SP Energy Networks
Draft Network Development Plan – for consultation
March 2022

# Network Development Plan

## Parts 1 & 2 – SP Manweb
## Capacity & Development Report

PRINCIPAL PARTNER
UN CLIMATE CHANGE CONFERENCE UK 2021
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# Contents

# 1 Introduction

## 1.1 Who we are

We are SP Energy Networks. We own and operate the electricity distribution network in Central and Southern Scotland (our SP Distribution network), and in North Wales, Merseyside, Cheshire, and North Shropshire (our SP Manweb network). It is through these two networks of underground cables, overhead lines, and substations that we provide our 3.5 million customers with a safe, reliable, and efficient supply of electricity.

## 1.2 Document context and purpose

Sharing data is key to the efficiency of the energy system as we decarbonize 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.

Each DNO's NDP must cover three main components:

1. **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).
2. **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 (Part 1).
3. **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.

Figure 1 shows the document map for these four documents.

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

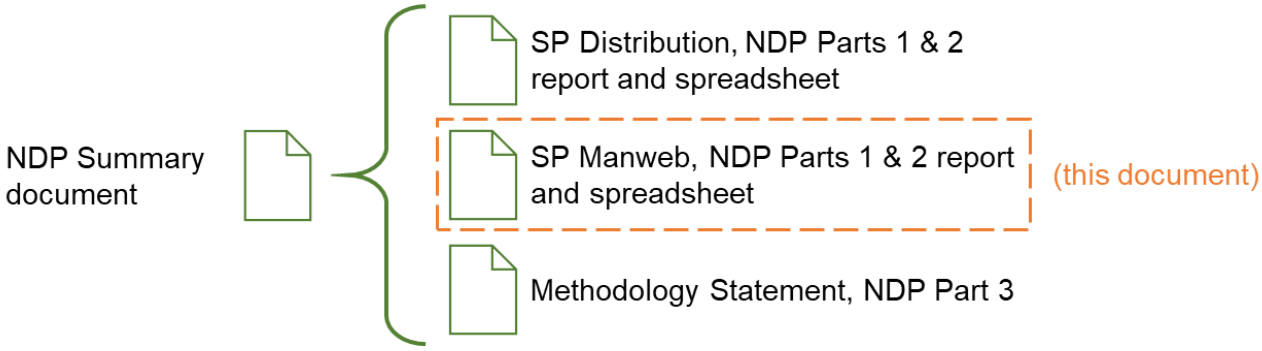



**Figure 1: SP Energy Networks' NDP document map**

## 1.3 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 Distribution and 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.

## 1.4 Document scope and structure

### 1.4.1 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.<br>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.<br>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).<br>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 parameters underlying headroom calculations | Thermal loading<br>Voltage | Fault level<br>Reverse power flows | |
| Evaluation methodology | Detailed analysis for the short-term where practical.<br>Simple tabular comparisons for the longer-term to 2050 (loading versus firm capacity). | | |

### 1.4.2 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 0 – 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 0** is a glossary to explain the terms we use within our NDP documents.

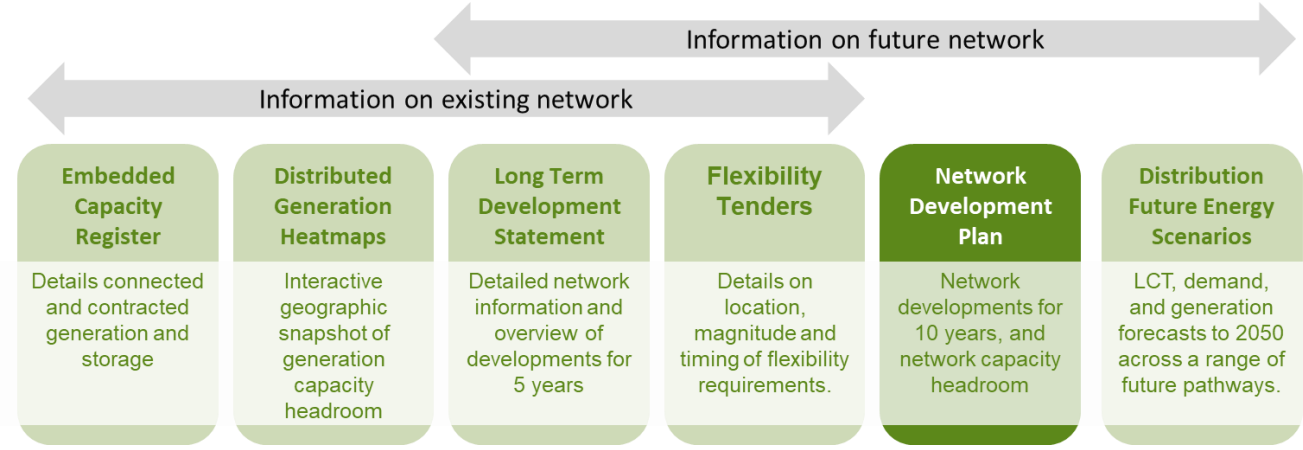
## 1.5 Next steps

Our NDP documents are now out for consultation until **16 April 2022**. Given that the purpose of NDPs is to share information with stakeholders, it's important that these documents meet our stakeholders' needs. We therefore welcome stakeholder views. Consultation questions and details on how stakeholders can feedback are given in our NDP summary document.

The consultation period will close **16 April 2022**. We will then publish the finalised versions of our NDP documents by 29 April 2022.

## 1.6 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 four main 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. Please see our DSO Strategy[7] for more information on the network data we plan to share in RIIO-ED2 based on stakeholder input.

## 1.7 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 first NDP comes a few months after we published our RIIO-ED2 Business Plan[8] on 1 December 2021. 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

[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] Our 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 at: https://www.spenergynetworks.co.uk/userfiles/file/Annex 4A.3 - DSO Strategy .pdf
[8] Our RIIO-ED2 Business Plan is available at: https://www.spenergynetworks.co.uk/userfiles/file/SPEN%20RIIO-ED2%20Final%20Business%20Plan%20-%201st%20December%202021%20-%20FINAL.pdf

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].

## 1.8 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: gettingconnected@scottishpower.com

[9] Our Future System Strategy is Annex 4A.1 of our RIIO-ED2 Business Plan. Available at: https://www.spenergynetworks.co.uk/userfiles/file/Annex%204A.1%20-%20Future%20System%20Strategy.pdf

# 2 Understanding the results in this document

## 2.1 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).

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 he 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.

### *2.1.1 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.

### *2.1.2 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.

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

| | 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. |

**Table 1: Types of intervention**

### *2.1.3 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.

| 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.<br>• Utilisation fee payable for the service provided in response to the scheduled notice.<br>• 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.<br>• Utilisation fee payable for the service provided in response to the scheduled notice.<br>• Arming fee is payable. |
| **Dynamic** | **Post-fault** *Dispatched* | • Used to support the network in the event of specific fault conditions.<br>• Providers declare availability one week ahead.<br>• Dispatch instruction issued if service is required.<br>• Utilisation fee payable if service is provided.<br>• Availability fee is payable once availability has been accepted. |
| **Restore** | **Post-fault** *Dispatched* | • Used to help with restoration following rare fault conditions.<br>• Providers declare availability one week ahead and declarations automatically accepted.<br>• Dispatch instruction if service is required following a network event.<br>• 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.<br>• Utilisation fee payable for the service provided in response to the scheduled notice.<br>• Arming fee is payable. |

**Table 2: Flexibility products**

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: https://www.flexiblepower.co.uk/.

### 2.1.4 Summary of interventions

Figure 2 summarises the interventions by driver (i.e. why we need to make the 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.

