Net Zero North West Cluster Plan,
Work Package 8, SP Energy Networks

SP ENERGY NETWORKS

Distribution Network Capacity & Development Report

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INTRODUCTION FROM SP ENERGY NETWORKS

Our role as a Distribution Network Operator is becoming even more central to our customers and stakeholders as they seek to rapidly decarbonise industrial connections, generation, transport and heat systems.

At SP Energy Networks we are dedicated to supporting our key stakeholders to facilitate delivery of their major connections projects. We are acutely aware of the challenges and opportunities this decarbonised future will bring for our communities across SP Manweb, and we are committed to helping our customers and stakeholders understand the ever changing new technologies available and helping to facilitate quicker, more efficient connections for our diverse customer base.

We know that decarbonisation of the industrial sector will be a critical part of the Net Zero journey, as it is a major contributor to the overall carbon footprint of the UK.

We are keen to support our connections customers and help facilitate delivery of their projects as there is no doubt that the move to Net Zero is intensifying and we expect the volume of major connection applications to continue to rise as we move into the RIIO-ED2 period.

We are introducing a new Design and Development function that will work alongside our 132kV System Design team to align all major connection applications to our network in the SP Manweb licence area.

These new teams will co-ordinate all new connections design and quote activity including design of any associated network reinforcement requirements. Introducing this organisational model will help to scale up design operations as required, given expected increasing volume in coming years.

We are also actively recruiting in the external market and upskilling our internal staff to increase the number of design resources we have available for connections activities as we manage the expected increase in applications.

To support the transition to a decarbonised future we continue to deliver a number of improvements to our processes and new initiatives designed to make connections to our network smooth and effective.

We have recently published our Network Development Plan which highlights the capacity available on our distribution network and the planned interventions to support our industrial and commercial customers as they connect to our network and deliver their low carbon ambitions. This guidance has been designed to help identify the most effective connection solution, and also provide an overview of our engagement, design and connections processes.

SP Energy Networks are also building on our past innovation project successes by looking at how we can use Distributed Energy Resources (such as solar PV or battery storage) as a proactive means of enhancing the stability of the electricity network, and our new Flexibility Services solutions will provide further opportunities for connections customers to identify viable commercial solutions for their connection projects.

We are developing an open data platform solution which is expected to be available for our customers to use on our website by March 2023. Our future delivery strategy is that the solution will allow major connections customers to view and corroborate all their data requirement needs in a one stop shop, therefore providing improved pre-application information provision and better customer service for all connections customers.

There is no doubt that the move to Net Zero is intensifying and the impact on the volume of connection applications to our distribution network and the transmission network in the area will be significant.

We conduct weekly meetings with NGESO to discuss existing constraints for major connections onto our SP Manweb distribution network, and are working with NGESO to determine what constraints may be imposed onto future connection applications to our distribution network.

We will continue this dialogue with NGESO, and we look forward to including our key stakeholders and customers within the Net Zero North West Cluster Plan area into any ongoing negotiations and lobbying for further infrastructure development across the region.

We are extremely proud that our business is involved with our key stakeholders on such an exciting project, and we are committed to working jointly with the Net Zero North West Cluster Plan project team following the completion of this report to deliver the modern, efficient and high quality network needed to unlock growth and industrial decarbonisation across the region.

About SP Energy Networks

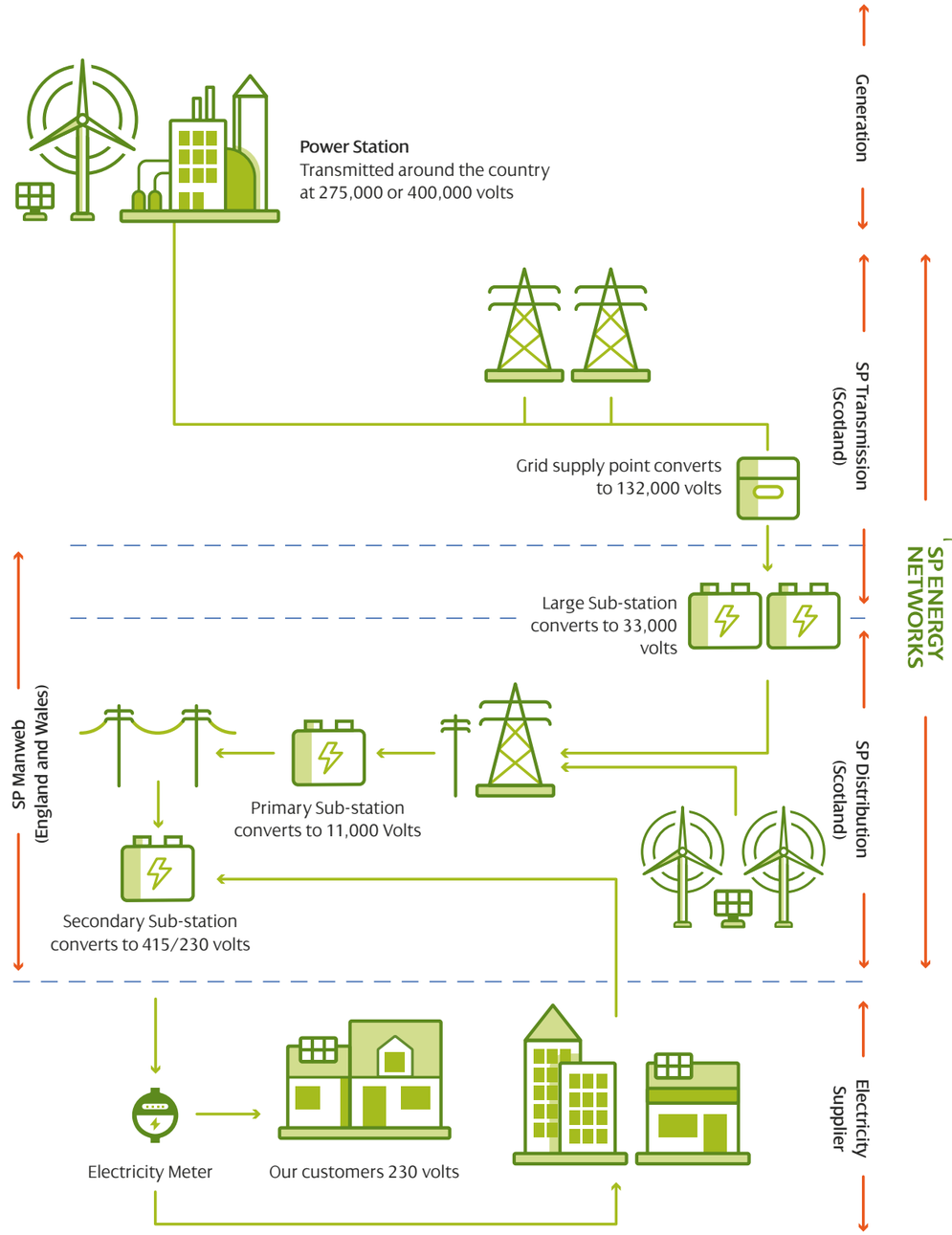
SP Energy Networks own and operate two regulated distribution networks, SP Distribution plc (SPD) and SP Manweb plc (SPM). We are the only DNO group to operate across all three nations of GB – Scotland, England and Wales. We also own and operate one transmission network in Central and Southern Scotland, SP Transmission plc (SPT).

We understand just how critical electricity is to the lives and work of all the customers we're here to serve. That's why it's important we look to the future – anticipating future needs and making sure we play our role in enabling a better future, quicker for everyone.

Our investment plans need to take account of a number of complex current and future demands. Given how quickly the energy sector is changing, technological advancements and political uncertainties, we also need to make sure that we're adaptable to change, in case the future energy system turns out differently to what we've planned for.

1

How we keep the electricity flowing



Net Zero North West Cluster Plan Distribution Network Capacity & Development Report

ABOUT NET ZERO NORTH WEST CLUSTER PLAN

Net Zero North West (NZNW) is an industry-led cluster acting as a public and private sector investment accelerator for industrial decarbonisation and clean growth projects in the North West. We unite business, regional leaders and academia, and are committed to delivering a co-ordinated Net Zero vision for the region (Figure 1).

As the region with the largest concentration of advanced manufacturing and chemical production in the UK – currently producing around 40 million tonnes of CO_2 annually – we have a core mission to become the UK's first low carbon industrial cluster by 2030 and world's first Net Zero industrial cluster by 2040.

The NZNW Cluster Plan will create a deliverable investment, technology, and infrastructure blueprint for the North West's Net Zero transition and low carbon recovery post-COVID-19. It will recommend the technologies, infrastructure changes and investment necessary to transition the North West, working with North East Wales, to Net Zero carbon by 2040.

As an industrial partner of the Net Zero North West Cluster Plan, SP Energy Network (SPEN) aims to assist with electrical network needs and provide understanding of individual project feasibility with relation to network capacity. Much of this work is contained within Work Package 8 (WP8) and is the purpose of this report. This report aims to outline the currently known electrical connections within the NZNW Cluster Plan and the network interventions required.

2

Why the North West?

THE WIDER UK ENERGY SYSTEM

National Grid Electricity Transmission (NGET)

NGET own and maintain the high-voltage electricity transmission network in England and Wales.

National Grid Electricity System Operator (NGESO)

NG ESO moves high voltage electricity from where it's generated, such as a wind farm, through the energy system.

Using the infrastructure owned by the 3 transmission companies - National Grid Electricity Transmission, Scottish Hydro Electric Transmission Ltd. and SP Energy Networks (SP Transmission) - this high voltage electricity is passed onto one of the fourteen Distribution Network Operators across the country.

Distribution Network Operators

The 14 Distribution Network Operators in the UK own the local distribution networks.

SP Energy Networks and Electricity North West Limited (ENWL) are the local distribution network operators for the Net Zero NW Cluster Plan area.

For the purposes of this report, we will also include links to information from Electricity North West Limited (ENWL) and National Grid Electricity Transmission (NGET) and National Grid ESO (NGESO) where appropriate.

More information on the Transmission and Distribution Network Operators for the Net Zero North West area can be found at:

National Grid Electricity Transmission:
www.nationalgrid.com/electricity-transmission

National Grid Electricity System Operator:
www.nationalgrideso.com

SP Energy Networks :
www.spenergynetworks.co.uk

Electricity North West:
www.enwl.co.uk

Our SP Energy Networks RIIO-ED2 Business Plan

WHAT WE DO

Our role as Distribution Network Operator (DNO) is becoming even more central to all our lives as we seek to rapidly decarbonise generation, transport and heat systems.

We've launched our RIIO-ED2 Business Plan, detailing the £3 billion worth of spending that's needed to ready the UK for an electric future.

Running from 2023 to 2028, our plan sets out our vision for a network that can meet the challenge of Net Zero across more than 100,000km of network and 30,000 substations and will benefit more than 3.5m homes and businesses across Scotland, England, and Wales.

This plan is the most important we have ever produced, developed at a pivotal time. The challenge to achieve legislated Net Zero targets will impact every part of society, with electricity at the heart of the solution. We forecast that up to 1.8m electric vehicles, 1.1m heat pumps, and up to triple the amount of distributed generation, will be connected to our networks by the end of this decade. This is a radical change.

Net zero will be a consumer-led revolution through rapid adoption of low carbon technologies. This will see electricity demand profiles, generation patterns, and consumer behaviour, dramatically change in a relatively short span of time.

To respond, we will realise the Distribution System Operator (DSO) model, evolving how we plan, design, and operate the grid. We will establish a transparent and discrete DSO business unit and roll out our leading DSO innovations to 40% of our network, building a flexible grid and that will unlock capacity without sacrificing the standards of safety, security and reliability our customers expect.

The SP Energy Networks Business Plan can be found at:

www.spenergynetworks.co.uk/pages/our_riio_ed2_business_plan.aspx

3

DISTRIBUTION FUTURE ENERGY SCENARIOS (DFES)

We have recently updated our Distribution Future Energy Scenarios (DFES)

The energy landscape is changing fast as the way our customers and communities generate, consume, and interact with energy evolves. Our role is to plan our distribution networks to facilitate their decarbonisation objectives and choices, and to enable their journey to Net Zero.

To achieve this, we need to forecast and understand our customers' changing electricity requirements. We develop Distribution Future Energy Scenarios (DFES) to do this, which are forecasts for a range of customer demand and generation metrics up until 2050.

Given the uncertainty and ever-changing policy landscape in which we operate, we have created forecasts for multiple scenarios, which reflect differing levels of consumer ambition, government/policy support, economic growth and technology development.

We have engaged with a wide range of our stakeholders. We're grateful for the feedback received and look forward to continuing to engage with you and hear your insights for our update next year. This feedback is vital to making sure that our forecasts reflect the plans and ambitions of the local communities we serve.

Our DFES documents below describe how electricity generation and demand may evolve in our SP Manweb licence area over the next 30 years.

You can find more information in our DFES publications:

- *SP Manweb Future Energy Scenarios*
- *SP Manweb Future Energy Scenarios Key Findings*

Our interactive maps below show our forecasts for customer demand and generation (peak demand, electric vehicles, heat pumps, generation capacity, etc.) for the selected combination of DFES scenario and year.

The tabs categorise the metrics by type (demand or generation) and by area (primary substation supplied area or local authority area). The legend can be displayed from the drop-down menu on the top right corner.

The SP Manweb view can be found at: SP Manweb

If you have any questions about the content of the maps you can get in contact with us at RIIO_ED2@spenergynetworks.co.uk and we will be happy to answer your queries.

We also host Customer Connections Surgeries where we will be able to provide guidance and assistance on the information in our DFES maps.

If you would like to make suggestions for any further improvements you feel would prove beneficial. Please contact us on gettingconnectedupdates@spenergynetworks.co.uk if you would like to book a Customer Connections Surgery.

LONG TERM DEVELOPMENT STATEMENT

This helps existing and future users of our network identify and assess opportunities for making new or additional use of our distribution systems. We have provided an overview of the design and operation of the network for both of our licence areas, SP Distribution and SP Manweb.

For access to the SPEN Long Term Development Statements requires customers to register for the information in order to ensure our customers are viewing the most up to date version of the statements.

We have also provided summary statements for both our licence areas. Access to the full registration form and/or to download the summary statements, please use the following link on the SPEN website: spenergynetworks.co.uk/LTDS

Similar information for Electricity North West Ltd

ENWL Business Plan for 2023 to 2028:
www.enwl.co.uk/about-us/regulatory-information/our-business-plan-2023-2028/businessplan2023-2028/

ENWL Distribution Future Energy Scenarios:
www.enwl.co.uk/get-connected/network-information/dfes/

ENWL Long Term Development Statement:
www.enwl.co.uk/get-connected/network-information/long-term-development-statement/

"The energy landscape is changing fast as the way our customers and communities generate, consume, and interact with energy evolves."

Introducing our SP Energy Networks Network Development Plan

Sharing data is key to the efficiency of the energy system as we decarbonise to Net Zero. It enables customers and stakeholders to assess market opportunities and participate in flexibility markets, in turn promoting the efficiency and competitiveness of these markets. It enables network companies and key stakeholders to work together to promote efficient whole system planning and operation. And it helps spur innovation and new solutions. Customers benefit from all of these.

In this context, Standard Licence Condition 25B came into force on 31 December 2020. It introduced a requirement for each DNO to publish a Network Development Plan (NDP), and set out a high-level scope of what was to be included. DNOs then worked together via the Energy Networks Association to define the detailed scope and content of NDPs; the resulting proposed Form of Statement was published in December 2021.

The primary objective of the NDP is to provide information on available network capacity to accommodate demand and generation growth, and interventions the DNO plans which will increase network capacity (such as flexibility use and reinforcement). The NDP is a medium-term outlook, and is designed to sit between short-term Long Term Development Statements (LTDS) and long-term Distribution Future Energy Scenarios (DFES) forecasts.

