biannually, and the granularity of detail will be increased, as part of our ongoing commitments to keep stakeholders informed of our progress. The roadmap also allows for comparison between organisations and helps facilitate the sharing of industry best practices and standardisation.

Government and regulatory enablement

Ofgem and BEIS are active participants in Open Networks, helping to ensure that all regions of the UK are aligned and implementing the necessary changes. In August 2019, Ofgem published a [position paper](#) on regulatory priorities and its approach to DSO. In the paper Ofgem outlined 19 DSO functions which are grouped into three themes: long term planning, operations and markets.

Ofgem's 19 DSO functions

Long term planning	Operations, real-time processes and planning	Markets and settlement
Network planning	Switching, outage restoration and distribution maintenance	Aggregation of DERs
Forecasting demand and generation and DER	1 Monitor parts of the Dx system under active network management	Design of principles of system access and trading arrangements
Connection studies and operation procedures	Supply of grid-operational services using DER assets	Operation of flexibility trading platforms and associated tasks
Integrated T-D planning	Supply of grid-operational services using DNO assets	
DER hosting capacity analysis	Identify DERs, ancillary service reqts. and operation restrictions	
Emergency response planning	Data management and sharing	Existing
Delivery of new investment	Co-ordination between T-D interfaces	Extended
DER net local value analysis	Co-ordination of DER schedules	New

While recognising that these are not exhaustive or definitive, these functions are a useful way to help explain what we will do differently in the future and we have used them to provide an update on our activities, progress to date and our future plans. In our accompanying consultation document 'Analysis of DSO functions', we have highlighted our high level current view on the scope of work required to implement these functions, including key enablers such as IT systems, new processes and the associated costs in RIIO-ED1 and RIIO-ED2.

Within the ‘Analysis of DSO functions’ document we have identified our position on the subject of “Who should be responsible for delivering each function?”. We are supportive of market competition to deliver DSO functionality where this provides the best value for money to our customers while ensuring that the quality of network performance is continually increased. We believe some of these functions are the core responsibilities of a DNO to retain liability for delivery; however, delivery of these activities can still be subcontracted where this provides inherent value.

During our consultation process in July 2020 there was broad support for this approach in terms of the delivery of each function. Many of the responses recommended that the DNO should be responsible for establishing the processes and markets of the DSO functions. Once the guiding principles have been established these could be opened up to a higher level of market competition, where appropriate to do so.

Supporting contestability

It is anticipated that some functions could be undertaken via a market substitute and are therefore potentially ‘contestable services’.

We support the position that DNOs, as monopoly businesses, should only implement DSO functions where there is a clear benefit in doing so. We are supportive of exploring contestability where alternative market solutions exist and look forward to continuing to facilitate new and emerging technologies and commercial models by increasing data sharing and visibility of network and system needs.

We have a long history of supporting competition in many areas such as providing new connections. Competition has brought real benefits for customers in driving service improvements and value for money through customers choice. In the North West there has been extensive competition in connections for many years and our role in facilitating this outcome has been recognised by Ofgem.

As part of DPCR5, Ofgem introduced ‘competition tests’ whereby DNOs could apply to Ofgem to have price regulation lifted altogether, if they could demonstrate that competition had developed sufficiently to effectively constrain prices. Electricity North West was the most successful DNO in demonstrating that there was effective competition in seven of the nine market segments identified by Ofgem. Ofgem’s chart below shows our leadership in ensuring and supporting competition.

Competition test applications and results

RMS	Electricity North West	Northern Powergrid		UK Power Networks			Western Power Distribution				Scottish & Southern Energy		SP Energy Networks	
		Yorkshire	North East	EPN	SPN	LPN	East Mids	West Mids	South West	South Wales	SHEPD	SEPD	SDP	SPM
Metered demand LV	Pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass
Metered demand HV	Pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass
Metered demand HV & EV	Pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass
Metered demand EV & above	Pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass
Distributed generation LV	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass
Distributed generation HV & EV	Pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass
Unmetered local authority	Pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass
Unmetered PFI	Pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass
Unmetered other	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass	Did not pass

■ Pass
 ■ Did not pass
 ■ Did not apply

We believe that our long-term support of competition and our best practice processes should give stakeholders confidence that we have both the track record and support for the principle of competition and that we will apply these equally to the different roles of DSO.

In the early phases of implementing the DSO functions, significant investment will be needed and we believe we are in the strongest position to deliver for customers in the North West. As the DSO model develops and is rolled out at scale in RIIO-ED2 and RIIO-ED3, we expect to see contestability emerging and providing benefits across many areas and functions.