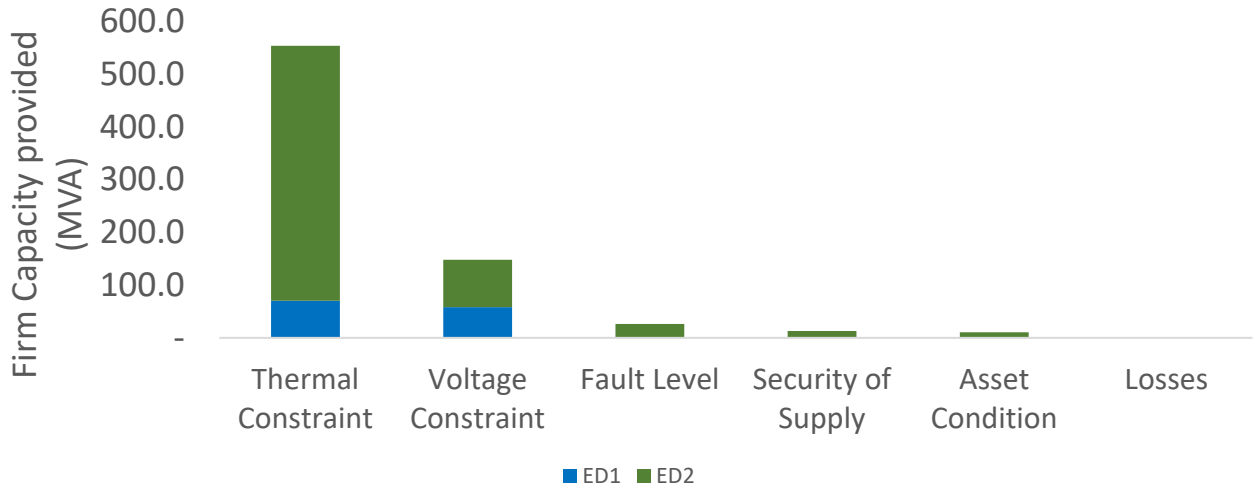



**Figure 2: SP Manweb summary of interventions by driver to 2028**

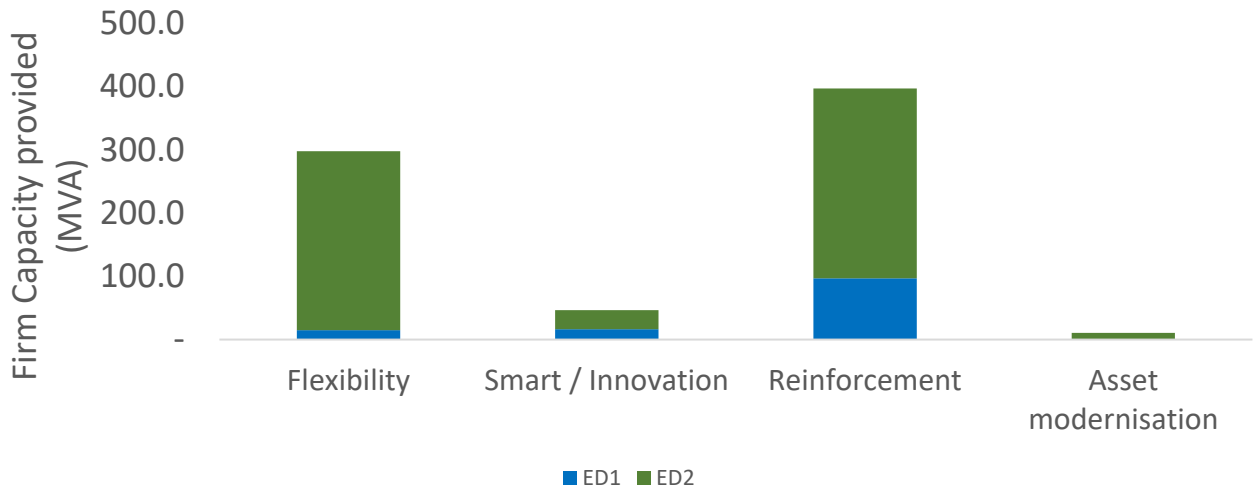



**Figure 3: SP Manweb summary of interventions by type to 2028**

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.

## 2.2 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.

### *2.2.1 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.

### *2.2.2 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 generators.

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.

### *2.2.3 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 be attributed to the use of the information presented in this report and the capacity headroom results.

## 2.3 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.

# 3 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].

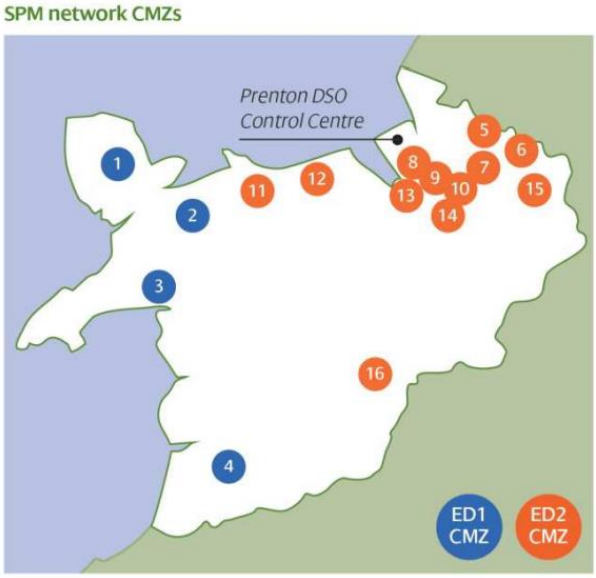



**Figure 4: Existing and planned CMZs**

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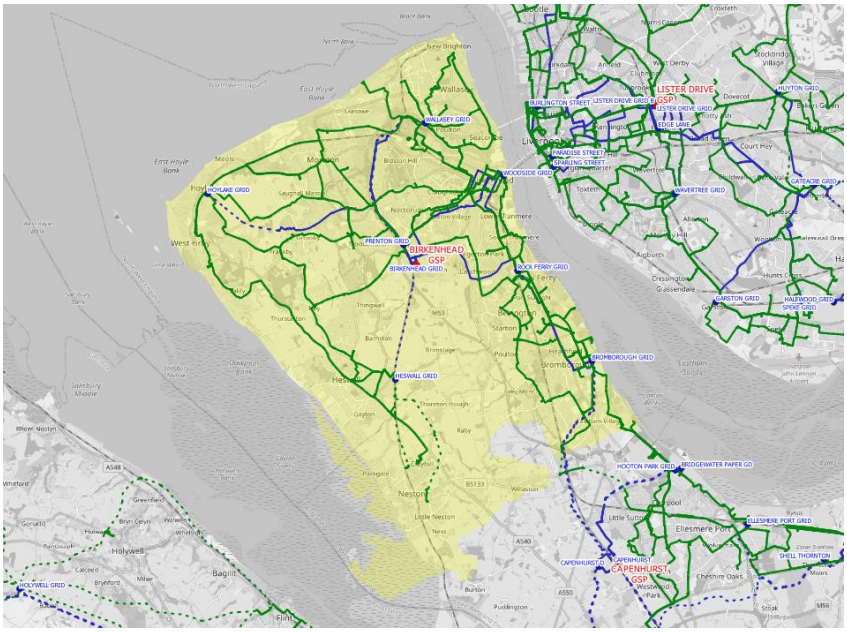
[11] Annex 4A.3 - DSO Strategy

# 4 Part 1 – Network Development Information

## 4.1 Overview

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 as follows:

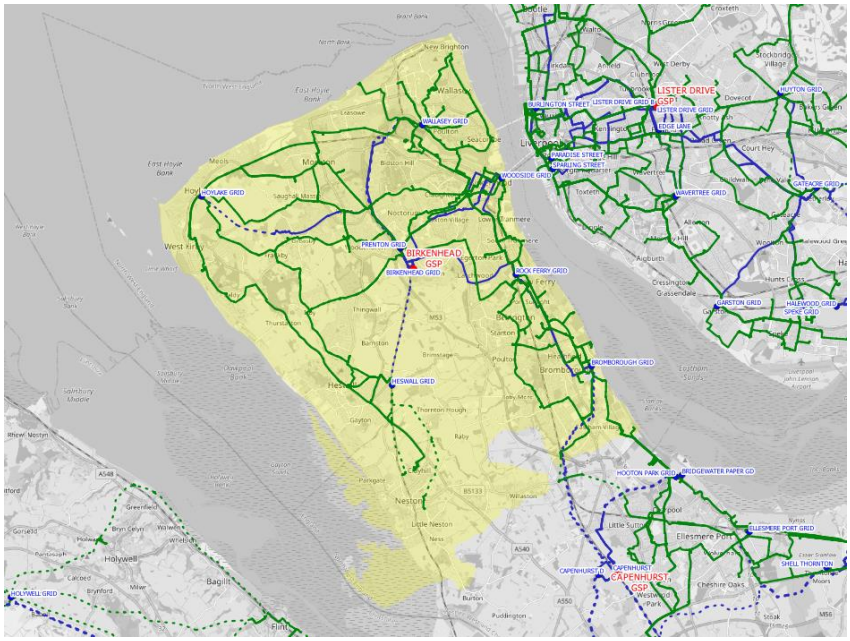
<table>
<tr><td rowspan="4">  <br>Description of the geographic area supplied by the GSP and the total customers in the electrical area.</td><td colspan="2">Summary graph of network groups with interventions in the GSP group, split by voltage.</td></tr>
<tr><td colspan="2">Total firm capacity to be released (MVA) by all interventions in the GSP group</td></tr>
<tr><td colspan="2">Total MW of flexibility services to be employed in the GSP group</td></tr>
<tr><td>Pre-fault</td><td>Post-fault</td></tr>
<tr><td></td><td>- MW</td><td>- MW</td></tr>
</table>

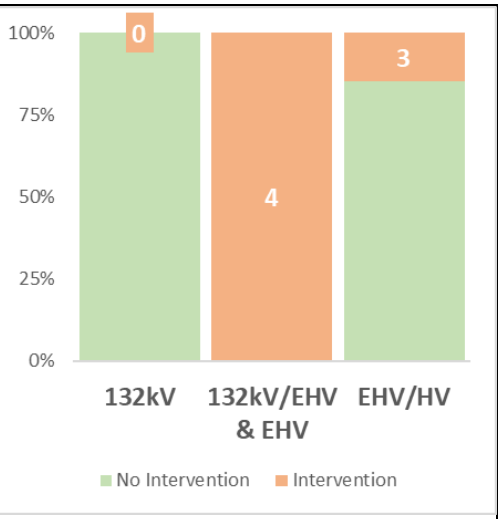
For each individual intervention the following information is summarised:

- 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).

## 4.2 Birkenhead




**This section of network is fed via three 240MVA 275/132kV SGTs. This group supplies arond 162,000 consumers in the Wirral, including Bromoborough, Heswall, Hoylake, Prenton, Woodside and Wallasey areas.**

**4.5 MVA Capacity Released**

**23.4 MW of Flexibility**

| Pre-fault | Post-fault |
|---|---|
| 23.4 MW | 0.0 MW |

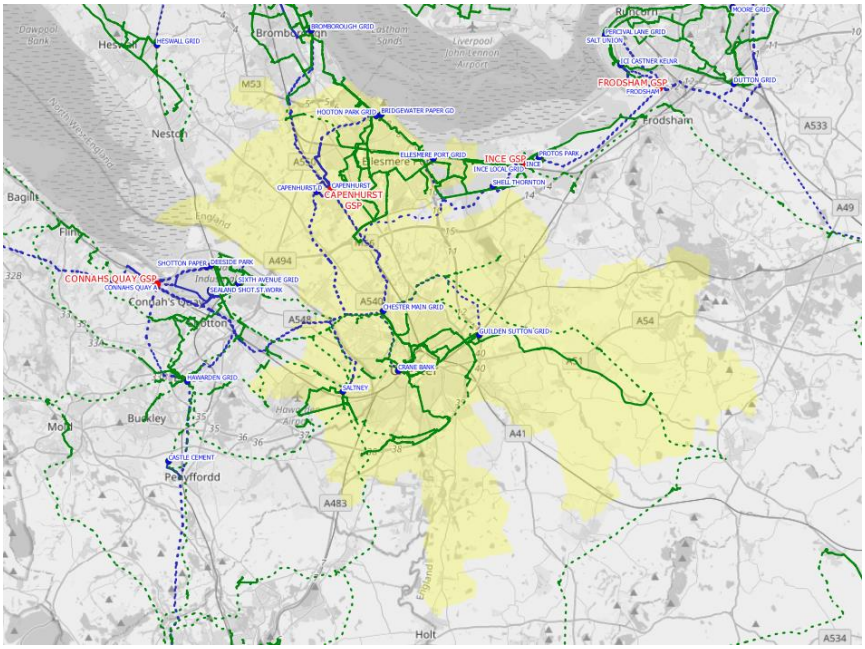
| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| BROMBOROUGH GT3 / ROCK FERRY GT2 | Asset Mod. | | **33kV RMU Modernisation** 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) |
| 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**<br>33kV RMU replacements at Cammell Laird South. | - | * | 2025/26 | Planned (ED2) |
| WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2 | Fault Level |  | **Woodside Grid 33kV Fault Level Mitigation**<br>Replace 33kV switchgear and associated remote end protection modifications. | - | * | 2025/26 | Planned (ED2) |
| WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2 | Fault level |  | **SPM 33kV RMUs Fault Level Mitigation**<br>Replace the 33kV RMUs at BR Shore Road and Mobil Oil Wallasey. | - | * | 2023/24 | Planned (ED2) |
| WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2 | Asset Mod. |  | **33kV RMU Modernisation**<br>33kV RMU replacements at Moreton. | - | * | 2022/23 | Delivery |
| WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2 | Asset Mod. |  | **33kV RMU Modernisation**<br>33kV RMU replacement at New Brighton. | - | * | 2023/24 | Planned (ED2) |
| WALLASEY GT1 / WALLASEY GT2 / WOODSIDE GT2 | Asset Mod. |  | **33kV RMU Modernisation**<br>33kV RMU replacements at Egremont, Gilbrook Dock and Seaview Road. | - | * | 2024/25 | Planned (ED2) |

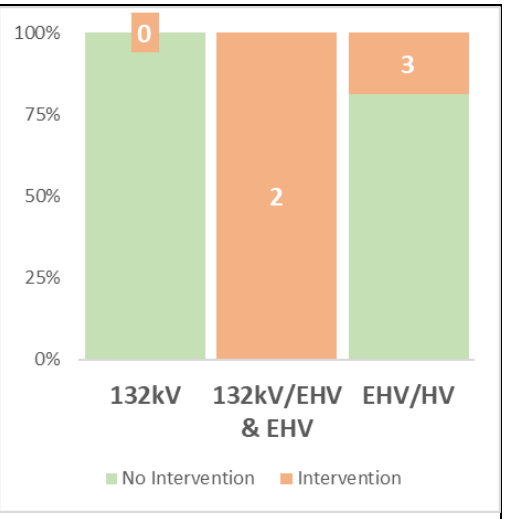
*These interventions could increase generation hosting capacity.

| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| BENTINCK ST T1 / BENTINCK ST T2 / CHESTER ST T1 | Fault level |  | **SPM 6.6kV Network Groups Fault Level Mitigation**<br>Uprating from 6.6 to 11kV. | - | 1.8 | 2027/28 | Planned (ED2) |
| MDHB EGERTON DOCK T1 / MDHB EGERTON DOCK T2 | Fault level |  | **SPM 6.6kV Network Groups Fault Level Mitigation**<br>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**<br>Uprating from 6.6 to 11kV. | - | 1.8 | 2025/26 | Planned (ED2) |

## 4.3 Capenhurst




**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.**




**8.3 MVA Capacity Released**

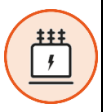
**2.1 MW of Flexibility**

| Pre-fault | Post-fault |
|---|---|
| 2.1 MW | 0.0 MW |

| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **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) |
| 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) |

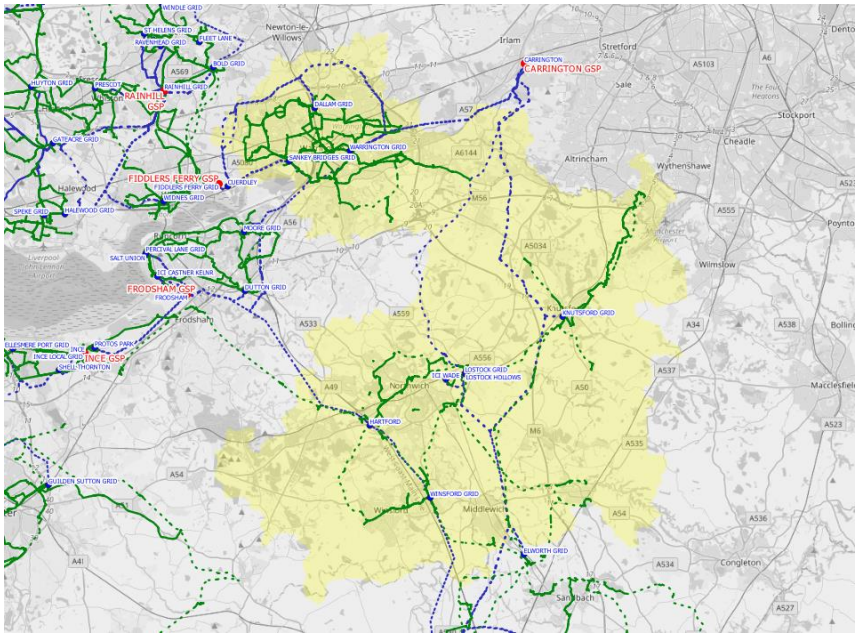
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CHESTER MAIN GT4 / CRANE BANK GT1 / GUILDEN SUTTON GT1 / SALTNEY G2A | Fault level |  | **SPM 33kV RMUs Fault Level Mitigation**<br>Installation of Real Time Fault Level Monitoring equipment at Northgate Terrace. | - | * | 2027/28 | Planned (ED2) |

*These interventions could increase generation hosting capacity.

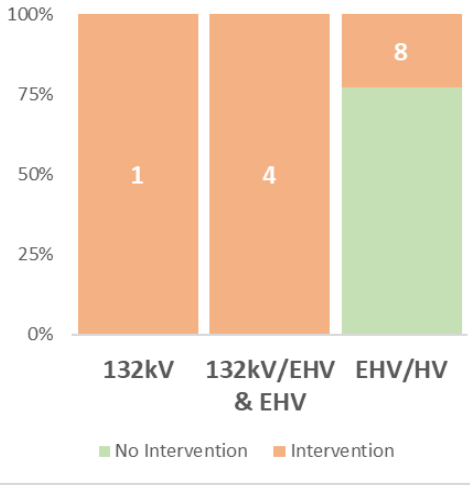
| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| BOWATER CONTAINERS T1 / ELLESMERE PORT LOCAL T1 / HH ROBERTSONS T1 / MOBIL OIL (E PORT) T1 / WHITBY MAIN T1 | Thermal |  | **Cheshire Oaks Reinforcement**<br>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**<br>Installation of two 33/11kV transformers and additional 33 kV switchgear.<br>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 |  <br>Secure | **Flexibility Services for High Utilisation Groups**<br>Flexibility services to manage thermal constraints. | 2.1 | - | 2025/26 to 2027/28 | Planned (ED2) |

*These interventions could increase generation hosting capacity.

## 4.4 Carrington – Fiddlers Ferry




**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.**




**83.9 MVA Capacity Released**

**51.8 MW of Flexibility**

| Pre-fault | Post-fault |
|---|---|
| 35.4 MW | 16.4 MW |

| 132kV/EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| Fiddlers Ferry Carrington 132KV group | Thermal | | **Carrington Fiddlers Ferry 132kV Reinforcement** Construct a 132/33kV substation near Hulseheath. | - | 60 | 2025/26 | Planned (ED2) |
| | | | **Carrington Fiddlers Ferry 132kV Smart Management** Dedicated monitoring and automation at Cuerdley 132kV substation. Flexibility services to manage the Sankey Bridges to Hartford 132kV circuit. | 16.4 | - | 2026/27 to 2027/28 | Planned (ED2) |
| | | Dynamic | | | | | |

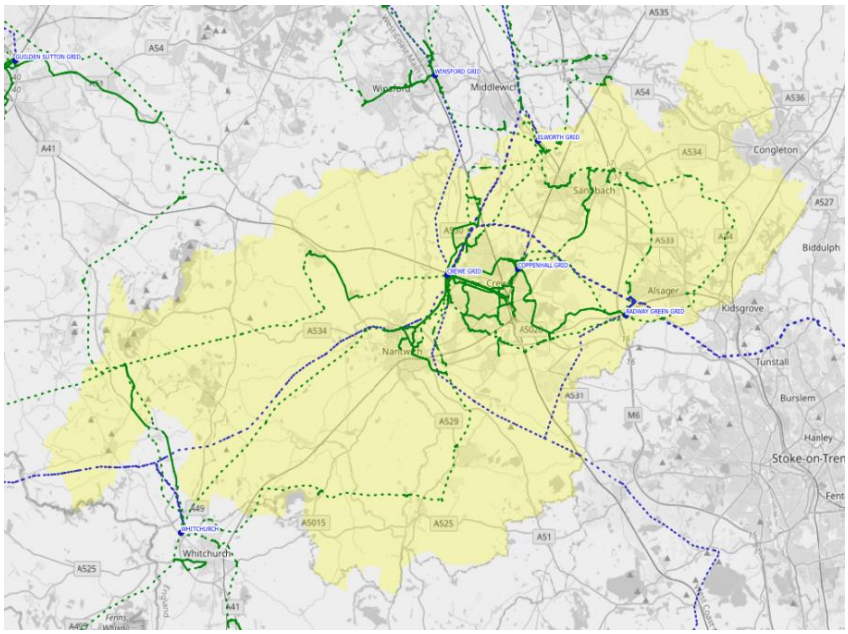
| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| DALLAM GT1 / SANKEY BRIDGES GT1 / WARRINGTON GT3 | Fault level | | **SPM 33kV RMUs Fault Level Mitigation** Installation of Real Time Fault Level Monitoring equipment at Hawkley 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) |