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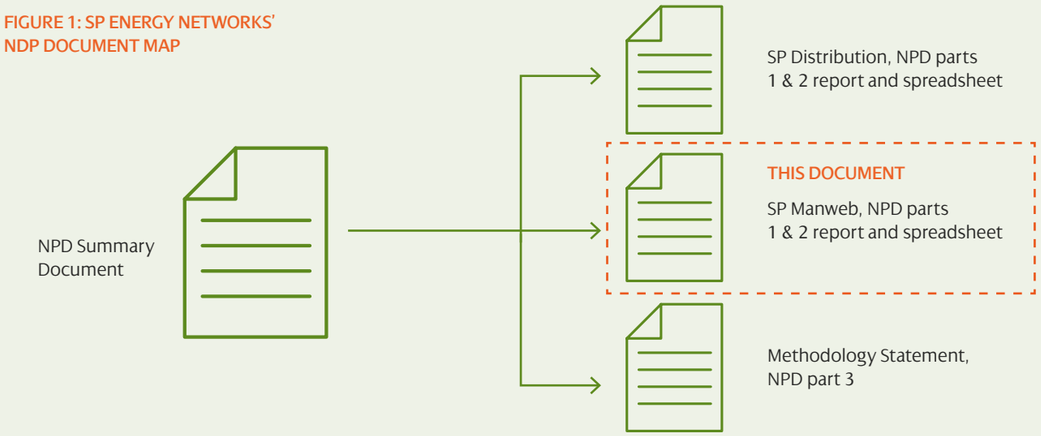
FIGURE 1: SP ENERGY NETWORKS' NDP DOCUMENT MAP



Each DNO's NDP must cover three main components:

PART 1: DEVELOPMENT REPORT – detailed information on the interventions we plan that will increase capacity. This includes non-load interventions which are not done to provide capacity but will increase capacity nonetheless (e.g. asset management interventions such as replacing an end-of-life transformer with a larger equivalent).

PART 2: NETWORK CAPACITY HEADROOM REPORT – the indicative demand and generation capacity available at each primary substation (down to and including the HV busbar). Forecasts are produced for every year for the first 10 years, and then for every five years after that out to 2050. These capacity forecasts must take account of known planned interventions which will increase capacity (i.e. those listed in Part 1).

PART 3: METHODOLOGY STATEMENT – a document explaining how we have produced Parts 1 and 2.

Parts 1 and 2 need to be produced for each DNO licence area, down to primary substation group (i.e. the NDP does not include network interventions and capacity headroom for the LV and HV networks). We have two licence areas: SP Distribution and SP Manweb. Therefore to meet our NDP licence obligation we are publishing four NDP documents[1]:

1. A summary document to introduce our NDP, summarise the contents, and set out our consultation questions.
2. A pdf report and supporting excel datasheet for SP Distribution, covering Parts 1 and 2.
3. A pdf report and supporting excel datasheet for SP Manweb, covering Parts 1 and 2. That is this document and supporting excel datasheet.
4. A single document for Part 3, covering SP Manweb and SP Distribution together as the methodology is the same for each. This includes the consultation feedback we received.

Our NDP will be updated annually. Figure 1 shows the document map for these four documents.

[1] www.spenergynetworks.co.uk/NDP

Our SP Energy Networks full Network Development Plan can be found at: www.spenergynetworks.co.uk/pages/network_development_plan.aspx

Similar information for Electricity North West Ltd

ENWL Network Development Plan: www.enwl.co.uk/get-connected/network-information/network-development-plan/

OVERARCHING PROCESS

This document is the NDP Parts 1 and 2 Network Capacity and Development Report for SP Manweb. The process below summarises how we produced NDP Parts 1 and 2 for SP Manweb. For further details please refer to NDP Part 3 Methodology Statement.

STEP 1, FORECASTING:
we develop our network to accommodate our customers' demand and generation requirements. Therefore the first step of network planning is to understand what these are. We do this using forecasts.

STEP 2, NETWORK IMPACT ASSESSMENTS:
we undertake industry-leading assessments to understand where, when, and how much additional network capacity is needed to accommodate these forecast customer requirements.

STEP 3, FLEXIBILITY TENDERS:
where our assessments show we need additional capacity, we tender for flexibility services to understand the availability and cost of using flexibility to provide it. We don't place contracts at this stage – we only do that where the Step 4 options assessments establishes flexibility is the best solution.

STEP 4, OPTIONS ASSESSMENT FOR LOAD-DRIVEN INVESTMENT:
to provide the capacity in the optimal way, we fairly and impartially assess different types and combinations of interventions (flexibility, energy efficiency, smart, innovation, and reinforcement), different delivery models (reactive, proactive), and how they could be coordinated with other interventions to reduce customer cost and disruption.

These four steps identify the RIIO-ED2 load interventions we will make that add network capacity – these are a key input to NDP Parts 1 and 2. Whilst these create the majority of the additional capacity we will deliver, the NDP requires that we include all interventions that increase capacity:

STEP 5, NDP PART 1 – REPORTING OF NETWORK INTERVENTIONS WHICH ADD CAPACITY:
we combine the load driven interventions identified in steps 1-4 with connections-driven, losses-driven, and non-load driven interventions which add capacity, to produce NDP Part 1.

After these five steps we know all the interventions we plan to make that will add capacity – this means Part 1 of the NDP is complete. To complete Part 2:

STEP 6, NDP PART 2 – REPORTING NETWORK CAPACITY HEADROOM:
combining our existing network model, our scenario forecasts, and our known intervention plans to calculate the 'post-intervention' headroom. Our NDP Part 2 Capacity Headroom spreadsheet data files provide an indication of headroom for each primary substation/substation group for each year through to 2050.

SIX STEP PROCESS

1. FORECASTING
2. NETWORK IMPACT ASSESSMENTS
3. FLEXIBILITY TENDERS
4. OPTIONS ASSESSMENTS
5. INTERVENTION PLAN (NPD PART 1)
6. CAPACITY HEADROOM (NPD PART 2)

DOCUMENT SCOPE AND STRUCTURE

Scope

This document is the NDP Parts 1 and 2 for SP Manweb. The scope of the Network Development report (Part 1) and Network Capacity Headroom report (Part 2) and are summarised below.

PARAMETERS	NETWORK CAPACITY HEADROOM	NETWORK DEVELOPMENT
DATE RANGE	Up to 2050. Consideration to 2050 matches the DFES date range and so can reflect the uncertainty on long term network impacts.	Planned interventions for the next 10 years.
REPORTING GRANULARITY	Every year for the first ten years. Every five years beyond that to the end of 2050.	Location, magnitude (MW) and timescales of interventions
NETWORK COVERAGE	All Bulk Supply Points (132/33 kV) and Primary substations (33/11 kV). NOTE: In Scotland the 132/33 kV substations are considered as Grid Supply Points (GSPs), and are excluded from this document.	All Bulk Supply Points (132/33 kV) and Primary substations (33/11 kV).
FORECAST SCENARIOS	Load scenarios based on DFES for all years up to 2050.	
REPORTED HEADROOM	Demand & Generation	
NETWORK PARAMAMETERS UNDERLYING HEADROOM CALCULATIONS	Thermal loading Voltage & Fault level Reverse power flows	
EVALUATION METHODOLOGY	Detailed analysis for the short-term where practical. Simple tabular comparisons for the longer-term to 2050 (loading versus firm capacity).	

Document structure

The structure of this document is as follows:

SECTION 2 – UNDERSTANDING THE RESULTS IN THIS DOCUMENT: this section provides background information and key considerations when reviewing the NDP Parts 1 and 2.

SECTION 3 – CONSTRAINT MANAGEMENT ZONES: this section explains what Constraint Management Zones are and why they are relevant in the context of the NDP.

SECTION 4 – NDP PART 1, NETWORK DEVELOPMENT INFORMATION: this section outlines the specific details of all the interventions we are planning in the SPM network that increase network capacity, including losses-driven and asset management-driven interventions which increase network capacity even though this isn't the primary reason for the intervention.

SECTION 5 – NDP PART 2, NETWORK DEVELOPMENT INFORMATION: this section provides a summary of the headroom results from our NDP Part 2 Capacity Headroom spreadsheet data files.

We are aware that our industry includes a wide range of terminology, so SECTION 6 is a glossary to explain the terms we use within our NDP documents.

HOW THE NDP FITS WITH OTHER DATA PROVISION

Publishing our NDP is just one measure we're taking to increase the transparency of how we plan and operate our distribution network, and is aligned with our approach of sharing an increasing range of network data with stakeholders. Other current data provision includes:

DFES FORECASTS[2] – these are forecasts for key customer demand and generation metrics up until 2050. We develop these considering a range of sources, including UK and devolved government targets and other industry forecasts. Given the uncertainties out to 2050, we create forecasts for multiple energy scenarios. These scenarios represent differing levels of customer ambition, government and policy support, economic growth, and technology development. Our stakeholders review our forecasts and we make changes based on their well-justified feedback. We will update our DFES annually.

LTDS[3] – these statements contain a range of information on our 132kV, 33kV, and 11kV network. This includes network asset technical data, network configuration, geographic plans, fault level information, demand and generation levels, and planned works. This information helps customers identify opportunities and carry out high level assessments of the capability of the network to accommodate new demand and generation. A main update is published every November with a minor update every May.

EMBEDDED CAPACITY REGISTER[4] – previously known as the System Wide Resource Register, this currently provides information on generation and storage resources (≥1MW) that are connected, or accepted to connect, to our distribution network. It is updated on the 10th working day of each month.

HEATMAPS[5] – these provide a geographic view of where there is available network capacity to accommodate new generation.

FLEXIBILITY TENDERS[6] – we tender for flexibility for all viable network constraints. When we run tenders we publish information on the location, magnitude, and duration of the constraint. In some cases we will also send ceiling price information. We run tenders twice annually.

Looking forward to RIIO-ED2, we plan to share a wider range of historical, near-time, real-time, and forecast data with stakeholders. This will be underpinned by infrastructure to gather, assess, and share data, and engagement with stakeholders to prioritise data publication. See our DSO Strategy [7] for more information on the network data we will share in RIIO-ED2 based on stakeholder input.

[2] Our DFES is available here: Distribution Future Energy Scenarios - SP Energy Networks
[3] Our LTDS is available here: Long Term Development Statement - SP Energy Networks
[4] Available here: Embedded Capacity Register - SP Energy Networks
[5] Heatmaps are available here: Distributed Generation Heat Maps - SP Energy Networks
[6] Available here: Flexibility Services - SP Energy Networks
[7] Our DSO Strategy is Annex 4A.3 of our RIIO-ED2 Business Plan. Available here

INFORMATION ON EXISTING NETWORK ← → INFORMATION ON FUTURE NETWORK

EMBEDDED CAPACITY REGISTER	DISTRIBUTION GENERATION HEATMAPS	LONG TERM DEVELOPMENT STATEMENT	FLEXIBILITY TENDERS	**NETWORK DEVELOPMENT PLAN**	DISTRIBUTION FUTURE ENERGY SCENARIOS
Details connected and contracted generation and storage	Interactive geographic snapshot of generation capacity headroom	Detailed network information and overview of developments for 5 years	Details on location, magnitude and timing of flexibility requirements	Network developments for 10 years, and network capacity headroom	LCT, demand, and generation forecasts to 2050 across a range of future pathways

HOW THE NDP OVERLAPS WITH OUR RIIO-ED2 BUSINESS PLAN

The NDP requires us to publish our planned interventions which will increase network capacity, and the resulting network capacity headroom. This NDP comes a few months after we published our RIIO-ED2 Business Plans mentioned earlier.

There is significant overlap between the two publications: the work we need to do to produce the NDP is the same that was done to create our RIIO-ED2 Business Plan, and all the EHV and 132kV interventions that increase capacity that we included in our RIIO-ED2 Business Plan need to be included within the NDP. So where our suite of NDP documents refers to RIIO-ED2 interventions and the RIIO-ED2 process, it is because they are directly relevant to the NDP.

Providing capacity (the scope of the NDP) is only one part of planning and developing a network. This means the interventions covered in our NDP are only a subset of those we need to make through RIIO-ED2. For a good summary overview of the full range of measures we're taking to ensure we have a safe, reliable, and efficient network, please see our Future System Strategy[9].

INFORMATION AND CONTACT

The information used to compile this report is derived from SP Manweb plc's own data. Whilst all reasonable care has been taken in the preparation of this data, SP Manweb plc is not responsible for any loss that may be attributed to the use of this information.

Opportunities exist for the connection of new load or generation throughout the SP Manweb system. System conditions and connection parameters are site specific and therefore the economics of a development may vary across the system. Developers are encouraged to discuss their development opportunities and SP Manweb will be pleased to advise on connection issues.

To discuss a specific enquiry about a new connection to the distribution network, or an enhancement to an existing connection, please contact:
gettingconnectedupdates@spenergynetworks.co.uk

[8] Our RIIO-ED2 Business Plan is available at: www.spenergynetworks.co.uk/userfiles/file/SPEN%20RIIO-ED2%20Final%20Business%20Plan%20-%201st%20December%202021%20-%20FINAL.pdf
[9] Our Future System Strategy is Annex 4A.1 of our RIIO-ED2 Business Plan. Available at: www.spenergynetworks.co.uk/userfiles/file/Annex%204A.1%20-%20Future%20System%20Strategy.pdf

UNDERSTANDING THE RESULTS IN THIS DOCUMENT

Network Development Plan results (NDP Part 1)

Our NDP Part 1 outlines the specific details of all the interventions we are planning in the SP Manweb network that increase network capacity. This means that in our NDP Part 1 we have not only included load-driven interventions but also included losses-driven and asset management-driven interventions which increase network capacity, even though this isn't the primary reason for the intervention.

We have included interventions which add capacity in RIIO-ED1 (before April 2023) and those that add capacity and are part of our Business Plan for RIIO-ED2 (April 2023 – March 2028). Beyond 2028 we still haven't yet planned interventions (we will start this in 2025 when we start preparing for RIIO-ED3). The capacity headroom results (Part 2) provide an indication of potential future intervention needs for the period between 2028-2031, for the range of scenarios.

The full suite of Engineering Justification Papers (EJP) for each RIIO-ED2 intervention is available on our website[10]. These are the technical and cost appraisals undertaken to develop robust, efficient, and fully justified intervention plans for our load and non-load plans.

In reviewing the planned network interventions, it is worth noting that the timing and type of network intervention may vary, depending on the rate of change in stakeholder requirements influenced by regional and national policies, requirements for emerging new connections, and further development of flexibility markets.

Types of constraints

There are three main types of network constraint. These are:

THERMAL CONSTRAINTS – where network current would exceed equipment thermal ratings. Thermal constraints can affect any type of asset at any voltage level. High loadings on certain assets may simply reduce their life, however significant overloading introduces safety risk. For example, an overhead line conductor will sag more if it is overloaded – this may risk the statutory minimum safety clearance distances outlined in the ESQCR.

The thermal loading on each asset is considered against its capability under normal and fault/outage conditions. Equipment thermal ratings are considered to vary seasonally with temperature through the year. Cyclic thermal ratings of assets are used when assessing the network under fault/outage conditions. The cumulative time exposure to overloads, and whether equipment has sufficient cool back periods are considered. We prioritise interventions when the network assets are at risk of exceeding 100% of their thermal rating.

VOLTAGE CONSTRAINTS – where network voltage would be in breach of statutory limits. Network voltages can be too low (usually caused by excess demand), too high (usually caused by excess generation), or change too quickly (instantaneous change in voltage due to planned/unplanned outages). Voltage excursions can cause damage to customer equipment and network assets, or introduce safety risks.