Key enablers

As well as the 19 functions, Ofgem also describe a range of key enablers to deliver those functions and their associated benefits to customers.

We have already made significant progress in developing and implementing the required key enablers. In our accompanying document ‘Analysis of DSO functions’ we have detailed our progress so far, our current activities and our future plans to put all the required enablers and functions in place.

Below we have summarised our action plans to put in place the key enablers that will unlock the value of the DSO functions for our customers and stakeholders. Data and transparency underpin the actions and ensure all participants, stakeholders and customers are included.

Enablers	What we have done/are doing	What benefits this delivers
<p>Forecasting and planning enablers [“provide the information needed to inform coordinated actions by the system and network operators, investment decisions of stakeholders and facilitate the development of efficient flexibility markets.”]</p>	<p>Through our engagement work we have developed our decarbonisation pathways to show how the region could decarbonise</p> <p>We have developed our Distribution future electricity scenarios (DFES); the supporting future energy scenarios identify where and when new capacity will be needed</p> <p>We have embedded our ATLAS and real options cost benefit analysis (ROCBA) decision support tools to ensure we provide capacity in the most efficient way</p>	<p>Our stakeholders will have greater clarity on when new technology will be available</p> <p>Our stakeholders can see where they can provide services to the grid and find lower cost connection opportunities</p> <p>ROCBA allows us to assess the best solution to today’s network issues while recognising the potential future requirements of the network – informing a ‘least regrets’ investment decision and keeping bills as low as possible</p>
<p>Network monitoring and visibility enablers [“decentralisation of the energy networks now demands greater network visibility, particularly on the 11kV and LV network to drive efficient operational decisions on network management across voltage levels, and allow and inform the activation of flexible services.”]</p>	<p>We have implemented a state-of-the-art network management system (NMS) incorporating over 30,000 network monitoring points spanning our network from 132,000 volts to 240 volts</p> <p>We are integrating smart meters into these systems as they are installed by suppliers</p>	<p>Investment in network monitoring will enable network optimisation in real time, increasing utilisation while minimising network losses and, support the development of renewable generation and flexibility markets by highlighting areas of capacity and constraint</p>

Enablers	What we have done/are doing	What benefits this delivers
<p>Flexibility trading enablers [“operational data is core to well-functioning flexibility markets, and provide value to flexibility providers, aggregators and platforms ...that informs market positions, the value of flexibility for near-term competitions, and the ability to stack value across markets... and will inform network and system operators about operations that may benefit from co-optimisation and conflict avoidance.”]</p>	<p>We have implemented risk control measures for flexibility providers such as our curtailment index to underpin the viability of flexible resources</p> <p>We are supportive of the development of flexibility and local capacity trading platforms to supplement our flexibility tendering processes</p> <p>We are developing ANM interface arrangements so that we can communicate with platforms</p>	<p>Assurance to network users that over time they will not experience more curtailment than a value understood at the time of connection</p> <p>Platforms will allow flexible resource operators to search for opportunities and to stack revenues by providing services to multiple users</p>
<p>Flexibility dispatch and control enablers</p> <p>[“open access arrangements for the management of a flexibility asset’s energy consumption or generation, including the sending of a signal and the enactment of a modulation of energy use to avoid path dependent institutional lock-in and the potential for conflicts of interest.”]</p>	<p>We are implementing a whole system active network management suite to allow the dispatch of flexible resources such as demand side response and generation. This will help to solve network constraints efficiently, manage the flow of energy to EVs and facilitate storage connected at any voltage level on the network.</p>	<p>Whole system benefits through coordination between transmission and distribution requirements delivering efficient network solutions and striking the right balance between new build and flexible solutions</p> <p>Development of sophisticated control algorithms will ensure coordination of T&D flexibility and prevent any unintended consequences</p>
<p>Data exchange enablers [“Open and transparent electricity system data collection and sharing by breaking down potential data silos by standardising datasets and simplifying data exchange between parties to bring efficiencies to the unbundled electricity system.”]</p>	<p>We are working through the ENA to put in place standard open source data flows to ensure all parties have access to the data they need</p> <p>We are a supporter of the Flexr project</p> <p>We have raised both Grid Code and Distribution Code modification proposals to mandate the provision of an enhanced level of network planning data</p>	<p>Data sharing will revolutionise the operation of the network bringing innovation and greater participation in the energy system</p> <p>Increased data capture and sharing will enable network companies to more efficiently plan their networks in a smart future; it will give new customers an insight into connection and flexibility opportunities and also provide general stakeholders (local authorities, community energy projects etc) with a resource to help them with their planning commitments</p>