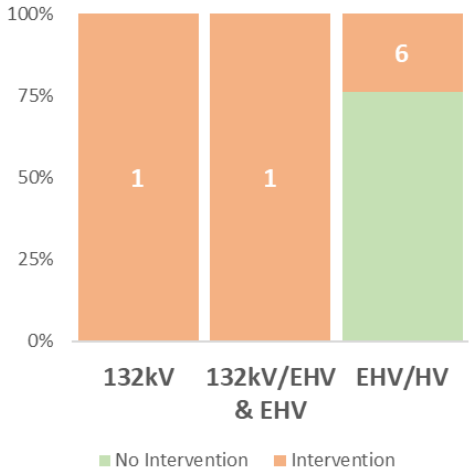
*These interventions could increase generation hosting capacity.

| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **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) |
| | | 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) |
| | | 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 (MVA)** | **Expected By** | **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 |

## 4.5 Cellarhead




**This section of network is fed via one 132kV circuit from the Cellarhead GSP, one 132kV circuit from Whitfield (WPD) and one 132kV circuit from Barlaston (WPD). This group supplies arond 78,000 consumers.**

**HS2 is expected to stimulate economic growth in this area.**

**40.6 MVA Capacity Released**

**22.8 MW of Flexibility**

| Pre-fault | Post-fault |
|---|---|
| 22.8 MW | 0.0 MW |

**132kV Interventions**

| Network Area | Driver | Type | Solution | Flexibility (MW) | Increase in Firm Capacity (MVA) | Expected By | Status |
|---|---|---|---|---|---|---|---|
| Crewe 132kV group | Thermal | | **Crewe 132kV** Installation of additional circuit breakers and cable interconnection between the two sides of the board. | - | 0.0 | 2022/23 | Delivery |

**132kV/EHV Interventions**

| Network Area | Driver | Type | Solution | Flexibility (MW) | Increase in Firm Capacity (MVA) | Expected By | Status |
|---|---|---|---|---|---|---|---|
| COPPENHALL GT1 / CREWE GT1 / CREWE GT2A / CREWE GT4A / RADWAY GREEN GT1 / RADWAY GREEN GT2 / WHITCHURCH GT2 | Thermal | | **Radway Green 33kV Reinforcement** Replace the Radway Green 45MVA GT1 with a 60MVA unit. | - | 15.0 | 2026/27 | Planned (ED2) |
| | | Secure | **Radway Green 33kV** Flexibility services to manage the network risk during delivery of reinforcement. | 4.7 | - | 2026/27 | Planned (ED2) |

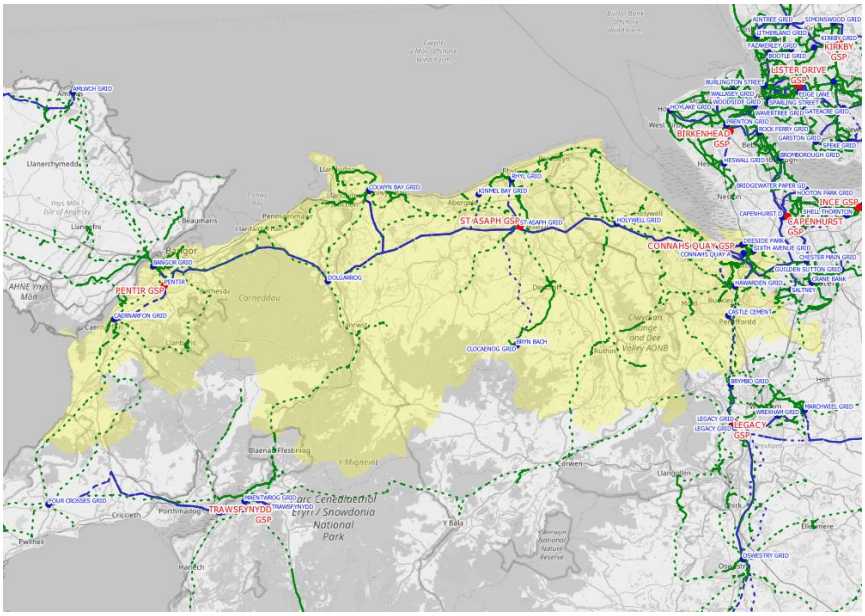
| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| COPPENHALL GT1 / CREWE GT1 / CREWE GT2A / CREWE GT4A / RADWAY GREEN GT1 / RADWAY GREEN GT2 / WHITCHURCH GT4 | Asset Mod. | | **33kV CB Modernisation**<br>33kV circuit breaker replacements at Wrenbury Firth, Audlem and Smallwood. | - | * | 2027/28 | Planned (ED2) |
| COPPENHALL GT1 / CREWE GT1 / CREWE GT2A / CREWE GT4A / RADWAY GREEN GT1 / RADWAY GREEN GT2 / WHITCHURCH GT2 | Thermal | | **Weston – Basford Sidings 33kV Circuit Reinforcement**<br>Replace 1.2km of overhead line between Weston – HS2 Hough<br>Overlay 0.8km of cable between Weston – HS2 Hough. | - | 8.0 | 2027/28 | Planned (ED2) |
| | | Secure | **Weston – Basford Sidings**<br>Flexibility services to manage the network risk during delivery of reinforcement. | 1.9 | - | 2026/27 | Planned (ED2) |

*These interventions could increase generation hosting capacity.

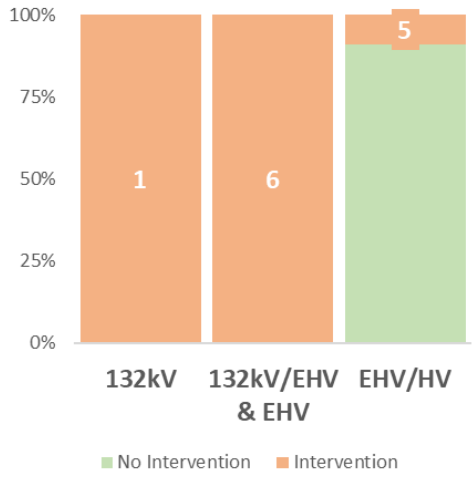
| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| ACER AVE T1 | Thermal | | **Acer Avenue Primary Reinforcement**<br>Additional 10MVA 33/11kV transformer<br>Replace 33kV and 11kV switchgear<br>Transfer Acer-Avenue into Coppenhall-Wheelock 33kV circuit and re-route the existing 33kV Coppenhall-Acer Avenue circuit to Rolls Royce primary. | - | 2.5 | 2026/27 | Planned (ED2) |
| | | Secure | **Acer Avenue**<br>Flexibility services to manage the network risk during delivery of reinforcement. | 6.5 | - | 2023/24 to 2026/27 | Planned (ED2) |
| CIVIC CENTRE T1 / CLAUGHTON AVE T1 / ELECTRICITY ST T1 | Thermal | | **Civic Centre - Electricity Street – Claughton Ave Primary Reinforcement**<br>New double 7.5/10MVA transformer primary substation to replace Electricity Street Primary substation.<br>Replace 33kV and 11kV switchgear. | - | 7.6 | 2022/23 | Delivery |
| NANTWICH T1 | Thermal | Secure | **Flexibility Services for High Utilisation Groups**<br>Flexibility services to manage thermal constraints. | 1.4 | - | 2026/27 to 2027/28 | Planned (ED2) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RADWAY GREEN T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups**<br>Flexibility services to manage thermal constraints. | 0.6 | - | 2027/28 | Planned (ED2) |
| SANDBACH T1 | Thermal |  | **Sandbach Primary Reinforcement**<br>Additional 10MVA 33/11kV transformer at Fodens.<br>Replace 33kV and 11kV switchgear.<br>Establish new 11kV interconnector between Sandbach and Fodens. | - | 7.5 | 2024/25 | Planned (ED2) |
| | |  Secure | **Sandbach**<br>Flexibility services to manage the network risk during delivery of reinforcement. | 3.8 | - | 2023/24 to 2024/25 | Planned (ED2) |
| SMALLWOOD T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups**<br>Flexibility services to manage thermal constraints. | 3.9 | - | 2025/26 to 2027/28 | Planned (ED2) |