We have a duty to maintain voltages within the statutory limits at each voltage level. We prioritise interventions when the network is at risk of breaching these limits.

FAULT CURRENT CONSTRAINTS – where the network fault current would exceed the fault current rating of switchgear. If this happened, it would represent a serious safety risk as the network could not be safely isolated in the event of a fault. Fault current constraints can affect equipment at any voltage level.

Circuit breakers may be called upon to disconnect faulting equipment from the network; or energise onto faulty or earthed equipment. A range of types of fault (including 3-phase and single-phase faults) are assessed under make and break fault duties. Where substations are approaching switchgear capability or operationally managed, detailed assessments of the maximum fault flows through each individual breaker are undertaken. Substation infrastructure such as busbars, supporting structures, flexible connections, current transformers, and terminations must be capable of withstanding the mechanical forces associated with the passage of high magnitude fault current i.e. through-current withstand duty. Where switchgear is in excess of 95% of equipment or design rating we consider the substation to be constrained.

These constraints can occur together or independently. In all cases, these network constraints are a result of there being insufficient network capacity to accommodate customer power flows.

Types of interventions

To resolve constraints we consider a range of flexible, energy efficient, smart, innovative, and conventional intervention solutions. Table 1 shows the six main categories of interventions to add capacity. They are not mutually exclusive, so can be combined to provide capacity.

TABLE 1: TYPES OF INTERVENTION

	INTERVENTION TYPE	DESCRIPTION
	ASSET INTERVENTION	Where we permanently increase network capacity by replacing existing assets or adding more assets – for example, a new substation.
	FLEXIBILITY SERVICES	Where customers agree to actively manage their demand/generation to help avoid constraints (see Section 2.1.3 for more information)
	INNOVATIVE SOLUTIONS	
	Smart Network Interventions	Where we look to get more out of existing network capacity.
	Using Enhanced Network Asset Ratings	Where we seek to increase the thermal capacity of individual existing network assets without having to replace them.
	Network Reconfiguration	Where we temporarily or permanently adjust the topography of the network to better match existing network capacity with customer power flows.
	Energy Efficiency	Where customers have agreed to passive measures to manage their demand to help avoid constraints.

[10] Our RIIO-ED2 Business Plan - SP Energy Networks

Flexibility

Flexibility services are where our customers agree to actively manage their demand or generation to help us manage capacity constraints on our network. Flexibility services can help us defer or avoid new network capacity, can be deployed more quickly than reinforcement interventions, and can help democratise and bring competition to the energy sector. They provide an agile smart means of managing our network, and are complementary to reinforcement solutions by providing short-term solutions where we need to act quickly or manage uncertainty. They will play a key part in helping to manage the pace of the Net Zero transition.

Given this, we tender for flexibility for all viable network constraints. This helps us understand the availability and cost of flexibility, which we use in our options assessment. When we tender for flexibility we state the location, service product (see Table 2), service window and time (e.g. 4-6pm weeknights between October and March), required magnitude (MW/MVArs), and any other necessary technical parameters (e.g. response time). In some cases we will also send ceiling price information.

We will continue to test every viable network constraint for flexibility. Regular flexibility tenders will allow us to understand the scope for flexibility solutions to network constraints. This will have several beneficial effects including improving service provider confidence, challenging market costs, and increasing certainty on the level of flexibility we can procure in the coming years.

Subject to requirements, we run two competitive tender rounds per year (Spring and Autumn). This timetable, along with documents detailing our flexibility processes are published at the following website: www.flexiblepower.co.uk

TABLE 2: FLEXIBILITY PRODUCTS

FLEXIBILITY PRODUCT	TIMEFRAME	PRODUCT DESCRIPTION
SUSTAIN	**Pre-fault** Scheduled	– Sustain will be scheduled in advance of the service window to support security of supply during system intact conditions. – Utilisation fee payable for the service provided in response to the scheduled notice. – No availability fee payable.
SECURE	**Pre-fault** Scheduled or dispatched	– Secure can be dispatched or scheduled to manage peak loading on the network and pre-emptively reduce network loading. – Utilisation fee payable for the service provided in response to the scheduled notice. – Arming fee is payable.
DYNAMIC	**Post-fault** Dispatched	– Used to support the network in the event of specific fault conditions. – Providers declare availability one week ahead. – Dispatch instruction issued if service is required. – Utilisation fee payable if service is provided. – Availability fee is payable once availability has been accepted.
RESTORE	**Post-fault** Dispatched	– Used to help with restoration following rare fault conditions. – Providers declare availability one week ahead and declarations automatically accepted. – Dispatch instruction if service is required following a network event. – Utilisation fee payable for the service provided.
REACTIVE POWER *(aligned with Secure)*	**Pre-fault** Scheduled or dispatched	– Reactive Power can be dispatched or scheduled to support the management of voltage constraints. – Utilisation fee payable for the service provided in response to the scheduled notice. – Arming fee is payable.

Summary of interventions

Figure 2 summarises the interventions by driver (i.e. why we need to make them). Figure 3 summarises the interventions by type (i.e. how we are making them). As a reminder, these graphs only show interventions on primary substations upwards given the scope of the NDP. This means they exclude interventions on the LV and HV networks, which account for the vast majority of the interventions we need to make to provide capacity.

Figure 2 shows that the need to provide thermal capacity is the main driver of interventions. Figure 3 shows that reinforcements and flexibility account for the great majority of the interventions we will make to provide capacity.

Our load and non-load intervention plans are both designed to be adaptable so they can respond to emerging customer needs. This means the interventions we actually deliver may differ slightly from those we currently plan to deliver. We will only make changes to the delivery plan where it is in customers' interests.

FIGURE 2: SP MANWEB SUMMARY OF INTERVENTIONS BY DRIVER TO 2028

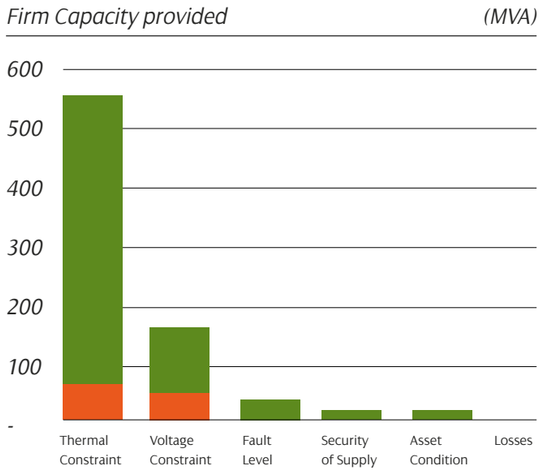
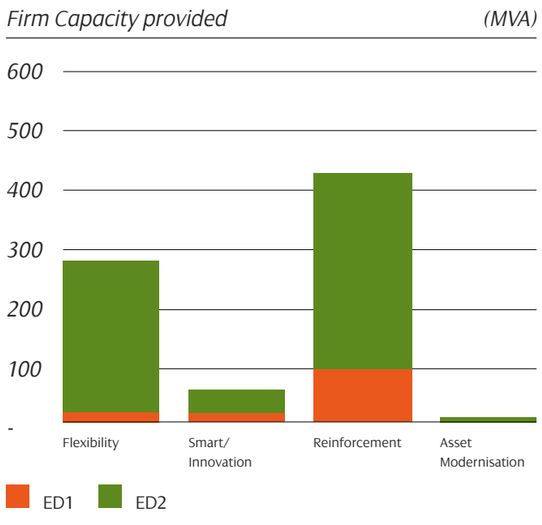


FIGURE 3: SP MANWEB SUMMARY OF INTERVENTIONS BY TYPE TO 2028



NETWORK CAPACITY HEADROOM RESULTS (NDP PART 2)

Future Network capacity headroom is indicated for all SP Manweb grid (132/33kV) and primary substations (33/11kV) in terms of demand and generation. For further details on the process to forecast capacity headroom see our NDP Methodology Statement.

Demand headroom

To calculate the demand headroom, we consider the expected increase in demand from the baseline, low and high scenarios, up to 2050, and compare these with the firm capacity of the group, including all planned interventions that increase capacity and flexibility services. A positive number indicates spare capacity and a negative number indicates a forecast constraint.

In reviewing the capacity headroom results, it is worth noting:

The firm capacity is the maximum load the substation (or substation group) can support whilst keeping the network operating safely within limits. For primary substations this is generally the capacity available during single circuit outage conditions.

When calculating the firm capacity, we consider the season of most onerous demand (typically winter). This is because the ratings of some equipment differ seasonally.

For multi-transformer substations, the firm capacity considers only the capacity that can be available through automatic processes (e.g. parallel operation of the transformers or automatic changeover schemes).

For single-transformer substations, the firm capacity values include the capacity that will be available through both automatic and manual switching processes, provided these can be carried out within the time constraints specified in Engineering Recommendation P2.

The firm capacity of solidly interconnected network groups in SP Manweb must be calculated from network analysis due to the more complex interconnected nature of the system.

In the headroom calculations we consider demand for developments that are due to connect, including that of Green Recovery schemes.

Generation headroom

To calculate the generation headroom, we consider the expected increase in generation from the baseline, low and high scenarios, up to 2050, and compare these against the reverse power flow capability of the substation/substation group, and the fault level limits.

The fault levels are calculated under the most onerous network conditions to yield the maximum anticipated fault currents. The most onerous network condition is considered to be when the following conditions occur concurrently:

- all generating apparatus is in service;
- all transformers are set to nominal tap position;
- the system is intact (N); and
- fault level contributions are included from all independent

Fault contributions from synchronous generators and converter connected generators are treated differently. Typical fault current contributions from synchronous generators and converter connected generators are used to determine the available fault level headroom when considering forecast generation.

Further considerations

In reviewing the capacity headroom results, it is worth noting:

- Headroom results take account of planned interventions, as outlined in Section 4 of this document. A negative headroom result changing to a positive result is indicative of a planned intervention taking place or a decrease in demand.
- Headroom results do not take account of the additional capacity provided through the rollout of Constraint Management Zones (CMZs) or other flexible connection arrangements - see Section 0 of this document.
- Generation headroom at a substation/group may be limited by upstream constraints beyond our network boundary. These upstream constraints are flagged in column E within the Part 2 spreadsheets, but are not reflected within the capacity headroom values. Any new generation connections where there are upstream constraints beyond our network boundary will be subject to detailed network assessments to determine the actual generation capacity headroom.
- The SP Manweb distribution network is configured as a mesh network with interconnection at all voltage levels (see Section 2.3). Headroom results provide the calculated headroom of the substation/substation group. The actual headroom at a particular location within interconnected networks is subject to further assessments, as the changing distribution of demand and generation across the mesh may alter available headroom.
- Demand and generation forecasts are subject to factors which can change over time and influence pre-determined plans.
- The timing and type of network interventions may vary, depending on the rate of change in stakeholder requirements influenced by regional and national policies, and requirements for emerging new connections.
- We have taken all reasonable endeavors to ensure the accuracy of the results using information available at the time of publishing. We are not responsible for any loss that may

CONSIDERATION OF THE SP MANWEB INTERCONNECTED NETWORK

The SPM network is unique in its design, configuration and operation. Over half of our network – predominantly that in urban areas across Merseyside, Cheshire, and Wirral – is operated fully interconnected at all voltage levels. The primary system is wholly configured to support this interconnected operation.

This interconnected operation means power can flow through more than one path to reach its destination in normal operation. By comparison, most distribution networks in Great Britain, including SPD, have a radial design, where power typically has only one possible path. Meshed networks give exceptionally high reliability but, once capacity is saturated, are typically more expensive to reinforce.

The tools we have developed to identify our planned interventions and assess network capacity headroom work for both meshed and radial networks.

> "The tools we have developed to identify our planned interventions and assess network capacity headroom work for both meshed and radial networks. "

Constraint Management Zones (CMZ)

In addition to load and non-load interventions which increase capacity, we will deliver DSO tools and capabilities. These are outside the scope of the NDP, but are relevant as they help make better use of existing capacity, better target load-driven interventions, and increase the range of tools we have available to create capacity – these all help provide the capacity our customers need.

Insufficient network capacity is a well-known barrier to new renewable generation, especially at the more remote locations where onshore wind farms are typically built. Prospective developers are faced with reinforcement works, which add expense, can significantly delay projects, and can have adverse visual impact.

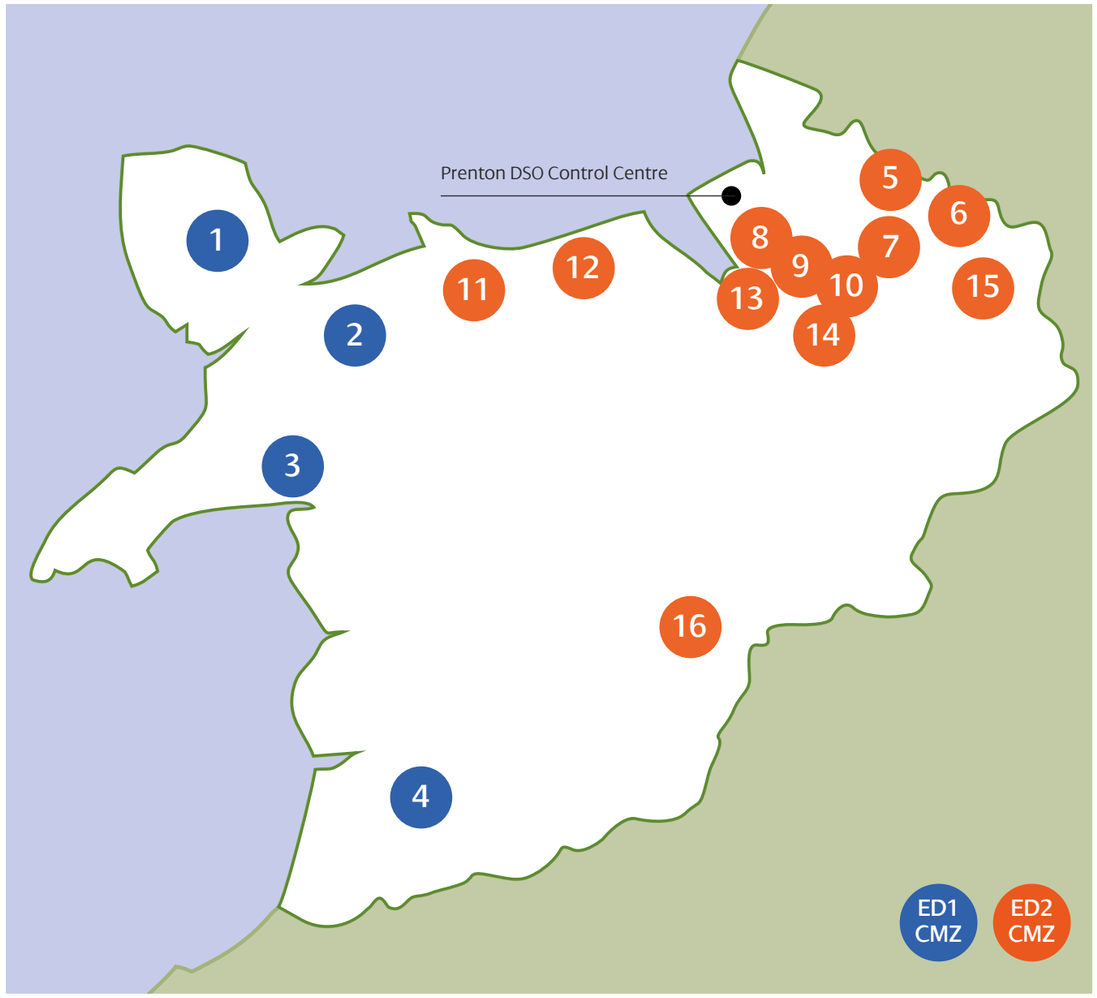
To help address this, we are currently developing four constraint management zones (CMZs). These are at Almwch, Bangor, Four Crosses, and Aberystwyth. These fulfil a number of functions, one of which is active network management (ANM). ANM enables renewable generators to connect more quickly and at lower cost where they would otherwise trigger capacity reinforcements. It does this by ramping down their output during periods where network constraints would otherwise occur. This keeps network power flows within safe limits. The Aberystwyth is unusual in that it is also managing transmission constraints. In short, these help renewable generators connect and increase utilisation of the existing network.