Enablers	What we have done/are doing	What benefits this delivers
<p><i>Our business</i></p> <p>As our role evolves, so will our skills and competency requirements. A culture for continuous improvement in our people and business processes will ensure we are successful in distribution system operation for the benefit of our customers</p>	<p>We have already formed a separate DSO team with appropriate governance and segregation from our other DNO functions such as asset management</p> <p>We are including our colleagues in these changes, revising our training and development policies and amending our recruitment and retention strategies</p>	<p>Our DSO team take decisions in the most efficient way to provide capacity and operate an open and transparent procurement process for flexibility</p> <p>We publish the outcome of our calls for flexible services to ensure transparency for market participants</p> <p>New ways of working will bring new opportunities for skilled resources across a wider range of disciplines</p>

6 A regional opportunity

Our stakeholders have told us that to ensure the carbon transition takes place we need to become a trusted, neutral party who can take a leading role in helping our communities achieve their aims. Our [Leading the North West to net zero](#) carbon plan, launched in 2019, sits alongside our DSO strategy. Supported by independent research and engagement it is focused on stimulating the adoption of low carbon technologies across the region through a three-part process:

1. An initial engagement campaign focused on industrial and commercial customers who consume over 60% of electricity as a priority set of energy users. This will be followed by a wider engagement plan encompassing all customer groups
2. Understand barriers to adopting low carbon technologies
3. Help industry and local authorities to overcome barriers to adoption.

As part of this debate, we will maintain our dialogue with our customers and stakeholders to understand their views on our role in stimulating the transition to a low carbon economy.

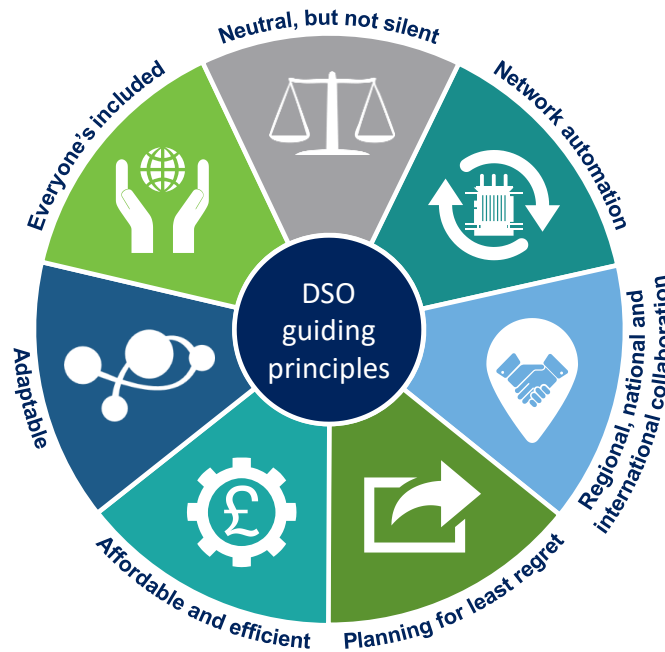
Our DSO strategy, as outlined in this document, covers how we will facilitate and deliver this economically.

7 Our DSO principles

In our first publication ‘Powering the North West’s future’, working with our stakeholders and customers, we identified six principles for guiding our approach to implementing DSO. This document demonstrates how we have kept the guiding principles at the heart of facilitating a range of services and technologies to deliver smart, flexible and zero carbon electricity systems.

Following further stakeholder feedback from the 2020 DSO consultation, we have added ‘adaptable’ to our guiding principles to reflect our willingness to change our plans in response to stakeholder feedback. We have also updated our guiding principles to reflect our stakeholders’ wishes to incorporate ‘international collaboration’ in our approach.

Electricity North West DSO guiding principles



Neutral, but not silent

Our stakeholders and customers see Electricity North West as a trusted source of information, helping to demystify the new, complex energy market for stakeholders while remaining commercially neutral, and acting as a catalyst for accelerating change

Neutral not silent means transparent in processes, and technology agnostic.

We have listened to stakeholder feedback indicating that we could do more to show neutral market facilitation and business ringfencing of contestable business elements. As a result, for ED2, we will introduce a DSO compliance officer, reporting to the board's audit committee. This role will ensure both appropriate separation of responsibilities and no actual or perceived conflicts of interest as part of our role as a neutral market facilitator.

Curtailement index

One of the early changes delivered by our DSO programme was the introduction of flexible connections which allow generation and demand to be connected at a reduced cost. These connections have become extremely popular with generation, industrial and commercial customers and are now the normal form of connection in many instances.

The inherent flexibility of these connections offers significant potential for helping to meet the challenges of decarbonisation. These stakeholders have told us that the main barrier to investing in additional assets that can provide flexibility services is the uncapped risk of curtailment i.e. not being able to operate their generation/storage/demand normally.