## 4.6 Connah's Quay – Pentir – St. Asaph




**This section of network is fed via four 240MVA 400/132kV SGTs at Connah's Quay, two 240MVA SGTs at Pentir and one 240MVA 400/132kV SGT at St Asaph. This group supplies arond 199,000 consumers in the North Wales area.**



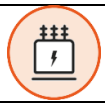
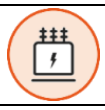

| | |
|---|---|
| **141.5 MVA Capacity Released** | |
| **90 MW of Flexibility** | |
| **Pre-fault** | **Post-fault** |
| **77.0 MW** | **13.0 MW** |

| 132kV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| Connah's Quay 132kV group<br><br>DEESIDE PK GT1 / SIXTH AVE GT1<br><br>CASTLE CEMENT GT1 / HAWARDEN GT1 / SALTNEY GT1 / SALTNEY G2B | Thermal and Security of Supply | | **Connahs Quay 132kV Reinforcement**<br>Install 60MVA GT at Deeside Park. Install 132kV Bus Section circuit breaker at Connahs Quay to enable 2+2 SGT operational arrangement. Swap Sixth Avenue GT with RAF Sealand circuit. Transfer Sixth Avenue GT onto busbar section "C" and "Normally open" bus section reactor. Run the bus section reactor at Hawarden - Normally Open. | - | 100.0 | 2027/28 | Planned (ED2) |
| | | | | - | 30.0 | 2027/28 | Planned (ED2) |
| | | Sustain | **Connahs Quay 132kV**<br>Flexibility services to manage the network risk during delivery of reinforcement. | 18.1 | - | 2026/27 | Planned (ED2) |

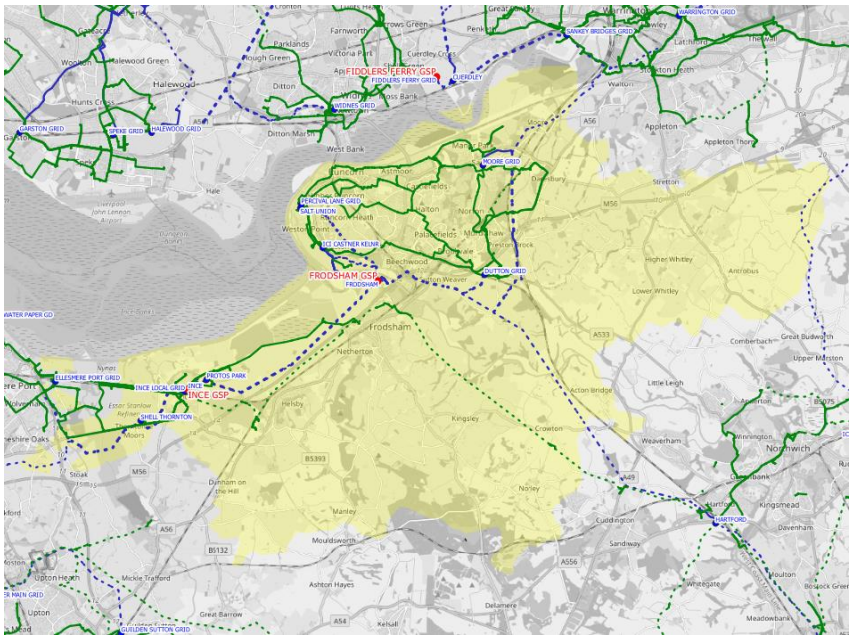
| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| BANGOR GT2 / CAERNARFON GT2 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Bethesda. | - | * | 2021/22 | Delivery |
| BANGOR GT2 / CAERNARFON GT2 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Peblic Mills. | - | * | 2023/24 | Planned (ED2) |
| BANGOR GT2 / CAERNARFON GT2 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Bangor Hospital. | - | * | 2024/25 | Planned (ED2) |
| BRYMBO GT2 / HAWARDEN GT2 / HOLYWELL GT2 | Voltage | Sustain | **Brymbo-Hawarden-Holywell 33kV** Contract flexibility services to mitigate low voltage issues in the group | 22.5 | - | 2021/22 to 2022/23 | Delivery |
| BRYMBO GT2 / HAWARDEN GT2 / HOLYWELL GT2 | Voltage | Sustain | **Brymbo-Hawarden-Holywell 33kV** Contract flexibility services to mitigate low voltage issues in the group | 26.7 | - | 2023/24 to 2027/28 | Planned (ED2) |
| BRYMBO GT2 / HAWARDEN GT2 / HOLYWELL GT2 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at North Wales Paper. | - | * | 2024/25 | Planned (ED2) |
| CASTLE CEMENT GT1 / HAWARDEN GT1 / SALTNEY GT1 / SALTNEY G2B | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Kinnerton. | - | * | 2021/22 | Delivery |
| CASTLE CEMENT GT1 / HAWARDEN GT1 / SALTNEY GT1 / SALTNEY G2B | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Queensferry. | - | * | 2023/24 | Planned (ED2) |
| COLWYN BAY GT1 / COLWYN BAY GT2 / DOLGARROG GT2 | Asset Mod. | | **33kV RMU Modernisation** 33kV RMU replacement at Llysfaen Road. | - | * | 2021/22 | Delivery |
| COLWYN BAY GT1 / COLWYN BAY GT2 / DOLGARROG GT2 | Security of Supply | | **Colwyn Bay-Dolgarrog 33kV Reinforcement** Install 25MVA 33kV 5% reactor at Colwyn Bay Grid substation. | - | 0.0 | 2025/26 | Planned (ED2) |
| | | Dynamic | **Colwyn Bay-Dolgarrog 33kV** Flexibility services to manage the constraint on the 33kV circuit from Colwyn Bay to Dolgarrog. | 13.0 | - | 2023/24 to 2027/28 | Planned (ED2) |
| COLWYN BAY GT1 / COLWYN BAY GT2 / DOLGARROG GT2 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Conwy. | - | * | 2024/25 | Planned (ED2) |
| COLWYN BAY GT1 / COLWYN BAY GT2 / DOLGARROG GT2 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Penmaenmawr. | - | * | 2026/27 | Planned (ED2) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DEESIDE PK GT1 / SIXTH AVE GT1 | Fault level |  | **Fault Level Monitoring and Management** Installation of Real Time Fault Level Monitoring equipment at Deedside Ind Park. | - | * | 2024/25 | Planned (ED2) |
| HOLYWELL GT1 / RHYL GT1 / ST ASAPH GT2 / ST ASAPH GT4 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Rhyl and Abergele. | - | * | 2021/22 | Delivery |
| HOLYWELL GT1 / RHYL GT1 / ST ASAPH GT2 / ST ASAPH GT4 | Asset Mod. |  | **33kV RMU Modernisation** 33kV RMU replacement at Dyserth Road. | - | * | 2022/23 | Delivery |
| HOLYWELL GT1 / RHYL GT1 / ST ASAPH GT2 / ST ASAPH GT4 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Point of Ayr and Llanfwrog. | - | * | 2023/24 | Planned (ED2) |
| HOLYWELL GT1 / RHYL GT1 / ST ASAPH GT2 / ST ASAPH GT4 | Fault level |  | **Fault Level Monitoring and Management** Installation of Real Time Fault Level Monitoring equipment and Active Fault Level Monitoring equipment at St Asaph Grid. | - | * | 2025/26 | Planned (ED2) |
| HOLYWELL GT1 / RHYL GT1 / ST ASAPH GT2 / ST ASAPH GT4 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Rhuddlan. | - | * | 2027/28 | Planned (ED2) |