In RIIO-ED2 we will deliver 12 more CMZs (four in Wales and eight in England) and we will extend their functionality to help our control team manage the increasingly complex and interactive network. This next generation of CMZs will coordinate and dispatch operational solutions – using network models, live data from network monitors, and automated analysis, they can make better decisions in shorter timescales than humans can to keep network power flows within limits and defer the need for reinforcement.

CMZs, along with the ANM platform, are a key component of enable a smarter and more flexible network that safely makes best use of existing network capacity. For more information see our DSO Strategy[11].

5

FIGURE 4: EXISTING AND PLANNED CMZS



1. Amlwch
2. Bangor
3. Four Crosses
4. Aberystwyth
5. Bold
6. Warrington
7. Percival Lane
8. Rock Ferry
9. Capenhurst
10. Ince
11. Colwyn Bay
12. St. Asaph
13. Deeside
14. Chester
15. Lostock
16. Legacy

We're engaging with NG ESO to establish exactly how these new Constraint Management Zones will interact with them, how customers will be compensated for their curtailment, and how we'll ensure security of both the Distribution and Transmission network.

The roll-out of CMZ's will ultimately become a crucial tool for allowing customers to connect quickly and for maximising the capability of our existing equipment. We're therefore committed to making this a business as usual solution, enabling us to deliver the zero carbon future our communities deserve.

"In addition to load and non-load interventions which increase capacity, we will deliver DSO tools and capabilities. "

[11] Annex 4A.3 - DSO Strategy

Part 1 – Network Development Information

Our NDP Part 1 outlines the specific details of all the interventions we are planning in the SP Manweb network that increase network capacity. This means we have also included in our NDP Part 1 losses driven and asset management-driven interventions which increase network capacity even though this isn't the primary reason for the intervention.

This section provides a detailed breakdown of our 10-year intervention plans, arranged by GSP and disaggregated by intervention driver. The information provided is shown on the following page:

For each individual intervention the following information is summarised:

NETWORK AREA: Name of the network group where the intervention is to be carried out.

DRIVER: Primary driver for the intervention (thermal, voltage, fault level, asset modernisation, etc.).

TYPE: Type of intervention (Section 2.1.2).

SOLUTION: Brief description of the intervention.

FLEXIBILITY: Flexible capacity to be employed in MW.

INCREASE IN FIRM CAPACITY: Capacity change resulting from the intervention in MVA.

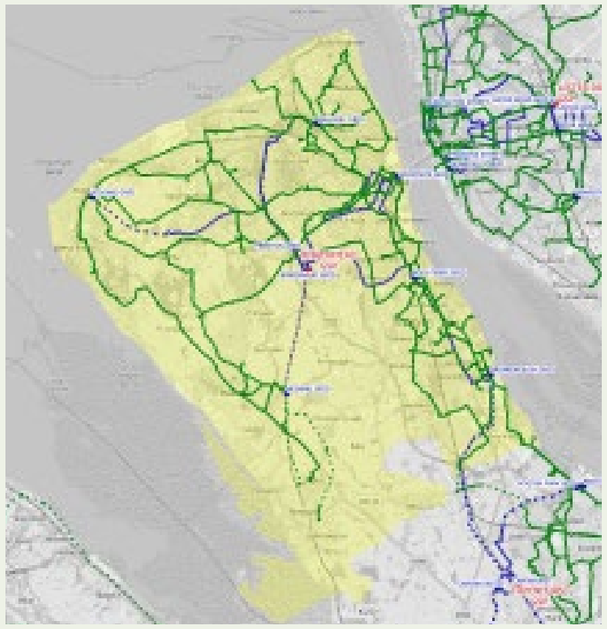
EXPECTED BY: Expected intervention completion year.

STATUS: Whether the intervention is in delivery or planned. RIIO-ED2 interventions contain a link to the relevant Engineering Justification Paper (EJP) for the intervention.

In addition to the list of interventions summarised in the following sections, we are planning to install enhanced voltage control at a number of grid (132/33kV) and primary (33kV/HV) sites during RIIO-ED2 (1 April 2023 - 31 March 2028).

6

OVERVIEW



SUMMARY GRAPH OF NETWORK GROUPS WITH INTERVENTIONS IN THE GSP GROUP, SPLIT BY VOLTAGE.

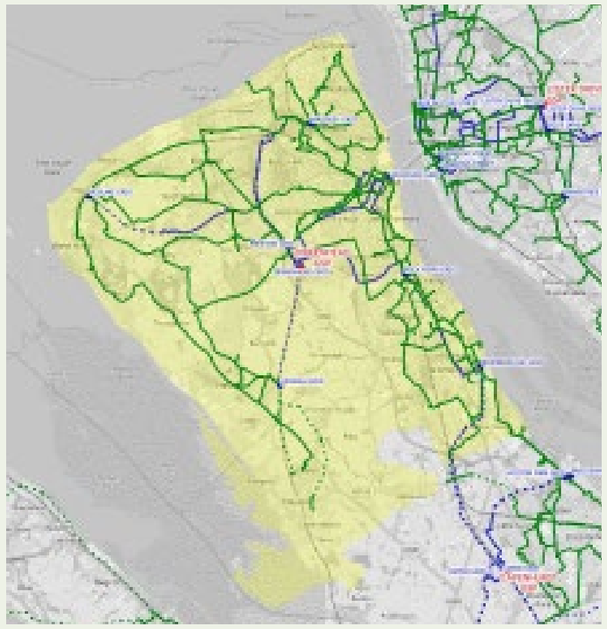
TOTAL FIRM CAPACITY TO BE RELEASED (MVA) BY ALL INTERVENTIONS IN THE GSP GROUP

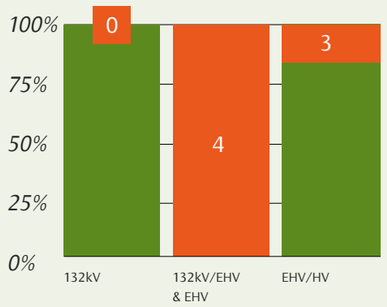
TOTAL MW OF FLEXIBILITY SERVICES TO BE EMPLOYED IN THE GSP GROUP

DESCRIPTION OF THE GEOGRAPHIC AREA SUPPLIED BY THE GSP AND THE TOTAL CUSTOMERS IN THE ELECTRICAL AREA.

PRE-FAULT	POST-FAULT
- MW	- MW

BIRKENHEAD





4.5 MVA CAPACITY RELEASED

23.4 MW OF FLEXIBILITY

THIS SECTION OF NETWORK IS FED VIA THREE 240MVA 275/132KV SGTS. THIS GROUP SUPPLIES ARONDD 162,000 CONSUMERS IN THE WIRRAL, INCLUDING BROMOBOROUGH, HESWALL, HOYLAKE, PRENTON, WOODSIDE AND WALLASEY AREAS.

PRE-FAULT	POST-FAULT
23.4 MW	0.0 MW

EHV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BROMBOROUGH GT3 / ROCK FERRY GT2	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at BXL Bromborough	–	*	2024/25	Planned (ED2)
HESWALL GT1 / HOYLAKE GT2 / PRENTON GT3	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacements at Greasby and West Kirkby South.	–	*	2024/25	Planned (ED2)
PRENTON GT1 / ROCK FERRY GT1	Asset Mod.		**33kV RMU and CB Modernisation** 33kV RMU and circuit breaker replacements at Bentinck Street.	–	*	2021/22	Delivery
PRENTON GT1 / ROCK FERRY GT1	Thermal	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	23.4	–	2025/26 to 2027/28	Planned (ED2)

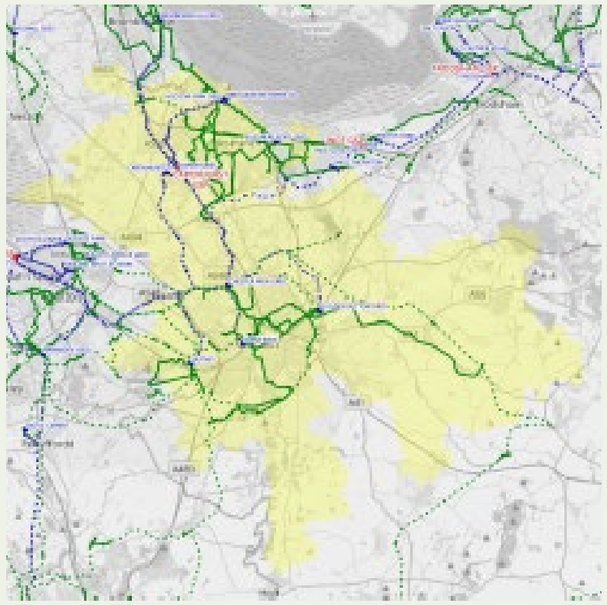
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
PRENTON GT1 / ROCK FERRY GT1	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Shell Tranmere.	–	*	2023/24	Planned (ED2)
PRENTON GT1 / ROCK FERRY GT1	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Cammell Laird North.	–	*	2024/25	Planned (ED2)
PRENTON GT1 / ROCK FERRY GT1	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Cammell Laird South.	–	*	2025/26	Planned (ED2)
WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2	Fault Level		**Woodside Grid 33kV Fault Level Mitigation** Replace 33kV switchgear and associated remote end protection modifications.	–	*	2023/24	Planned (ED2)
WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2	Fault Level		**33kV RMU Modernisation** 33kV RMU replacements at Moreton.	–	*	2022/23	Planned (ED2)
WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacements at New Brighton.	–	*	2023/24	Planned (ED2)
WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacements at Egremont, Gilbrook Dock and Seaview Road.	–	*	2024/25	Planned (ED2)

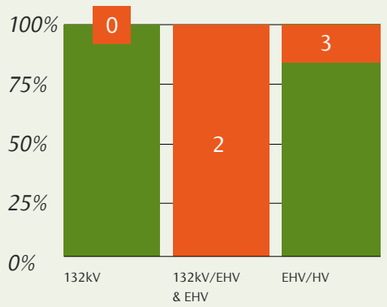
EHV/HV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BENTINCK ST T1 / BENTINCK ST T2 / CHESTER ST T1	Fault Level		**SPM 6.6kV Network Groups Fault Level Mitigation** Uprating from 6.6 to 11kV.	–	1.8	2027/28	Planned (ED2)
MDHB EGERTON DOCK T1 / MDHB EGERTON DOCK T2	Fault Level		**PM 6.6kV Network Groups Fault Level Mitigation** Uprating from 6.6 to 11kV.	–	0.9	2027/28	Planned (ED2)
GILBROOK DOCK T1 / HILL RD T1 / MOBIL OIL (WALLASEY) T1	Fault Level		**SPM 6.6kV Network Groups Fault Level Mitigation** Uprating from 6.6 to 11kV.	–	1.8	2025/26	Planned (ED2)

*These interventions could increase generation hosting capacity.

CAPENHURST





8.3 MVA CAPACITY RELEASED

2.1 MW OF FLEXIBILITY

THIS SECTION OF NETWORK IS FED VIA THREE 180MVA 275/132KV SGTS. THIS GROUP SUPPLIES AROND 87,000 CONSUMERS IN CHESHIRE, INCLUDING CHESTER, GREAT SUTTON, WHITBY, SUTTON HALL AND LITTLE SUTTON AREAS.

PRE-FAULT	POST-FAULT
2.1 MW	0.0 MW

EHV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BROMBOROUGH GT2 / ELLESMERE PORT GT1 / HOOTON PK GT1A / HOOTON PK GT2A	Asset Mod.		**33kV RMU and CB Modernisation** 33kV RMU replacements at Little Sutton and Great Sutton. 33kV circuit breaker replacements at Great Sutton.	–	*	2021/22	Delivery
BOWATER CONTAINERS T1 / ELLESMERE PORT LOCAL T1 / HH ROBERTSONS T1 / MOBIL OIL (E PORT) T1 / WHITBY T1	Fault Level.		**Mobil Oil Fault Level Reinforcement** Replacement of existing 33kV RMU	–	*	2021/22	Delivery
HOOTON PK GT1B / HOOTON PK GT2B	Fault Level.		**Fault Level Monitoring and Management** Install Real Time Fault Level Monitoring equipment at Hooton Park grid B.	–	*	2023/24	Planned (ED2)

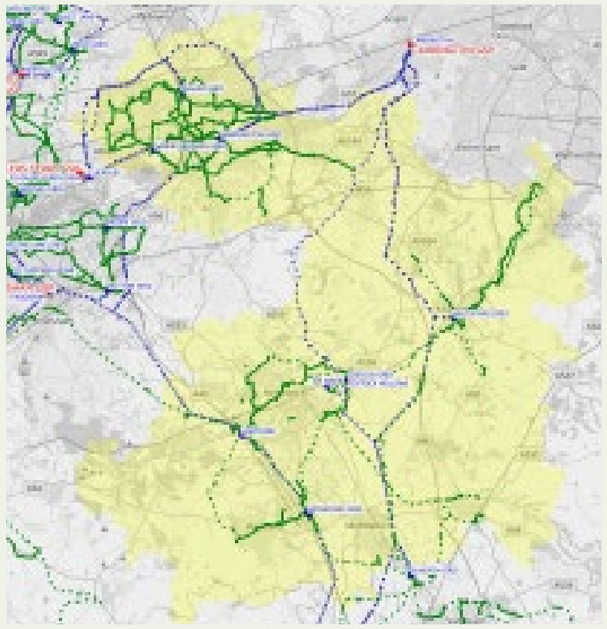
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
CHESTER MAIN GT4 / CRANE BANK GT1 / GUILDEN SUTTON GT1 / SALTNEY G2A	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Replace the 33kV RMU at Mannings Lane.	–	*	2023/24	Planned (ED2)
CHESTER MAIN GT4 / CRANE BANK GT1 / GUILDEN SUTTON GT1 / SALTNEY G2A	Asset Mod.		**33kV CB Modernisation** 33kV circuit breaker replacements at LCWW Huntington and Tarvin.	–	*	2025/26	Planned (ED2)
CHESTER MAIN GT4 / CRANE BANK GT1 / GUILDEN SUTTON GT1 / SALTNEY G2A	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Installation of Real Time Fault Level Monitoring equipment at Northgate Terrace.	–	*	2027/28	Planned (ED2)

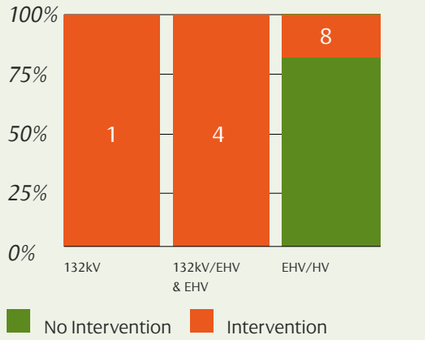
EHV/HV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BOWATER CONTAINERS T1 / ELLESMERE PORT LOCAL T1 / HH ROBERTSONS T1 / MOBIL OIL (E PORT) T1 / WHITBY MAIN T1	Thermal		**Cheshire Oaks Reinforcement** Move Ellesmere Port Local T1 across to Outlet Village T1 – Outlet Village T2 – Ellesmere Port Local T1– Chester Gates T1 – Unilever Dunkirk T1	–	-5.2	2022/23	Delivery
CHESTER GATES T1 / UNILEVER DUNKIRK T1	Thermal		**Cheshire Oaks Reinforcement** Installation of two 33/11kV transformers and additional 33 kV switchgear. New group configuration: Outlet Village T1 – Outlet Village T2 – Ellesmere Port Local T1– Chester Gates T1 – Unilever Dunkirk T1	–	13.5	2022/23	Delivery
TARVIN T1	Thermal	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	–2.1	–	2025/26 to 2027/28	Planned (ED2)

*These interventions could increase generation hosting capacity.