In response to this we introduced a curtailment index cap for all flexible connection contracts to ensure they have complete transparency around this risk and that it is managed to an agreed level. We are the only DNO to put such measures in place in response to stakeholder feedback.

We are planning to use the curtailment index to share use of the network between flexible connections on an equitable basis. In our July 2020 consultation the feedback we received was supportive of the use of the curtailment index in preference to the use of LIFO ('last in, first off'), or capacity sharing.

Capacity trading

Our stakeholders have also told us that at certain times they may be willing to release the network capacity they normally use for use by others. This ‘capacity trading’ will become much more prevalent as the number of flexible demand devices increases – for example EV charge points. To allow customers to directly benefit from such capacity trading on local networks, we will put in place a market mechanism whereby customers can bilaterally trade their capacity. While we will facilitate and technically enable the market, our neutrality principle means that we will not participate in it.

Flexible services

As part of our drive to find smarter solutions to meet the future demand for electricity, we promote the provision of [flexible services](#) and invite customers to increase or reduce demand, generation or storage at certain times and receive payment in return, to help us manage constraints on our network.

We run local markets for flexibility and encourage active participation in the energy system from a broad range of participants. This allows them to get the maximum value out of their ability to flex their use of the network and increase revenue streams for electricity assets such as batteries and EVs.

Procuring flexibility will minimise the need for investing in more cables or transformers, reducing the cost of DSO as use of the electricity network increases. It should be noted that we are not able to use flexibility to mitigate the need for asset intervention in some of the constraint categories, so there will always be a need to install assets.

We see procuring flexibility services as a key DSO function and a vehicle for change as part of the transition to net zero carbon. We believe it will be inappropriate to purchase carbon-emitting flexibility in the future.

In our 2020 DSO consultation we asked the question “Should we look to purchase low carbon flexibility in preference to any technology that does not conform to low carbon definitions?”. The response we received was one of overwhelming support for this policy. We intend to take this feedback and feed it back into the Open Network project in order that this can be integrated into the common selection criteria for flexible services selection.

We secured our first flexibility contract in 2009 and have been running regular tenders to purchase flexibility.

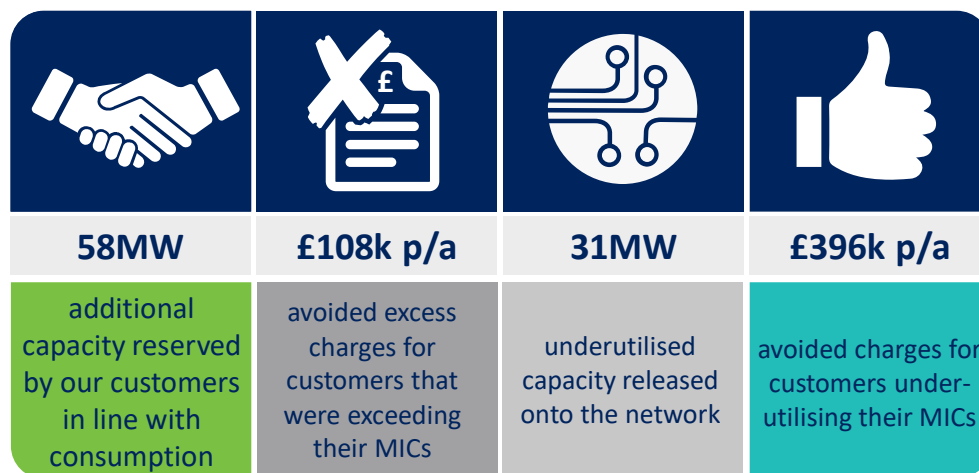
We are a leading voice in the development of common definition and contracts for flexibility services. Most notably during 2019-20, we led national work in the Open Networks Project towards the standardisation of active power flexibility services and contractual agreements. We are proud to be the first DNO to implement these standardised deliverables in our spring 2020 flexibility tender. The use of industry-agreed terminology for flexibility services is important to help facilitate participation through the transparency and simplification of information available. This early adoption shows our commitment to removing barriers to entry and encouraging participation as much as possible.

We recognise that this is an embryonic market so ongoing feedback from stakeholders participating in our tenders, and more widely through the Open Networks platform, is essential. Feedback from participants has already identified that the greatest barrier to entry to this market is the specific geographical location in which we require flexible services. Our DFES document has changed as a result of this feedback and will help stakeholders see where and when future capacity needs will emerge. This will ensure continued successful engagement with our stakeholders and encourage participation as opportunities arise across our region.