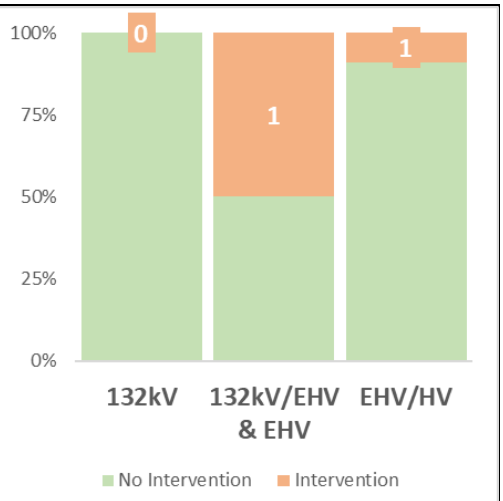
*These interventions could increase generation hosting capacity.

| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| ABERGELE T1 / PENSARN T1 | Thermal |  | **Abergele – Pensarn** Enhanced transformer ratings and network automation. | - | 1.0 | 2021/22 | Delivery |
| ABERGELE T1 / PENSARN T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 5.0 | - | 2026/27 to 2027/28 | Planned (ED2) |
| CAERGWRLE T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 4.6 | - | 2025/26 to 2027/28 | Planned (ED2) |
| GRAIG FAWR T1 | Thermal |  | **Graig Fawr Primary Reinforcement** Additional 33/11kV 7.5/10MVA transformer. | - | 5.7 | 2022/23 | Delivery |
| NANT-Y-GAMAR T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.1 | - | 2027/28 | Planned (ED2) |
| WIMPEYS PANT QUARRY T1 / WIMPEYS PANT QUARRY T2 | Asset Mod. |  | **Primary Transformer Replacement** Replace Wimpeys Pant Quarry T2 with a 7.5/10MVA unit. | - | 4.8 | 2023/24 | Planned (ED2) |

## 4.7 Frodsham – Ince



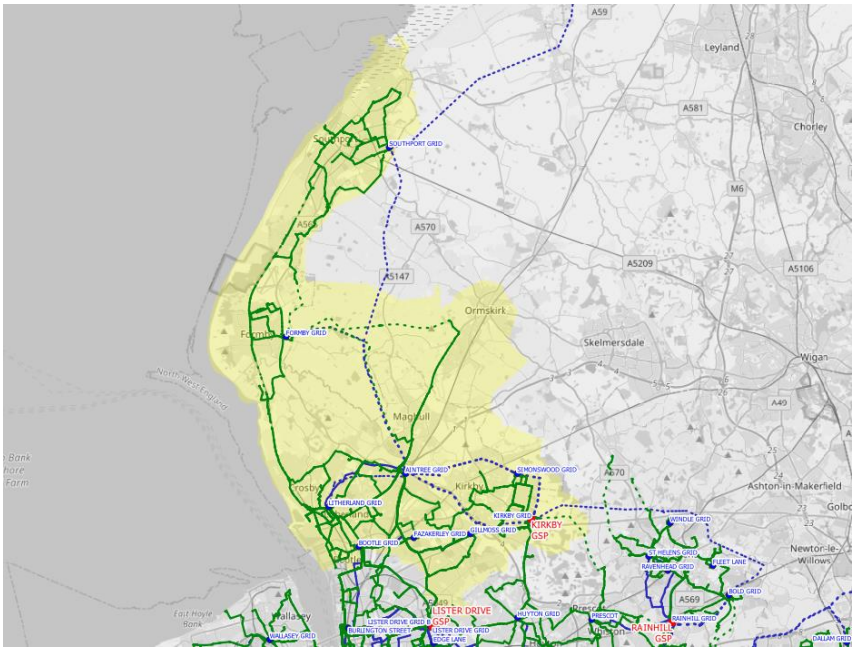

**This section of network is fed via two 180MVA 275/132kV SGTs at Frodsham and one 180MVA and one 240MVA 275/132kV SGTs at Capenhurst. This group supplies arond 42,000 consumers in Cheshire, including Ellesmere Port, Ince and Runcorn areas.**



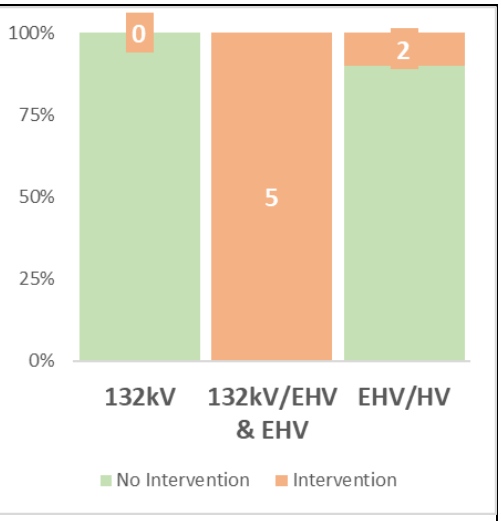

| **0.0 MVA Capacity Released** | |
|---|---|
| **0.4 MW of Flexibility** | |
| **Pre-fault** | **Post-fault** |
| **0.4 MW** | **0.0 MW** |

| **EHV/HV Interventions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| FRODSHAM LOCAL T1 | Thermal | Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.4 | - | 2027/28 | Planned (ED2) |

## 4.8 Kirkby




**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.**




| 48.9 MVA Capacity Released | |
|---|---|
| **5.1 MW of Flexibility** | |
| **Pre-fault** | **Post-fault** |
| **5.1 MW** | **0.0 MW** |

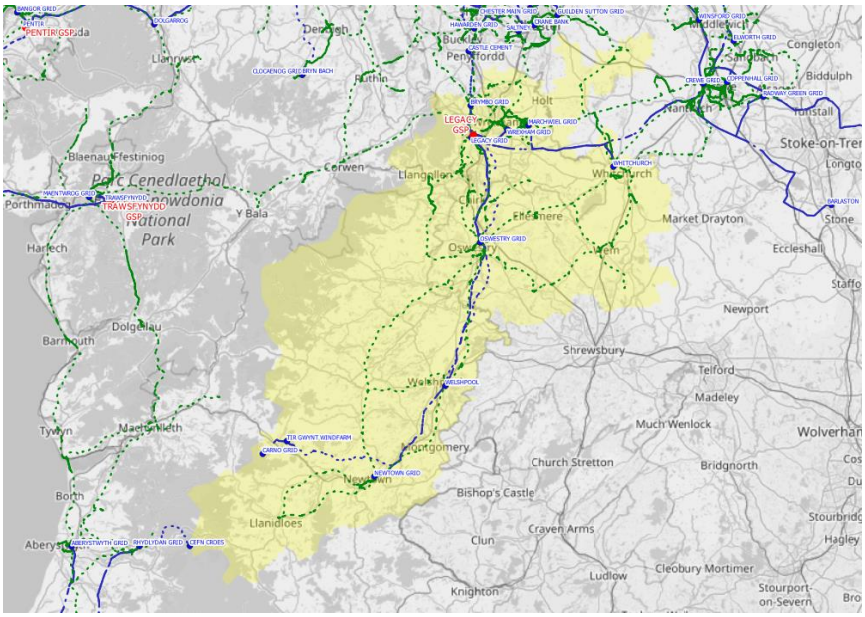
| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| AINTREE GT2 / FAZAKERLEY GT1 / GILLMOSS GT2 | Fault level | | **SPM 33kV RMUs Fault Level Mitigation**<br>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**<br>Flexibility services to manage thermal constraints. | 1.8 | - | 2027/28 | Planned (ED2) |
| FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2 | Thermal | | **Formby-Southport 33kV Reinforcement**<br>Overlay 14km of cable and establish new 33kV interconnector between Formby and Southport.<br>Extend 33kV switchboard at Formby by one circuit breaker.<br>Refurbish and use spare circuit breaker at Southport Grid substation. | - | 28.0 | 2025/26 | Planned (ED2) |
| | | Secure | **Formby-Southport 33kV**<br>Flexibility services to manage the network risk during delivery of reinforcement. | 3.3 | - | 2023/24 to 2025/26 | Planned (ED2) |