CARRINGTON – FIDDLERS FERRY





83.9 MVA CAPACITY RELEASED

51.8 MW OF FLEXIBILITY

THIS SECTION OF NETWORK IS NORMALLY FED VIA TWO 275/132KV SGTS AT FIDDLERS FERRY AND TWO 275/132KV SGTS AT CARRINGTON. THIS GROUP SUPPLIES AROND 149,000 CONSUMERS IN THE MID CHESHIRE REGION, INCLUDING WARRINGTON, ELWORTH, KNUTSFORD, HARTFORD, LOSTOCK AND WINSFORD AREAS.

PRE-FAULT	POST-FAULT
35.4 MW	16.4 MW

132KV/EHV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
CARRINGTON - FIDDLERS FERRY 132KV GROUP	Thermal.		**Carrington Fiddlers Ferry 132kV Reinforcement** Construct a 132/33kV substation near Hulseheath.	–	60	2025/26	Planned (ED2)
	Thermal.		**Carrington Fiddlers Ferry 132kV Smart Management** Dedicated monitoring and automation at Cuerdley 132kV substation.	16.4	–	2026/27 to 2027/28	Planned (ED2)
	Thermal.	Dynamic	Flexibility services to manage the Sankey Bridges to Hartford 132kV circuit.				

EHV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
DALLAM GT1 / SANKEY BRIDGES GT1 / WARRINGTON GT3	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Installation of Real Time Fault Level Monitoring equipment at Hawley's Lane	–	*	2027/28	Planned (ED2)
DALLAM GT1 / SANKEY BRIDGES GT1 / WARRINGTON GT3	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	26.1	*–	2026/27 to 2027/28	Planned (ED2)
DALLAM GT1 / SANKEY BRIDGES GT1 / WARRINGTON GT3	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Padgate and Rylands Eldon Street.	–	*	2027/28	Planned (ED2)
ELWORTH GT1 / ELWORTH GT2 / KNUTSFORD GT1 / KNUTSFORD GT2	Asset Mod.		**33kV CB Modernisation** 33kV circuit breaker replacements at Primrose Hall.	–	*	2021/22	Delivery
ELWORTH GT1 / ELWORTH GT2 / KNUTSFORD GT1 / KNUTSFORD GT2	Thermal.		**Lostock – Knutsford 33kV Circuit Reinforcement** Replace 1.5km of overhead line section between Lostock – Knutsford from 0.1sq. inch Cu with 150 sqmm ACSR.	–	10.9	2022/23	Delivery
HARTFORD GT1 / LOSTOCK GT2 / WINSFORD GT1 / WINSFORD GT2	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Eden Vale.	–	*	2022/23	Delivery
SANKEY BRIDGES GT3 / WARRINGTON GT5	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Thames Board Mill.	–	*	2022/23	Delivery
SANKEY BRIDGES GT3 / WARRINGTON GT5	Fault Level.		**Fault Level Monitoring and Management** Installation of Real Time Fault Level Monitoring equipment at Crossfields and Solvay Interox.	–	*	2025/26	Planned (ED2)
SANKEY BRIDGES GT3 / WARRINGTON GT5	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Installation of Real Time Fault Level Monitoring equipment at Stockton Heath.	–	*	2026/27	Planned (ED2)
SANKEY BRIDGES GT3 / WARRINGTON GT5	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Gigg Lane Thelwall.	–	*	2025/26	Planned (ED2)

*These interventions could increase generation hosting capacity.

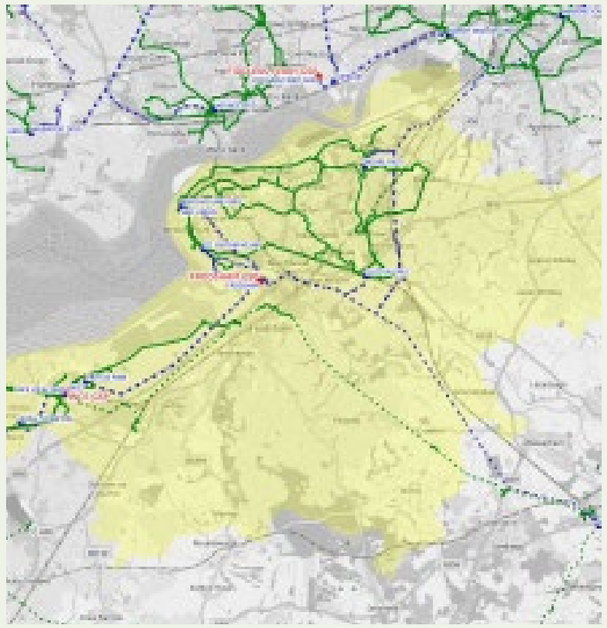
EHV/HV INTERVENTIONS

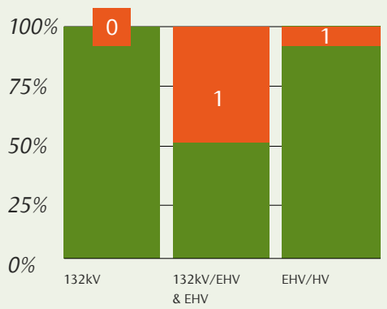
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
ANDERTON T1	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	0.9	–	2026/27 to 2027/28	Planned (ED2)
HARTFORD T1	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	3.3	–	2025/26 to 2027/28	Planned (ED2)
HOLMES CHAPEL T1	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	0.3	–	2027/28	Planned (ED2)
LYMM T1 / WHITELEGGS LA T1	Thermal.		**Flexibility Services for High Utilisation Groups** Enhanced transformer ratings and installation of network automation	–	0.0	2024/25	Planned (ED2)
	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	1.2	–	2025/26 to 2027/28	Planned (ED2)
MERE T1	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	3.1	–	2026/27 to 2027/28	Planned (ED2)
MIDDLEWICH T1	Thermal.		**Middlewich Primary Reinforcement** Additional 10MVA 33/11kV transformer. Extension of the 33kV switchboard Transfer Morrisons primary into Lostock- Gadbrook 33kV circuit and re-route the existing 33kV Lostock-Morrisons circuit to Middlewich primary.	–	2.5	2025/26	Planned (ED2)
	Thermal.	Secure	**Middlewich Primary Reinforcement** Flexibility services to manage the network risk during delivery of reinforcement	0.5	–	2023/24 to 2024/25	Planned (ED2)
RINGWAY T1	Voltage and Thermal.		**Ringway** New 8km of 33kV circuit between Mobberley and Ringway substations to install an additional 33/11kV transformer at Ringway. Replace RMU with a 3 panel 33kV board at Mobberley.	–	6.5	2022/23	Delivery

HV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
ORFORD T1 / PADGATE T1	Thermal.		**Padgate Primary Reinforcement** Auto-reclosure of 11kV bus-section for the loss of either Padgate or Orford primary transformer.	–	4	2022/23	Delivery

FRODSHAM – INCE





0.0 MVA CAPACITY RELEASED

0.4 MW OF FLEXIBILITY

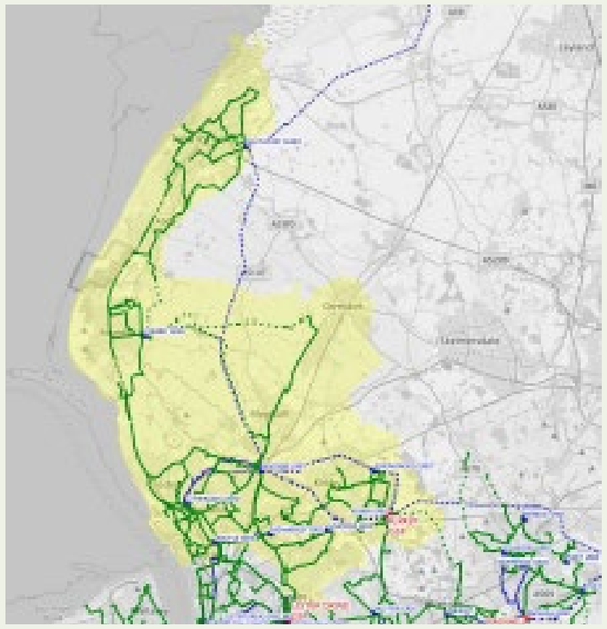
THIS SECTION OF NETWORK IS FED VIA TWO 180MVA 275/132KV SGTS AT FRODSHAM AND ONE 180MVA AND ONE 240MVA 275/132KV SGTS AT CAPENHURST. THIS GROUP SUPPLIES AROND 42,000 CONSUMERS IN CHESHIRE, INCLUDING ELLESMERE PORT, INCE AND RUNCORN AREAS.

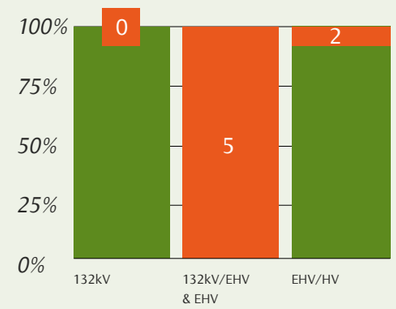
PRE-FAULT	POST-FAULT
0.4 MW	0.0 MW

EHV/HV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
FRODSHAM LOCAL T1	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	0.4	–	2027/28	Planned (ED2)

KIRKBY





48.9 MVA CAPACITY RELEASED

5.1 MW OF FLEXIBILITY

THIS SECTION OF NETWORK IS FED VIA THREE 240MVA 275/132KV SGTS AND ONE 180MVA 400/132KV SGT. THIS GROUP SUPPLIES AROND 219,000 CONSUMERS IN THE MERSEY REGION, INCLUDING FORMBY AND SOUTHPORT AREAS.

PRE-FAULT	POST-FAULT
5.1 MW	0.0 MW

EHV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
AINTREE GT2 / FAZAKERLEY GT1 / GILLMOSS GT2	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Installation of Real Time Fault Level Monitoring equipment at Jacobs.	–	*	2027/28	Planned (ED2)
AINTREE GT1 / FORMBY GT2A / LITHERLAND GT1B	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	1.8	–	2027/28	Planned (ED2)
FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2	Thermal.		**Formby-Southport 33kV Reinforcement** Overlay 14km of cable and establish new 33kV interconnector between Formby and Southport. Extend 33kV switchboard at Formby by one circuit breaker. Refurbish and use spare circuit breaker at Southport Grid substation	–	28.0	2025/26	Planned (ED2)

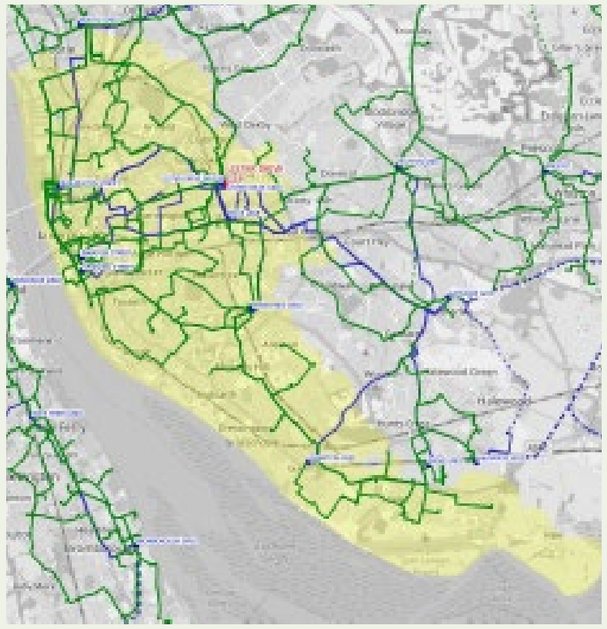
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2	**Thermal.**	Secure	**Formby-Southport 33kV** Flexibility services to manage the network risk during delivery of reinforcement.	3.3	–	2023/24 to 2025/26	Planned (ED2)
FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2	**Asset Mod.**		**33kV RMU Modernisation** 33kV RMU replacement at Nevill Street.	–	*	2024/25	Planned (ED2)
FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2	**Asset Mod.**		**33kV RMU Modernisation** 33kV RMU replacement at Mullards Balmoral Road.	–	*	2025/26	Planned (ED2)
FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2	**Asset Mod.**		**33kV RMU Modernisation** 33kV RMU replacements at Grantham Close, Lord Street, Market Street and York Road.	–	*	2026/27	Planned (ED2)
GILLMOSS GT1 / KIRKBY GT2 / SIMONSWOOD GT1	**Fault Level.**		**SPM 33kV RMUs Fault Level Mitigation** Replace 33kV RMU at Hammond Road, Dickinsons and St Ivel Foods.	–	*	2026/27	Planned (ED2)
GILLMOSS GT1 / KIRKBY GT2 / SIMONSWOOD GT1	**Fault Level.**		**Fault Level Monitoring and Management** Installation of Real Time Fault Level Monitoring equipment at Yorkshire Imperial Metals and Acornfield Road.	–	*	2024/25	Planned (ED2)
GILLMOSS GT1 / KIRKBY GT2 / SIMONSWOOD GT1	**Asset Mod.**		**33kV RMU Modernisation** 33kV RMU replacements at Westvale.	–	*	2026/27	Planned (ED2)
AINTREE GT1 / FORMBY GT2A / LITHERLAND GT1B BOOTLE GT1 / LITHERLAND GT1A	**Fault Level.**		**Switchgear Replacement** Replace 33kV switchboard at Litherland grid substation.	–	*	2022/23	Delivery

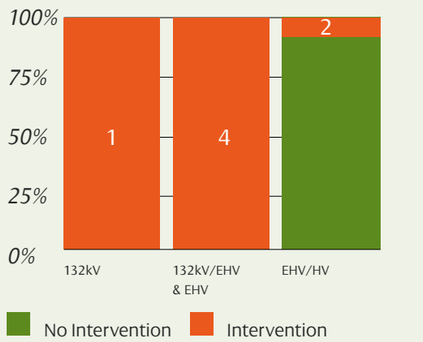
*These interventions could increase generation hosting capacity.

EHV/HV INTERVENTIONS

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BANASTRE RD T1 / DOVER RD T1 / GRANTHAM CL T1	**Thermal.**		**Southport Primary Reinforcement** IUprate group from 6.6 to 1kV. Transition of HV feeders from X-type to Y-type with network automation.	–	10.9	2021/22	Delivery
KELCO T1 / NEWS INTERNATIONAL T1 / NEWS INTERNATIONAL T2 / PALCO T1 / SOUTHDENE T1	**Fault Level.**		**SPM 11kV Network Group Fault Level Mitigation** Establish a new 7.5/10MVA 33/11kV transformer at Ainsworth Lane substation by looping into the Kirkby-Palco 33kV circuit via 2 x 0.8km cable to split the Kelco-News International-Palco-Southdene group.	1.8	10.0	2025/26	Planned (ED2)

LISTER DRIVE





5.1 MVA CAPACITY RELEASED

41.3 MW OF FLEXIBILITY

THIS SECTION OF NETWORK IS NORMALLY FED VIA THREE 240MVA 275/132KV SGTS. THIS GROUP SUPPLIES AROND 160,000 CONSUMERS IN THE LIVERPOOL CITY AREA.