We expect the number of potential flexible solution providers to grow, enabled by further decentralisation of generation and the connection of LCTs. New, innovative market entrants will participate in emerging opportunities and our ongoing investment in the key enablers of our people, technology, data and business capabilities will help these markets to mature by providing greater visibility of network needs and simplifying coordination between all parties.

Management of contracted capacity

A key function of DSO is to ensure the efficient use of the network at all times. Our stakeholder engagement consistently shows that customers value reductions in their bills. To help meet these requirements we have introduced a process for the management of contracted capacity which proactively helps customers understand and manage their capacity on a continuous basis to ensure that they only pay for capacity they use. On a monthly basis, we contact those customers who are exceeding their contracted maximum import capacity (MIC) and help them avoid excess capacity charges by changing to the correct MIC. We also contact those customers who are underutilising their MIC, who are therefore paying to reserve capacity that they are not using.



Costs are estimated based on last 12 months maximum demand data of customers and 2020/2021 DUoS charges; and assumes MICs were changed as a direct result of notifications sent.

This activity helps to free up capacity on the network for use by others. This benefits new customers connecting to our network who are able to use this capacity and avoid any reinforcement charges they would otherwise face. The regular review process has also helped us streamline our network planning processes and provide stakeholders and customers with a more accurate view of where capacity already exists through our DFES.

We are the only DNO to proactively contact customers in this way, as we recognise the changing nature of our customers' requirements and endeavour to move away from a 'connect and forget' approach.

Network automation

Network management system

Our new £35 million advanced network management system (NMS) is the first end-to-end NMS in the UK. It allows our network model to individually represent all 2.4 million of our customers including their low voltage (LV) service connections, LV network and high voltage network connected assets, and will make the vision of whole system management a reality.

Active network management

The NMS will pave the way for the first active network management (ANM) solution to be deployed at full network scale. This will ensure that our network is optimised for the lowest cost operation at

all times and, crucially, at all voltages. This investment will also provide the foundations for bilateral trading of capacity and flexibility between customers, without the need for network operator participation – truly neutral market facilitation.

ANM maximises the use of the distribution network for all parties at minimum cost.

In the July 2020 consultation we asked: How should our ANM system be configured to take into account the potentially aligned or conflicting requirements of the provision of flexibility to multiple industry parties? Should it be through market mechanism, networks coordination, via contractual or other means?

Some of the responses we received to the consultation expressed concern that the utilisation of ANM would give us a range of free resources which would then subsequently reduce the need for the procurement of flexible services. ANM provides the automation of dispatch operations capabilities required to fully unlock the value which can be offered by flexible services and flexible connections, so we see ANM necessary to grow the value of flexible services to the network and increase their range and granularity.

The way we are implementing ANM capabilities into our network means flexible services, flexible connections and flexible network assets will all be controllable by the same system. We will use an open and transparent method for the deployment of all types of flexibility deployed in the system. This allows us to utilise the optimal combination of services, connections and assets to provide the network stability at an efficient cost, while ensuring that customers are not adversely impacted.

By using the curtailment index methodology we will ensure that there will be predefined limitations on the levels of curtailment which can be used per customer connection. We will use a monetary value multiplier combined with the curtailment index to value the cost of curtailment and then compare this against the cost of using flexible services. We will carry out regular reviews of our use of flexible connections and assets compared to flexible services, to ensure that this does not discourage market participation.

Network automation for energy efficiency

By installing intelligent software and innovative voltage control technology, the [Smart Street](#) system stabilises supply voltage to customers which makes their appliances and our low voltage network run more efficiently. This brings a number of benefits to customers. It can deliver real savings through a reduction in energy used by domestic appliances, reduce carbon emissions and provide more flexible solutions to help us connect LCTs to the network – all without impacting power quality.

Regional, national and international collaboration

We will continue working with North West stakeholders and collaborate with them to develop local and regional solutions to deliver against devolved and national policy objectives.

As part of our stakeholder engagement we have established independently-chaired groups to guide our thinking and improvement plans with focus on our key priorities – affordability, sustainability and consumer vulnerability. We believe that stakeholder engagement with a wide range of stakeholders is fundamental to informing our strategy. In future our local knowledge and relationships with customers will help us to coordinate demand and supply and support all customers to effectively engage with the future smart grid.

Our stakeholders have told us that they expect whole system outcomes; as an industry it is important that there is close collaboration to deliver this. As a result of such feedback we have been working more closely with Cadent, the region's main gas network, to develop our local energy master plans. As we all decarbonise our lives we need to work ever closer with other sectors such as gas, transport,

telecoms and water. This whole system thinking will bring significant benefits and savings for customers.