PRE-FAULT	POST-FAULT
41.3 MW	0.0 MW

132KV INTERVENTIONS

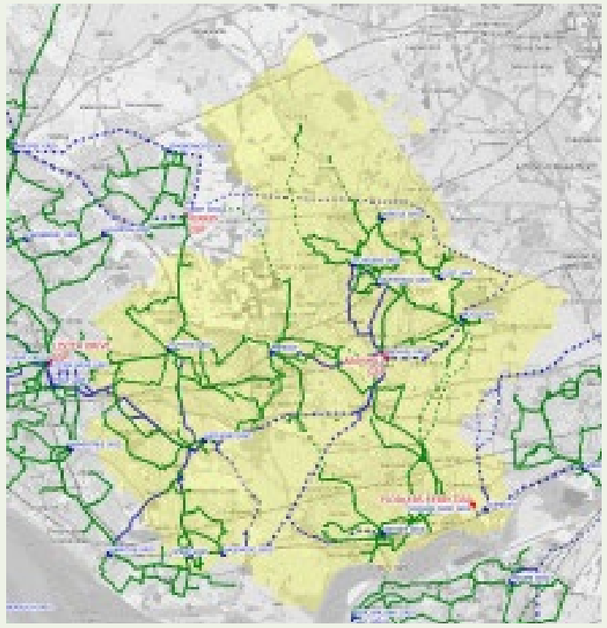
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
LISTER DRIVE 132KV GROUP	Thermal.		**Lister Drive 132kV Reinforcement** Install real time thermal monitoring equipment on 132kV circuit to Burlington St. CMZ based automation scheme to trip Burlington St. – Bootle circuit and close either line or bus section beaker at Bootle. Annual tendering for flexibility to reduce dependence on automation scheme and higher demand turnout.	–	0.0	2023/24	Planned (ED2)
LISTER DRIVE 132KV GROUP	Thermal.	Sustain	**Lister Drive 132kV** Flexibility services to manage the network risk during delivery of reinforcement.	41.3	–	2024/25 to 2027/28	Planned (ED2)

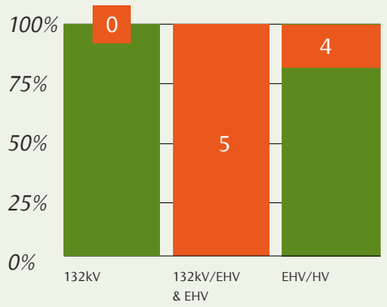
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BOOTLE GT2A / BURLINGTON ST GT1 / LISTER DV A GT2	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacements at MDHB Canada Dock.	–	*	2022/23	Delivery
BOOTLE GT2A / BURLINGTON ST GT1 / LISTER DV A GT2	Asset Mod.		**33kV CB Modernisation** F33kV circuit breaker replacements at Lister Drive A.	–	*	2023/24	Planned (ED2)
BOOTLE GT2A / BURLINGTON ST GT1 / LISTER DV A GT2	Fault Level.		**Fault Level Monitoring and Management** Installation of Real Time Fault Level Monitoring equipment at Bootle Grid B.	–	*	2023/24	Planned (ED2)
BOOTLE GT2A / BURLINGTON ST GT1 / LISTER DV A GT2	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Replace 33kV RMU at Gardners Row, Regent Road and Sheil Park,	–	*	2024/25	Planned (ED2)
BOOTLE GT2A / BURLINGTON ST GT1 / LISTER DV A GT2	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Installation of Real Time Fault Level, Monitoring equipment at Suburban Road.	–	*	2026/27	Planned (ED2)
BURLINGTON ST GT2 / LISTER DV B GT1 / PARADISE ST GT1	Fault Level.		**Fault Level Monitoring and Management** Installation of Real Time Fault Level Monitoring equipment at Paradise St Grid.	–	*	2026/27	Planned (ED2)
BURLINGTON ST GT2 / LISTER DV B GT1 / PARADISE ST GT1	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Replace 33kV RMU at Littlewoods.	–	*	2027/28	Planned (ED2)
BURLINGTON ST GT2 / LISTER DV B GT1 / PARADISE ST GT1	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Oldham Place.	–	*	2027/28	Planned (ED2)
GARSTON GT2 / SPEKE GT3 / WAVERTREE GT1A	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Replace 33kV RMU at Weaver Ind Estate.	–	*	2027/28	Planned (ED2)
LISTER DV B GT3 / SPARLING ST GT1 / WAVERTREE GT2	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Replace 33kV RMUs at St James and Blundell Street.	–	*	2025/26	Planned (ED2)
LISTER DV B GT3 / SPARLING ST GT1 / WAVERTREE GT2	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Installation of Real Time Fault Level Monitoring equipment at Stoneycroft.	–	*	2025/26	Planned (ED2)

*These interventions could increase generation hosting capacity.

EHV/HV INTERVENTIONS							
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BIBBYS T1 / INLAND REVENUE OFFICES T1 / REGENT RD T1	Thermal and Fault Level.		**Bootle Canal Quarter Regeneration Scheme** Voltage uprating to 11kV.	–	2.5	2025/26	Planned (ED2)
DELAMORE ST T1 / KIRKDALE T1 / WALTON T1	Thermal and Fault Level.		**Bootle Canal Quarter Regeneration Scheme** Voltage uprating to 11kV.	–	2.6	2026/27	Planned (ED2)

RAINHILL





24.5 MVA CAPACITY RELEASED

6.6 MW OF FLEXIBILITY

THIS SECTION OF NETWORK IS FED VIA FOUR 180MVA 275/132KV SGTS. THIS GROUP SUPPLIES AROND 174,000 CONSUMERS IN THE MERSEY REGION, INCLUDING PRESCOT, WIDNES, RAVENHEAD, ST HELENS, HUYTON, LOSTOCK AND KIRBY AREAS.

PRE-FAULT	POST-FAULT
6.6 MW	0.0 MW

EHV INTERVENTIONS							
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BOLD G4A / PRESCOT GT1B / WIDNES GT1 / WIDNES GT2	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Replace 33kV RMU at Hills Moss.	–	*	2023/24	Delivery

NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
BOLD G4A / PRESCOT GT1B / WIDNES GT1 / WIDNES GT2	Asset Mod.		**33kV RMU Modernisation** 33kV RMU replacement at Pilk Sullivan.	–	*	2024/25	Planned (ED2)
GATEACRE GT1 / HUYTON GT1 / KIRKBY GT3 / PRESCOT GT1A	Fault Level.		**Fault Level Monitoring and Management** Installation of Real Time Fault Level Monitoring equipment at East Prescot Road (Finch Lane)	–	*	2024/25	Planned (ED2)
GATEACRE GT1 / HUYTON GT1 / KIRKBY GT3 / PRESCOT GT1A	Fault Level.		**Switchgear Replacement** Replace 33kV switchboards at Huyton and Gateacre grid substations.	–	*	2021/22	Delivery
GATEACRE GT1 / HUYTON GT1 / KIRKBY GT3 / PRESCOT GT1A	Fault Level.		**Prescot Grid 33kV Fault Level Mitigation** Install 60MVA 33kV 6% reactor.	–	*	2027/28	Planned (ED2)
HALEWOOD G1B / HALEWOOD G2B / HALEWOOD GT3 / SPEKE GT1A	Fault Level.		**Fault Level Monitoring and Management** Installation of Real Time Fault Level Monitoring equipment at Halewood Grid	–	*	2023/24	Planned (ED2)
HALEWOOD G1B / HALEWOOD G2B / HALEWOOD GT3 / SPEKE GT1A	Fault Level.		**SPM 33kV RMUs Fault Level Mitigation** Replace 33kV RMU at Woodend Avenue	–	*	2027/28	Planned (ED2)

EHV/HV INTERVENTIONS							
NETWORK AREA	DRIVER	TYPE	SOLUTION	FLEXIBILITY (MW)	INCREASE IN FIRM CAPACITY (MW)	ETA	STATUS
APPLETON T1 / HORNSBRIDGE T1 / LUGSDALE T2	Thermal.	Secure	**Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints.	6.6	–	2026/27 to 2027/28	Planned (ED2)
BRITISH SIDAC T1 / SHERDLEY RD T1 / ST HELENS LINKWAY T1 / WATERY LA T1	Fault Level.		**SPM 6.6kV Network Groups Fault Level Mitigation** Uprating from 6.6 to 11kV.	–	11.8	2025/26	Planned (ED2)
CARLTON ST T1 / CARLTON ST T2 / CHALON WAY T2	Thermal and Fault Level		**St. Helens 6.6kV uprating** Uprating from 6.6 to 11kV	–	1.8	2022/23	Delivery
CHALON WAY T1 / TECHNOLOGY CAMPUS T1 / WOODVILLE ST T1	Thermal and Fault Level		**St. Helens 6.6kV uprating** Uprating from 6.6 to 11kV	–	0.9	2022/23	Delivery
	Thermal and Fault Level.		**St. Helens 33kV Network Modifications** Transfer Technology Campus to RAVENHEAD G1A1 / ST HELENS GT2B / WINDLE GT1 to complete 33kV group split.	–	10	2022/23	Delivery

*These interventions could increase generation hosting capacity.

Part 2 – Network Capacity Headroom

This section provides a forecast of post-intervention headroom across all network groups out to 2050. We've calculated this post-intervention headroom by combining our existing network model, our scenario forecasts, and our known intervention plans.

Our NDP Capacity Headroom spreadsheet data files provide this information for each grid (132/33kV) and primary (33kV/HV) substation/substation group for each year for the first ten years and every five years thereafter through to 2050. Given the forecast uncertainty in future pathways to achieve Net Zero, we have done this for each of the low, baseline, and high scenarios (see NDP Methodology Statement). We provide our headroom calculation for demand and generation separately as the constraints limiting each can be different (see Section 2.2).

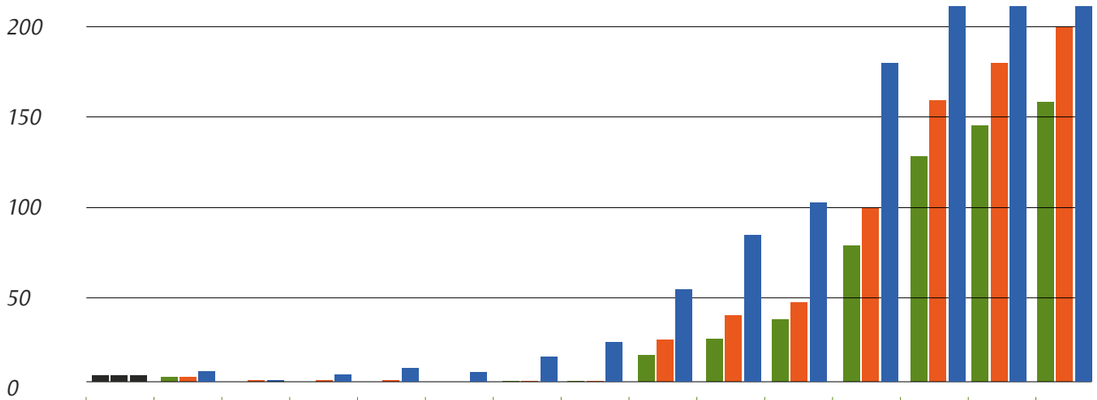
7

DEMAND HEADROOM RESULTS

Demand growth is increasing from now out to 2050 due to the decarbonisation of heat and transport. This isn't fully reflected in Figure 5, which shows the number of constrained primary groups only increasing after 2028, as this constraint data incorporates our planned RIIO-ED1 and RIIO-ED2 investments (i.e. there are few constraints up to 2028 as we have planned interventions to resolve these rather than because there is no demand increase). Constraints increase after this point, as we haven't yet planned interventions for that period (we will start this in 2025 when we start preparing for RIIO-ED3).

The difference in constraints pre-2028 and post-2028 illustrates an important point: we can provide the interventions our customers need to decarbonise providing Ofgem authorise the investment. However if the interventions aren't made then the network will suffer from widespread constraints. These would make 2050 Net Zero target unachievable, and the network would be overloaded, exposing customers to safety risks, supply interruptions, and higher overall costs. It is absolutely in our customers' interests for us to deliver additional capacity.

FIGURE 2: SP MANWEB SUMMARY OF INTERVENTIONS BY DRIVER TO 2028
SPM - DEMAND CONSTRAINED HV GROUPS



	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	34/35	39/40	44/45	49/50
Low	4	2	0	0	0	0	0	0	13	27	35	82	132	147	160
Baseline	4	2	1	1	1	0	1	1	22	32	44	100	156	176	200
High	4	5	1	3	7	5	15	26	59	85	102	185	225	237	238

GENERATION HEADROOM RESULTS

Generation growth is increasing from now out to 2050. This isn't fully reflected in Figure 6, which shows the number of constrained primary groups only increasing after 2028, as this constraint data incorporates our planned RIIO-ED1 and RIIO-ED2 investments (i.e. there are reducing constraints up to 2028 as we have already planned interventions to resolve these). Constraints increase after this point as we haven't yet planned interventions for that period (we will start this in 2025 when we start preparing for RIIO-ED3).

These figures show that we are not reducing all known generation constraints within RIIO-ED2. Some key points:

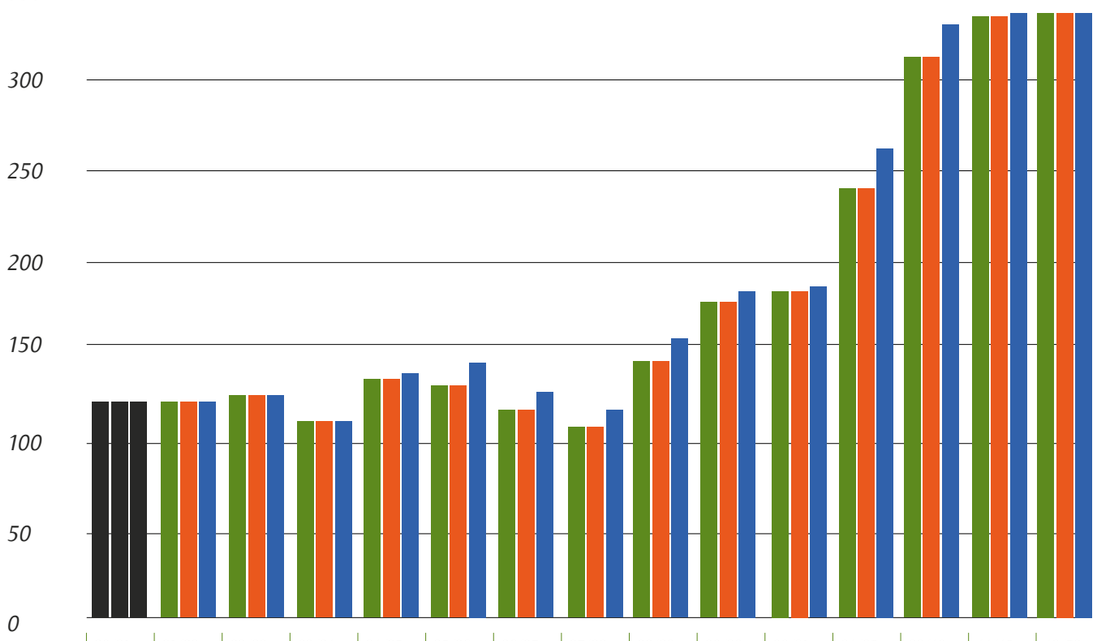
1. Figure 6 shows the number of primary substation groups with no spare firm capacity. However we are enabling generation to connect to some of these primary substation groups through flexible connection arrangements such as ANM and AFLM.

2. As these show constrained primary substations, these constraints will likely not impede larger-scale generation where this connects to 33kV or 132kV network assets.

3. These constraints will likely not impede domestic-scale (<50kW) generation given its minimal contribution to network constraints.

4. Figure 6 does not incorporate upstream constraints beyond our network boundary. However these are flagged within the Part 2 spreadsheets.

FIGURE 6: SP MANWEB NUMBER OF GENERATION CONSTRAINED PRIMARY SUBSTATION GROUPS
SPM - GENERATION CONSTRAINED HV GROUPS



	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	34/35	39/40	44/45	49/50
Low	121	121	122	113	134	132	124	111	142	182	185	243	316	335	338
Baseline	121	121	122	113	134	132	124	111	142	182	185	243	316	335	338
High	121	121	123	114	136	138	133	121	151	186	187	266	326	338	338

FLEXIBILITY BY YEAR

	FLEXIBLE CAPACITY (MW)				
NETWORK AREA	2023/24	2024/25	2023/24	2024/25	2024/25
ACER AVE T1	0.6	0.7	2.4	2.8	–
SANDBACH T1	1.6	2.2	–	–	–
MERE T1	–	–	–	0.8	2.3
LYMM T1 / WHITELEGGS LA T1	–	–	0.6	0.3	0.3
NANTWICH T1	–	–	–	0.5	0.9
RADWAY GREEN T1	–	–	–	–	0.6
MIDDLEWICH T1	0.2	0.3	–	–	–
COPPENHALL GT1 / CREWE GT1 / CREWE GT2A / CREWE GT4A / RADWAY GREEN GT1 / RADWAY GREEN GT2 / WHITCHURCH GT2	–	–	–	4.7	–
COPPENHALL GT1 / CREWE GT1 / CREWE GT2A / CREWE GT4A / RADWAY GREEN GT1 / RADWAY GREEN GT2 / WHITCHURCH GT2	–	–	–	1.9	–
AINTREE GT1 / FORMBY GT2A / LITHERLAND GT1B	–	–	–	–	1.8
FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2	1.0	1.1	1.2	–	–
CONNAH'S QUAY 132KV	–	–	–	18.1	–
LISTER DRIVE 132KV	–	9.3	13.4	10.4	8.2
APPLETON T1 / HORNSBRIDGE T1 / LUGSDALE T2	–	–	–	2.7	3.9
TARVIN T1	–	–	0.1	0.5	1.5
ANDERTON T1	–	–	–	0.3	0.6
HARTFORD T1	–	–	0.8	1.6	0.9
FRODSHAM LOCAL T1	–	–	–	–	0.4
SMALLWOOD T1	–	–	1.1	1.6	1.2
HOLMES CHAPEL T1	–	–	–	–	0.3
DALLAM GT1 / SANKEY BRIDGES GT1 / WARRINGTON GT3	–	–	–	6.7	19.4
PRENTON GRID GT1 / ROCK FERRY GT1	–	–	2.8	5.3	15.3
CARRINGTON - FIDDLERS FERRY 132KV	–	–	–	8.0	8.4

Flexibility Services

To meet evolving customer needs, we are developing smarter, more flexible network solutions to help mitigate the need for traditional reinforcement and reduce costs for our customers. This is cheaper for our customers as it enables us to delay expensive reinforcement work for as long as possible.

Resources connected to our networks could provide both additional capacity and additional generation to assist in key areas that have specific challenges during periods of network constraint.

We are exploring markets for flexibility with new and existing customers who are able and willing to control how much they generate or who can control their demand.

8

FLEXIBILITY SERVICES OVERVIEW

Flexibility Services is where a Distribution Network Operator (DNO), like SP Energy Networks, pays a third party to operate assets in a way that's beneficial to our network. Those third parties will be owners of generation assets or low carbon technologies (LCTs) such as wind turbines, battery storage, solar or electric vehicles, and we may ask them to "turn down" or up depending on the needs of our network. In other words, we might ask them to lower the power consumption of their assets for an agreed period to allow us to free up that capacity for use elsewhere, or we might ask them to use more power in areas where we have excess generation.

As the needs of our customers and communities are constantly changing, the requirements of our electricity network are too. The increased uptake of LCTs does often result in constraints on the network during periods of high demand. However, new technologies and connections can often lead to excess generation in other areas too. Flexibility therefore provides an agile, smart means of balancing our network to solve both of those challenges.

We have accepted bids totalling 140MW of flexibility services in previous rounds of Flexibility Services tendering.

Flexibility involves working with customers who can control their electricity demand or how much they generate. This then helps unlock capacity in the existing infrastructure as low carbon technologies such as electric vehicles and electric heating systems connect to the network.

In the latest round of tendering, we sought to procure flexibility services across high voltage (HV), extra-high voltage (EHV) and low voltage (LV) locations for the RIIO-ED2 business plan period 2023-2028 This was the first time SPEN tendered for low voltage flexibility.

Bids were accepted across 55 sites at HV, EHV and 132kV.

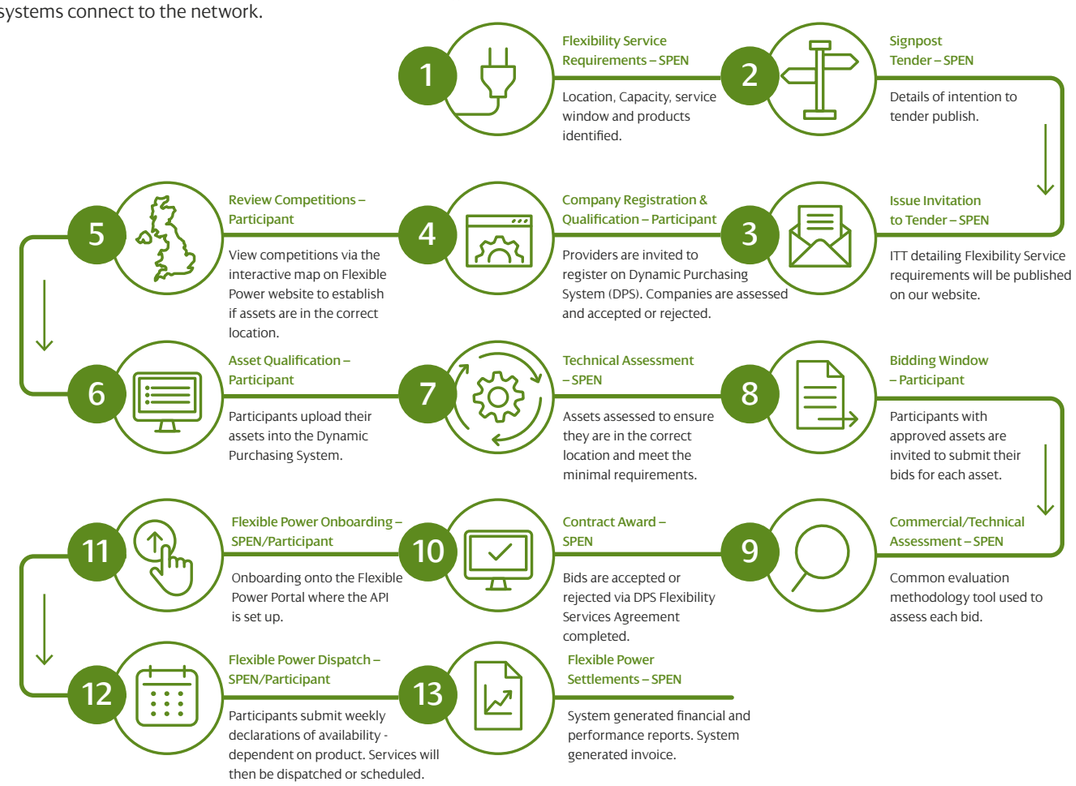
In north-west England and North Wales, 113MW was secured across 12 locations at HV and EHV.

Bids for 3MW of flexibility across the full LV network were accepted at 33 locations.

We're encouraged by the responses from flexibility providers to our latest tenders. The bids enable us to identify the level of flexible capacity available in areas where it could benefit the network, understand the capabilities of these resources, and assess the viability of using flexibility to meet network requirements.

Flexibility is key to achieving smarter energy networks, reducing the need – where possible – for costly reinforcement work and giving customers the opportunity to participate in a low carbon future and benefit financially for doing so.

Key stakeholders and customers interested in providing flexibility services can find further information by emailing: flexibility@spenergyservices.co.uk



Major Connections to our SP Manweb Distribution Network

We know that customers who are connecting larger or more complex projects will require more support information, and advice both upfront and throughout the process. Our approach and commitments to serving these customers includes increased network data transparency, easier to navigate processes and continuous engagement as we recognise the needs of these customers are likely to change.

We appreciate that the nature of certain types of connections are complex and we will support these customers in designing network solutions which best suit them. To do this, our network designers require future-ready innovative design tools, supplemented by artificial intelligence, network data and real time analysis.

Our designers will have industry leading electrical design knowledge delivered through a comprehensive suite of workforce initiatives including upskilling and recruitment. This will provide customers with the most economical solution for them, even providing alternative flexible arrangements to potentially break down any barriers.

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CHANGES TO THE COST TO CONNECT TO OUR NETWORK FOR LARGE DEMAND AND GENERATION CUSTOMERS.

Access Significant Code Review

In an effort to accelerate towards Net Zero, Ofgem are changing the way customers pay for connecting to the electricity distribution network.

Ofgem's Access Significant Code Review (SCR) was published on the 3rd May 2022 and the changes outlined will come into force from the 1st April 2023.

Access SCR is part of a package to reform how different parties access and pay charges for a connection to the electricity network. The objective of the Access SCR is to ensure that electricity networks are used efficiently and flexibly, allowing consumers to benefit from new technologies and services. It is expected the changes will enable more Low Carbon Technology (LCT) connections and allow Distribution Network Operators (DNOs) to reinforce the network more strategically.

At its simplest level the Access SCR changes will mean that Demand customers no longer pay a proportion of upstream reinforcement costs and Generation customers will only pay a proportion of reinforcement costs at the same voltage level as their point of connection.

All customers will still pay for the works to provide their Point of Connection either via their Distribution Network Operator (DNO) or via an Independent Connection Provider (ICP).

Charges for Transmission related works will not be impacted by the Significant Code Review. These charges will still be passed onto the connecting customer by the electricity DNO.

OVERVIEW OF THE CHANGES THAT WILL BE IMPLEMENTED ON 1ST APRIL 2023:

Demand Connection Sites

Applications for a Demand Connection site will not be required to contribute to reinforcement works unless they trigger the Demand High-Cost Project Threshold of £1740/kVA or are deemed to be a Speculative Development. This should likely result in a reduction in their connection charges if this scheme is subject to reinforcement.

Generation Connection Sites

Applications for a Generation Connection site will be required to contribute to reinforcement works at the same voltage of their connection, up to the Generation High-Cost Project Threshold of £200/kW. This should likely result in a reduction in their connection charges. Please note that Connection of Energy Storage will be treated consistently with generation for connection charging purposes.

High Cost Project Threshold (HPCT)

This is the £/kW threshold above which connecting customers are required to pay for any reinforcement costs in full.

This is a mechanism in place to protect the wider customer base from excessive costs triggered by connections requiring significant reinforcement works.

It works by limiting the DNO's contribution to reinforcement works (which will ultimately be socialised to the wider customer base) on a £ per capacity basis.

THE HIGH COST PROJECT THRESHOLD (HPCT) WILL CHANGE FROM 1ST APRIL 2023:

Demand

This will be £1740/kVA to mitigate the exposure of Distribution Use of System (DUOS) bill payers to excessively high costs.

Where the Demand High-Cost Project threshold is exceeded, the sum of Reinforcement costs at the voltage of the Point of Connection (POC) and the voltage above in excess of the threshold should be paid in full by the customer. The customer will not pay for any reinforcement costs below the HCPT.

Generation

This will be retained at £200/kW. Where the Generation HCPT is exceeded, the sum of reinforcement costs at the voltage of the Point of Connection and the voltage above in excess of the threshold will need to be paid in full by the customer. Reinforcement costs below the threshold will be apportioned between the customer and the DNO using the cost apportionment factor methodology set out in the Common Connection Charging methodology (CCCM).

SP Energy Networks are currently developing flexibility services which can be used to connect customers without the need for traditional reinforcement, and therefore reducing costs.

Where applicable customers may be offered a Curtailable Connection as an interim solution to facilitate an earlier connection whilst reinforcement is undertaken.

This allows SP Energy Networks to curtail the customer usage within agreed parameters defined in the connection offer.

A Curtailable Connection could also provide an enduring solution where the connection request triggers the High-Cost Project Threshold and the connecting customer does not agree to contribute to reinforcement costs above the threshold.

From 1st April 2023 the ECCR (second comer) rules will be updated to reflect the new charging boundaries i.e. Demand Connections will not contribute to reinforcement works while Generation Connections will contribute a reduced value to reinforcement works.

Should an ED2 (from 1st April 2023) Demand Connection utilise network assets that were funded by previous ED1 (pre 1st April 2023) customers, then they will not be charged second comer reimbursement payments. This means that ED1 first comer customers will not receive second comer reimbursement payments from ED2 Demand connected customers.

Should an ED2 Generation Connection utilise network assets that were funded by previous ED1 customers, then they will be charged second comer reimbursement payments. This means that ED1 first comer customers will likely receive a reduced value in second comer reimbursement payments from ED2 Generation connected customers.

The second comer rules will be updated to reflect the new charging boundaries in ED2 (from 1st April 2023). This includes:

Demand Connections will not be entitled to ECCR rebates or be required to reimburse first comers.

Generation Connections will be entitled to ECCR rebates and be required to reimburse first comers, but only proportionately to their initial contribution (and typically to a lower amount in ED2 in comparison to ED1).

Speculative Developments will not be entitled to ECCR rebates if the second comer is a Demand Connection but may be entitled to ECCR rebates if the second comer is a Generation Connection.

SP ENERGY NETWORKS STATEMENT OF WORKS PROCESS

Generators wishing to connect to SP Energy Networks distribution network may have an impact on the National Electricity Transmission System.

SPEN is required (under the Connection and Use of System Code) to make a request for a Statement of Works (SoW) to NGESO in relation to the potential impact of generation connections onto the National Electricity Transmission System.

The Statement of Works (SoW) process is set out within National Grid's Connection & Use of System Code (the CUSC).

Distribution network companies are obligated to follow this process in order to ascertain whether the connection of embedded generation (<100MW in England and Wales) will have an impact on the transmission network and the extent of any reinforcement works that may be required.

Under the SoW process, SP Manweb (SPM) have a responsibility to make an initial assessment as to whether a proposed generation connection is likely to have a significant impact on the transmission network and therefore require a Statement of Works application.

The following diagram illustrates this.

SoW Application Process:

Within the Statement of Works Process, there are three options:

IMPACT CATEGORY	PROCESS
WHERE THERE IS NO IMPACT ON THE TRANSMISSION SYSTEM	– Where it is known that there is no impact on the Transmission System, no application for a SoW will be submitted. – The Connection Offer will NOT include any dependency on the outcome of a SoW application.
WHERE THERE MAY BE AN IMPACT ON THE TRANSMISSION SYSTEM	– Stage 1 of the process will apply in that a SoW application will be made for an assessment of works (a fee applies). – Stage 2 of the process applies if, following the outcome of Stage 1 National Grid confirm the transmission network is impacted by the connection. Stage 2 requires a Project Progression (in the form of a Modification Application) to be submitted to National Grid (a fee applies). – The Connection Offer will include dependency on the transmission works being completed prior to the generator being able to connect and a requirement to pay such additional charges and/or provide securities as may be required.
WHERE THE IMPACT IS KNOWN	– Can move straight to Stage 2 of the process. A Project Progression (in the form of a Modification Application) is submitted to National Grid (a fee applies). – The Connection Offer will include dependency on the Transmission works being completed prior to the generator being able to connect and a requirement to pay such additional charges and/or provide securities as may be required.