Our local energy master plans are there to provide certainty to stakeholders to embark on their carbon transition over the next two price control periods to 2033. For example, they give clarity on how private vehicles, vans and heavy goods vehicles will decarbonise allowing customers and stakeholders to make their decisions with confidence. They also span heat, electricity generation and the emerging role of hydrogen as a source of energy.

Our local energy master plans are complemented by our DFES document which sets out in detail what those changes mean for our network and ultimately inform our RIIO-ED2 price control submission.

Our joint work with Cadent has already highlighted the important role EVs will play in decarbonising road transport and delivering the region's clean air strategy. To enable these EVs to recharge we have identified the need for additional network capacity at major transport hubs such as Manchester Airport, key city centre locations and regional leisure and retail hubs. Our strategic projects programme was put in place to deliver this capacity which will enable our region to adopt EVs at scale.

We work nationally and internationally to establish best practices, and to source products and knowledge to improve network efficiency and improve customer experience.

Planning for 'least regret'

Our forecasting work includes the views of our stakeholders and utilises the best available techniques, but we recognise that future demands on the network cannot be predicted with complete certainty.

When we invest to increase network capacity through either new assets or through flexibility markets we are spending our customers' money and we must ensure we only do so where justified.

ROCBA

The real options cost benefit analysis (ROCBA) tool was developed in 2016 as part of our research work. It compares the cost of different network investment solutions such as the cost of reinforcement against the cost of flexibility and includes an assessment of the risks and benefits under the five DFES scenarios.

We now use this tool for all reinforcement and asset replacement investment proposals to inform our decision-making and to ensure we make the most efficient use of our customers' money. The tool has been used since 2017, and we have demonstrated savings of over £5 million on network investment solutions during RIIO-ED1.

The tool compares the demand forecast for each site, using our DFES scenarios, against the cost of investment, while accounting for the depreciation of assets and the value of network losses incurred.

By incorporating our DFES scenarios into this tool, we can take a much longer-term view of our network investment programme, thereby avoiding the need for subsequent disruptive investment solutions while maintaining security of supply and cost efficiencies for our customers.

We were the first DNO to adopt such a holistic approach to network investment analysis and this ensures we take much more efficient decisions on behalf of our customers. This approach has been recognised by the Open Networks Project and Workstream 1A, Product 1 is developing a common evaluation methodology for flexibility services, which will be used by all DNOs from April 2021.

Affordable and efficient

Our stakeholders and customers expect us to continue to focus on value for money and on making efficient investment decisions. The policies, practices and solutions we adopt should represent long-term efficiency and best value for money for our stakeholders. The solutions we employ should also represent long-term efficiency and minimise the impacts of our network operations on the environment.

The principles outlined above combine to ensure that we are delivering on this obligation. Our use of ROCBA, our regional energy master plans and our DFES give us certainty in decision-making and underpin our actions and investments.

We recognise the importance of close collaboration in our industry to deliver whole system outcomes. With the increase in the provision of flexibility we believe there is great potential for distribution networks to offer solutions to the transmission network. Likewise, there may be limited potential for the transmission network to provide solutions to distribution networks. Working closely with other sectors will be key for the electricity industry to deliver whole system benefits and maximise value for customers.

Stakeholder engagement and feedback from the Open Networks Project has provided us with valuable insights in how whole system thinking can be incorporated into our DSO strategy.

Whole system planning

The National Grid electricity system operator (NGESO) had, at periods of low demand, experienced difficulty maintaining transmission system voltage within statutory limits. Its Pennine Pathfinder Project considers all possible solutions to this issue and will conduct a cost benefit analysis to decide the most efficient solution to progress. Through the Open Networks Project, we have developed distribution network 'build' solutions to address the voltage problems. This consists of installing 132kV reactors at grid supply points on our network. The 'build' solution was compared to solutions submitted by Northern Power Grid and National Grid Electricity Transmission. NGESO are currently testing the flexibility market for an alternative. The result of their analysis may be a build solution, a flexible solution or a combination of the two.

Enabling competitive markets

We believe that competition in markets drives reduction in costs to customers, so we are keen to promote competition in all areas. The existing DNO aspects of the business are already open to competition, and we intend to extend this even further to the newer DSO elements.

Improvements in automation, and reductions in fixed costs, of procurement, dispatch and settlement, and increased network monitoring allows us to remove materiality thresholds of the size of flexible services which can be procured economically. This will allow us to compare flexibility options against conventional asset build solutions at all voltage levels on our network, increasing the liquidity of flexibility markets.

In relation to the renewal of flexible services contracts, only when there is little or no competition will we use contracts for more than one year. These contracts will only be renewed after reviewing the availability and capability of potential providers. We will not renew a contract more than four times to encourage potential future engagement and competition.