OUR ASSESSMENT

Applications will be assessed with reference to our published GSP Register, which can be found at:

Distributed Generation Heat Maps - SP Energy Networks

– Any site seeking connection into a GSP highlighted as RED will progress directly to Stage 2 of the SoW process.

– In England & Wales, any site seeking to connect into a GSP highlighted as AMBER will be dependent upon a SoW application.

– For any site seeking to connect into a GSP highlighted as GREEN, if the level of connected AND contracted generation exceeds the minimum demand at the GSP, then it is likely that the additional MW seeking to connect will have an impact on the transmission system and will therefore be dependent on a SoW application.

If however there is still capacity headroom available at the GSP, prior to a reversal of power flow at the transmission/distribution interface points, then the connection offer will NOT generally be dependent upon a SoW application.

Fees

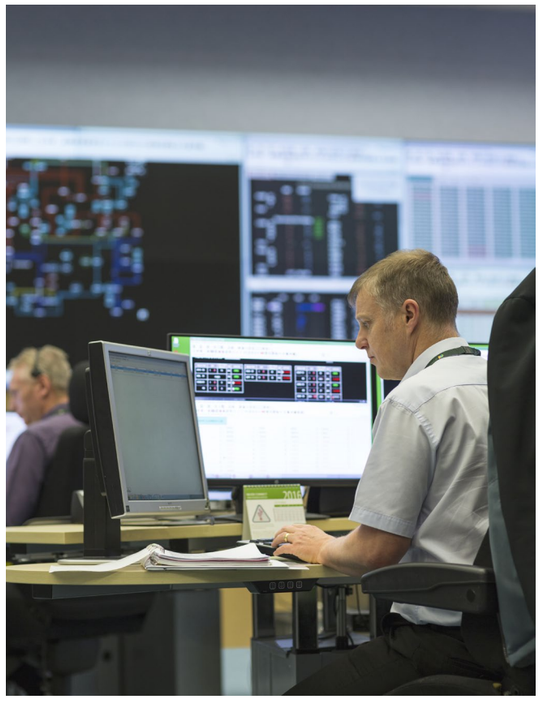
Full details of the application fees can be found in the Charging Statement published on the National Grid website:

www2.nationalgrid.com/uk/services/electricity-connections/new-connection/

Updating the Statement of Works process to facilitate aggregated assessment of relevant and collectively relevant embedded generation.

Due to the cumulative impact of connecting large volumes of new generation to the distribution system and the lengthy SoW process, a new trial SoW process is currently in place, known as the 'Appendix G trial'.

SP Energy Networks are actively involved in this 'Appendix G trial' and we will continue to work closely with all generation customers to facilitate their connections in a timely and efficient manner.



Next Steps

SP Manweb currently have weekly meetings with NGESO to discuss existing constraints for generation connections onto our SP Manweb distribution network, and are working with NGESO to determine what constraints may be imposed onto future connection applications to our distribution network.

We will continue this dialogue with NGESO and we look forward to including our key stakeholders and customers within the Net Zero North West Cluster Plan area into any ongoing negotiations and lobbying for further infrastructure development across the region.

Updating our Network Development Plan during April and May 2023

We are committed to providing annual updates of our Network Development Plan to help our customers and stakeholders understand the steps we are taking to help them achieve Net Zero.

We received excellent feedback from stakeholders during the creation of our Network Development Plan in 2022, and we are keen to continue the important discussions with customers and stakeholders to ensure we fully understand their needs and assist in the transition to net zero as much as possible.

To ensure that our plans and publications cover the needs and wants of our stakeholders, customers, and the communities we serve, we welcome ongoing feedback. Feedback can be emailed to RIIO_ED2@spenergynetworks.co.uk.

We will be hosting further stakeholder engagement sessions over the next few months to fully understand the pipeline of projects that customers and stakeholders are developing within the SP Manweb area. We will welcome feedback from all sources as we work to deliver the distribution network that accommodates our connections customer and stakeholder plans.

Further information can be found at:
Stakeholder Events - SP Energy Networks

HELPING OUR CUSTOMERS PREPARE FOR NET ZERO

Our Energy Data Hub has been created to house all data that SP Energy Networks currently shares openly in the public domain.

The purpose of having an open data platform is to share data to open up opportunities for future development including innovation, optimisation and decarbonisation. This may be of interest to a number of parties: customers who may want to locate EV charging points, flexibility providers who may be interested in local capacity and potential for development, and anyone interested in SP Energy Networks' long term development statement and data-oriented strategies.

Our Energy Data Hub can be found at:
spenergynetworks.co.uk/energy_data_hub

This may be of interest to a number of parties: customers who may want to locate EV charging points, flexibility providers who may be interested in local capacity and potential for development, and anyone interested in SP Energy Networks' long-term development statement and data-oriented strategies.

TAILORED CONNECTIONS ENGAGEMENT PLANNING

Staying true to our Core Stakeholder Engagement Strategy, we listen to what our customers and stakeholders are telling us and develop actions with measures in areas that matter to them most.

We extend an open door policy, regularly meeting with customers and stakeholders to assist with individual projects, on an as and when required basis. In addition to this, we host a wide range of engagement events which are published on our website and issue invitations to all relevant stakeholders. At SP Energy Networks we value the feedback we receive on how we can further improve our service.

Those interested in providing their views can register as a stakeholder using the link below.

Register as a stakeholder: spenergynetworks.co.uk/register

Based on what you tell us you are interested in when you register as a stakeholder - we will invite you to a range of engagement opportunities such as workshops, conferences, meetings and consultations.

We will continue to shape our engagement to our stakeholder requirements and we would like to encourage all stakeholders to provide updates on the engagement we provide to ensure we fully provide any improvements necessary.

Customer Surgeries

We are committed to helping our stakeholders and customers understand new policies and procedures as they arise.

We will continue to offer online sessions to engage with stakeholders and provide updates on specific projects when appropriate.

Please contact us and suggest topics you would like to understand more about if you feel there are further subjects you would like us to cover in our online sessions.

Please contact us on:
gettingconnectedupdates@spenergynetworks.co.uk

Monthly Newsletters

Following feedback from stakeholders we have decided to provide regular updates on the key topics that are important to our stakeholders.

We have revised the format of our monthly newsletter, which now gives a regular update on the SP Energy Networks Drive to Decarbonisation, providing a monthly update on the work we are doing on the following topics:

EV, Heat, DSO/Flexibility, Innovation Projects, Policy Updates, Community Partnerships

Please let us know if you would like a monthly update on any other topics.

Please contact us: ongettingconnectedupdates@spenergynetworks.co.uk

Open Door Policy

We will be continuing our Open Door Policy via telephone or using MS Teams or Zoom.

We are keen to engage with any stakeholder and customer in any way they choose despite the lack of face to face meetings at present.

Please continue to contact our teams in both licence areas using the Areas of Responsibility information at the back of his document, or the Contact Us page of our website, which can be found at: spenergynetworks.co.uk/contactconnections

Email Communications

We continue to look for new ways to communicate with our stakeholders, and we have increased our email communications to our registered stakeholders during the ongoing COVID-19 pandemic.

Stakeholders have told us that this increased communication has been appreciated, and we plan to deliver further communications in this manner.

Please register as a stakeholder with us if you would like to receive ongoing communications and updates in this format.

Register as a stakeholder: spenergynetworks.co.uk/register

Please register as a stakeholder with SP Energy Networks so that we can keep you informed on all the improvements we are making.

Website

We have recently updated our SP Energy Networks website to bring the work we do for our major connection customers into a more prominent position on the Getting Connected part of our website.

We plan to make further enhancements to our website over the next 6 months and would welcome feedback to help us shape a platform that is beneficial to all customers and stakeholders.

If you would like to make suggestions for any further improvements you feel would prove beneficial.

Please contact us on: gettingconnectedupdates@spenergynetworks.co.uk

Would you like to have your say?

In response to positive feedback from customers and stakeholders, we continue to deliver a wide range of activities and engagements to help them liaise with us using their preferred communication channel.

This has led to an increasing provision of information published on our website and at our engagement events, to help our customers and stakeholders interact with us in the most effective and efficient manner for their own individual needs.

We have also increased the amount of information we provide for our registered stakeholders via email communication as many of them find this an efficient way for us to keep them informed.

We value the feedback we receive on how we can further improve our service and those interested in providing their views can register as a stakeholder using the link below.

Register as a stakeholder:
spenergynetworks.co.uk/register

Based on what you tell us you are interested in when you register as a stakeholder – we will invite you to a range of engagement opportunities such as workshops, conferences, meetings and consultations.

We will continue to shape our engagement to our stakeholder requirements and we would like to encourage all stakeholders to provide updates on the engagement we provide to ensure we fully provide any improvements necessary.

Glossary

Constraint Management Zone (CMZ) – CMZs are areas of network we have an automated control system to coordinate and dispatch different operational solutions.

Customer – means anyone connected to our network and who depends on us for an electricity supply. This includes demand, generation, and storage sites, and IDNO networks.

Decarbonisation – the process to reduce the amount of carbon dioxide (CO_2) and other greenhouse gas emissions by introducing new low carbon alternatives and technologies. Much of the UK's decarbonisation strategy is based on switching carbon energy vectors (e.g. petrol/diesel for transport, and natural gas and oil for heating) to electricity and powering them with renewable generation.

Decentralisation – this reflects the extent to which generation is sited closer to demand consumption (or is even undertaken by consumers themselves) via the use of smaller-scale technologies such as solar PV and local energy storage. A less decentralised system would be characterised by fewer, larger-scale generators sited further from where the electricity is ultimately consumed (demand); a more decentralised system would be characterised by more smaller-scale generators sited closer to demand.

Distribution Future Energy Scenarios (DFES) – detailed forecasts we publish annually for our two distribution networks. We work with an external party to determine and produce them. They cover a range of demand and generation metrics (e.g. EVs, heat pumps, different generation technologies) out to 2050. www.spenergynetworks.co.uk/pages/distribution_future_energy_scenarios.aspx

Distributed Generation (DG) – generation connected to the distribution network, as opposed to the transmission network.

Distribution network – in England and Wales this consists of overhead lines, underground cables and other network infrastructure that operate at 132kV and below; in Scotland this is the infrastructure that operates at 33kV and below. Nearly all demand in GB is connected to the distribution network; only very large demand users (e.g. the rail network) are connected to the transmission network. Nearly all medium-scale and smaller scale generation in GB is connected to the distribution network; typically only large fossil fuel power stations, offshore generation, and large onshore generation are connected to the transmission network.

Electricity System Operator (ESO) – the company responsible for operating the GB transmission network. They have two main operational functions: balancing the total demand and generation on the system to maintain system frequency at 50Hz, and ensuring transmission power flows remain within transmission network capability and statutory limits.

Extra high voltage (EHV) – all distribution voltages greater than 22kV.

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Flexibility – the ability of a consumer or generator to change their operation (i.e. their generation/consumption levels) in response to an external signal. With the push towards the electrification of heat and transport, being able to flexibly utilise demand and generation will help minimise the amount of additional network capacity required, balance the system, and provide system stability – these can all help reduce customer electricity bills.

Grid Supply Point (GSP) – the interface substations between the transmission and distribution network.

GW – equal to 1,000 MW.

High voltage (HV) – all voltages above 1kV up to and including 22kV.

Low carbon technologies (LCTs) – means the range of customer technologies that are needed to deliver decarbonisation. For example, EVs, heat pumps, storage, and renewable generation.

Low voltage (LV) – all voltages up to and including 1kV.

MVAr – mega volt amps (reactive) is a unit of reactive power. It can be useful to help manage network voltage levels. It can describe both the amount of reactive power that a user is importing (e.g. this generator is importing 1MVAr of reactive power"), and the amount of reactive power that a user is exporting (e.g. "this generator is exporting 1MVAr of reactive power").

MW – megawatt is a unit of power (not energy). It can describe both the amount of power that a demand user is consuming (e.g. "this town's peak demand has increased by 3MW due to an increase in EVs and heat pumps"), and the amount of power that a generator is producing (e.g. "3MW of solar PV generation has been installed in this area").

Minimum demand – the point in the year, typically during the summer months, when our distribution network as a whole sees the lowest demand. It is an important study condition (along with peak demand) as a network with low demand can experience voltage control issues.

Net Zero – means the legislated target of reducing greenhouse gas emissions to net zero. For the UK, there are three Net Zero targets:

1. The UK Government has introduced the Climate Change Act 2008 (2050 Target Amendment) Order 2019. This legislation introduces a legally binding target for the UK to have net zero greenhouse gas emissions by 2050. The legislation is available at: www.legislation.gov.uk/ukpga/2008/27/contents

2. The Scottish Government has introduced the Scottish Climate Change (Emissions Reduction Targets) Act 2019. This legislation introduces a legally binding target for Scotland to have net zero greenhouse gas emissions by 2045. The legislation is available at: www.legislation.gov.uk/asp/2019/15/contents/enacted

3. The Welsh Government has introduced The Environment (Wales) Act 2016 (Amendment of 2050 Emissions Target) Regulations 2021. This introduces a legally binding target for Wales to have net zero greenhouse gas emissions by 2050. The legislation is available at: www.legislation.gov.uk/anaw/2016/3/contents

Open Networks – this is a pan-industry project involving transmission and distribution network companies, the ESO, the Department for Business, Energy, and Industrial Strategy (BEIS), Ofgem, and other stakeholders. It has done much work developing DSO models, the customer experience, whole electricity system planning and distribution to transmission data exchange, and flexibility services.

Peak demand – the point in the year, typically during the winter months, when our distribution network as a whole sees the highest demand. It is an important study condition (along with minimum demand) as it places the greatest need on network capacity – our network must be able to accommodate peak demand.

Primary substation – see 'Substation'.

RIIO-ED2 – means the distribution network price control period which runs from 1st April 2023 to 31st March 2028. Before this period starts, we will agree with Ofgem the outputs we will deliver during this period, and the funding, incentives, and penalties for delivering those outputs.

Services (aka DER services or flexibility services) – DER can change its import/export position in a controlled manner in response to a signal. This capability can be utilised for the benefit of the network or wider system (e.g. a DER reducing their import to reduce the overall level of demand the network must supply). Where we utilise this capability, the DER is providing us with a 'service'. See also 'Flexibility' and 'Distribution energy resources'.

SP Transmission (SPT) – the Transmission Network Owner for Central and Southern Scotland, that owns the transmission network at 132kV, 275kV and 400kV.

SP Distribution (SPD) – the Distribution network Operator for Central and Southern Scotland, that owns the distribution network at 33kV, 11kV and LV up to customers' meters.

SP Manweb (SPM) – the Distribution Network Operator for Merseyside, Cheshire, North Shropshire, and North Wales, that owns the distribution network at 132kV, 33kV, 11kV and LV up to customers' meters.

Substation – a building or outdoor compound which contains one or more transformers and switchgear protection. The primary purpose of a substation is to change the network power flow from one voltage level to another. In a primary substation the highest voltage is EHV (primary substations are typically 33kV/11kV); in a secondary substation the highest voltage is HV (secondary substations are typically 11kV/LV).

Transmission Network – the high voltage electricity network used for the bulk transfer of electrical energy across large distances. The transmission network takes electricity from large generators (e.g. coal, gas, nuclear and offshore wind) to supply large industrial customers and the distribution network.

SP ENERGY NETWORKS

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