To introduce competition in the provision of marketplace services, we propose to regularly re-tender for marketplace platform services. Each time we will look for new and innovative ways to encourage new providers to the marketplace by developing new access routes for network users.

Adaptable

Supporting the transition to net zero will require our business to be able to flex and adapt our plans dynamically. This means making the business more agile to these changes and making sure we have in place the required tools and procedures.

Government policy

A large part of being able to adapt our plans is to make sure that we keep up to date with changes to local and national government policies. A good example of where we have been dynamic with our approach relates to the changes to policies surrounding the ban of sales of new petrol and diesel cars and vans. In the last three years we have seen the introduction of a ban to sales of new petrol and diesel cars and vans by 2040, a consultation to change this date to 2035, and finally a change of this date to 2030. Each time these proposals have changed we have modified our network planning and forecasting activities to reflect the potential network impacts and developed solutions to any identified issues.

Everyone's included

We have a comprehensive stakeholder engagement process which aims to engage with as many different consumer voices as we can. These include our consumer vulnerability advisory panel which makes sure the voices of our hard-to-reach customers are heard; and our sustainability panel which links us with the community energy sector. These panels help us to develop our understanding of specific issues and give us the mechanisms to consult on the development of our support for vulnerable customers and the fuel poor.

One of the ways we are already providing direct support and making sure we engage a diverse segment of our customer base is through our support for community energy and vulnerable customers and our Powering our Communities Fund.

From our existing stakeholder engagement activities, it is clear that the work we are doing to transition to DSO is important to them, however we need to do more to improve our messages. We have taken this feedback onboard and recognise the need to simplify our communications to customers and provide specific case studies to illustrate how the DSO transition will positively benefit them.

Vulnerable customers

We are committed to ensuring that the most vulnerable in our region are not disadvantaged or excluded from the benefits of developments in the energy sector. We want to include those people who may be in vulnerable circumstances or find it particularly difficult to be without power so that we can put the right support in place and ensure that the benefits of DSO are understood and shared equitably.

It is important that these customers are pro-actively included in initiatives such as Smart Street which delivers material savings on energy bills through reduced energy consumption.

Value of Lost Load

Understanding the impact of power cuts on different groups of customers and the [Value of Lost Load](#) (VoLL) is important as it is used by the electricity industry to determine investment strategies and network planning, which is one of the functions of DSO.

We have conducted an extensive piece of research which has led to a better understanding of the unique impact of power cuts on a diverse range of domestic and business customers.

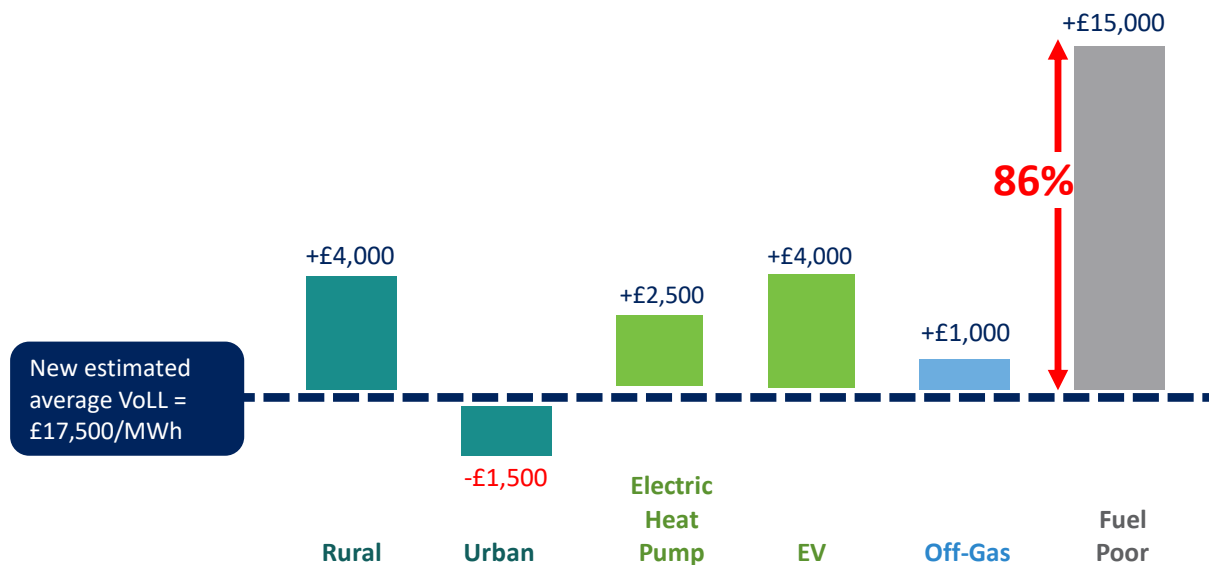
The research shows a huge difference in the way customers value their electricity supply. The under 30s are among the least affected by a power cut whereas the groups most affected include those in

vulnerable circumstances, particularly those struggling with fuel poverty. Other highly impacted groups include young families and early adopters of LCTs.

The research has demonstrated that the value electricity consumers place on the security of their supply has increased significantly to an average of £17,500/MWh, since Ofgem set the single value for our current regulatory period (RIIO-ED1) at £16,000/MWh, reflecting customers' greater dependence on electricity and their evolving needs.

The findings from the VoLL project directly guide our investment decisions on security of supply, restoration following an interruption or provision of a temporary support during an interruption.

Factors which have more impact on VoLL



Community energy

Community energy refers to a whole range of community-led projects and initiatives to reduce, manage, generate or purchase energy. Community energy projects focus on community engagement and delivery of benefits directly to the local area and communities. These are aligned to our DSO/decarbonisation ambitions as the projects are largely focused on the development of renewable energy and the promotion of energy efficiency advice.

In 2018 we developed our [Community and local energy strategy](#) which sets out our approach to forging links with community and local energy groups and organisations to support the growth of the sector.

The strategy demonstrates a clear commitment to our customers in this exciting and rapidly changing area. It was developed in consultation with our stakeholders to ensure it addresses the issues they are facing and to make sure our response is well informed.

Consultation with our stakeholders led to the development of a range of initiatives including the launch of a community and local energy newsletter to help us keep our stakeholders up-to-date with our activities, and the launch of a series of 'community connects' workshops, aimed at increasing capacity and skills within the community and local energy sector.

8 Glossary

Term	Description
ANM	Active network management
ATLAS	Architecture of Tools for Load Scenarios project which developed methodologies, prototype tools and specifications to develop detailed loading scenarios
BEIS	Department for Business, Energy & Industrial Strategy
Curtailment index	A cap which provides a safeguard against excessive outages or faults
CIs	Customer interruptions – the number of customers whose supplies have been interrupted per 100 customers per year over all incidents, where an interruption of supply lasts for three minutes or longer
CMLs	Customer minutes lost – the average customer minutes lost per customer per year, where an interruption of supply lasts for three minutes or longer
DCPR5	Electricity distribution price control period, 2010-2015
DFES	Distribution Future Electricity Scenarios – forecasting plans for a range of scenarios for how low carbon technologies will be taken up and how the network could respond. The scenarios inform our investment plans and provide visibility of flexibility opportunities
DNO	Distribution network operator - company licensed to distribute electricity in Great Britain by the Office of Gas and Electricity Markets (Ofgem)
DSO	Distribution system operation
ENA	Energy Networks Association – industry body which represents transmission and distribution network operators for gas and electricity in the UK and Ireland
EV	Electric vehicle
Flexible services	The term used for paying a customer to reduce their electricity consumption or increase generation on request, due to a network constraint
Flexr project	A project led by ElectraLink and GB distribution network operators to provide and standardise data to enable a smarter, more flexible energy system
HP	Electric heat pump
HV	High voltage
Key enablers	The technology, data and engineering competencies and capabilities needed to deliver DSO functions

Term	Description
LCT	Low carbon technology such as electric vehicles, electric heat pumps, solar and wind generation
LV	Low voltage
Net zero carbon	The achievement of balancing carbon dioxide emissions with carbon removal or eliminating carbon dioxide emissions altogether
NMS	Network management system
Ofgem	Office of Gas and Electricity Markets – the government regulator for gas and electricity markets in Great Britain
Ofgem DSO functions	A list of 19 key distribution system operation functions published by Ofgem designed to enable the delivery of net zero carbon
Open Networks Project	A key industry initiative to deliver government policy that will transform the way our energy networks work and help deliver the ‘smart grid’
Prosumer	A person who both consumes and produces a product, in this case electricity
PV	Photovoltaic (solar panel)
RIIO-ED1	Current electricity industry price control period, 2015-2023
RIIO-ED2	Next electricity industry price control period, 2023-2028
ROCBA	Real options cost benefit analysis tool
Smart grid	An electricity network which allows devices to communicate between suppliers to consumers, allowing them to manage demand, protect the distribution network, save energy and reduce costs
Smart Grid Forum	Industry platform which engages on the significant challenges and opportunities posed by GB’s move to a low carbon energy system
VoLL	Value of Lost Load project – extensive piece of research which has led to a better understanding of the impact of power cuts on a diverse range of customers