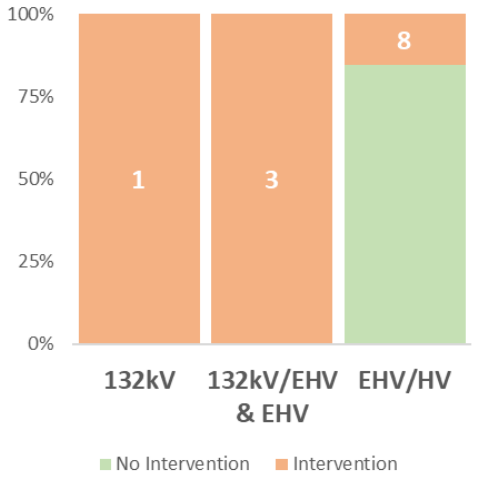
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2 | Asset Mod. |  | **33kV RMU Modernisation** 33kV RMU replacement at Nevill Street. | - | * | 2024/25 | Planned (ED2) |
| FORMBY GT2B / SOUTHPORT GT1 / SOUTHPORT GT2 | Asset Mod. |  | **33kV RMU Modernisation** 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<br><br>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 (MVA)** | **Expected By** | **Status** |
| BANASTRE RD T1 / DOVER RD T1 / GRANTHAM CL T1 | Thermal |  | **Southport Primary Reinforcement** Uprate group from 6.6 to 11kV. 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. | - | 10.0 | 2025/26 | Planned (ED2) |

## 4.9 Legacy



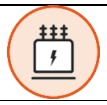

**This section of network is fed via four 240MVA 400/132kV SGTs. This group supplies arond 141,000 consumers in Dee Valley, north Shropshire and part of Cheshire, including Ruabon, Wrexham, Marchwiel, Whitchuch, Oswestry, Newton and Welshpool areas.**

| **45.4 MVA Capacity Released** | |
|---|---|
| **33.4 MW of Flexibility** | |
| **Pre-fault** | **Post-fault** |
| **33.4 MW** | **0.0 MW** |

| **132kV Interventions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| Legacy 132kV group | Security of Supply | | **Legacy 132kV Reinforcement**<br>Swap SGT2 and SGT4 tails across the 132kV busbar.<br>Install bus section circuit breaker between reserve busbars. | - | 0.0 | 2024/25 | Planned (ED2) |

| **132kV/EHV Interventions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| OSWESTRY GT5 / WHITCHURCH GT1 | Voltage and Thermal | | **Whitchurch Reinforcement**<br>Install 22km of new build 132kV overhead line to connect a new 60MVA GT at Wem substation<br>Replace the 33kV switchboard. | - | 25.5 | 2022/23 | Delivery |

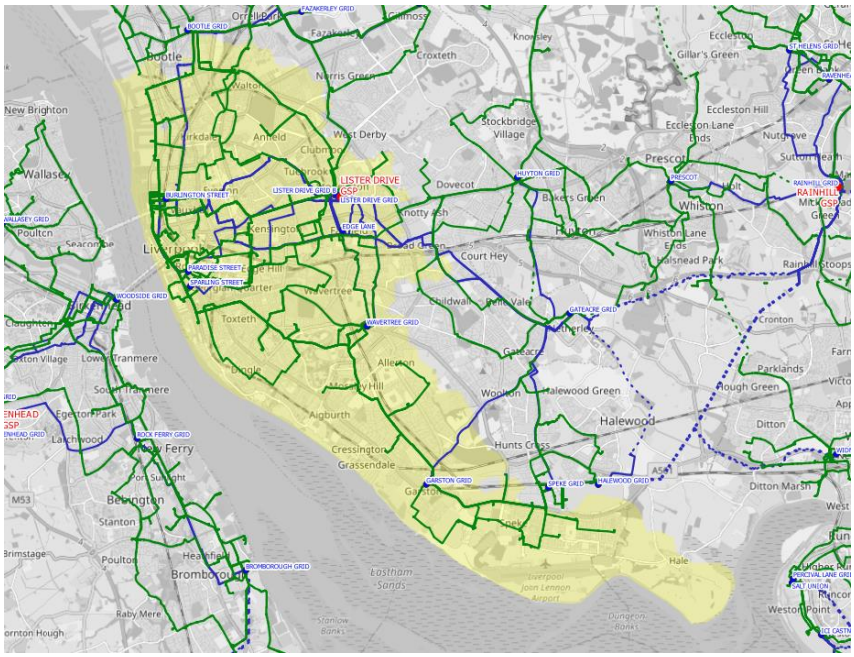
| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| BRYMBO GT1 / LEGACY LOCAL GT1 / MARCHWIEL GT1 / MARCHWIEL GT2 / WREXHAM GT1 | Asset Mod. |  | **33kV RMU and CB Modernisation**<br>33kV circuit breaker and 33kV RMU replacements at Kelloggs Wrexham. | - | * | 2021/22 | Delivery |
| BRYMBO GT1 / LEGACY LOCAL GT1 / MARCHWIEL GT1 / MARCHWIEL GT2 / WREXHAM GT1 | Asset Mod. |  | **33kV CB Modernisation**<br>33kV circuit breaker replacements at Wrexham A. | - | * | 2023/24 | Planned (ED2) |
| BRYMBO GT1 / LEGACY LOCAL GT1 / MARCHWIEL GT1 / MARCHWIEL GT2 / WREXHAM GT1 | Asset Mod. |  | **33kV CB Modernisation**<br>33kV circuit breaker replacements at Clywedog Road. | - | * | 2024/25 | Planned (ED2) |
| BRYMBO GT1 / LEGACY LOCAL GT1 / MARCHWIEL GT1 / MARCHWIEL GT2 / WREXHAM GT1 | Asset Mod. |  | **33kV RMU Modernisation**<br>33kV RMU replacements at Ash Road and Llay. | - | * | 2024/25 | Planned (ED2) |
| BRYMBO GT1 / LEGACY LOCAL GT1 / MARCHWIEL GT1 / MARCHWIEL GT2 / WREXHAM GT1 | Asset Mod. |  | **33kV RMU Modernisation**<br>33kV RMU replacement at Davy Way. | - | * | 2026/27 | Planned (ED2) |
| BRYMBO GT1 / LEGACY LOCAL GT1 / MARCHWIEL GT1 / MARCHWIEL GT2 / WREXHAM GT1 | Asset Mod. |  | **33kV CB Modernisation**<br>33kV circuit breaker replacements at Fibreglass. | - | * | 2025/26 | Planned (ED2) |
| BRYMBO GT1 / LEGACY LOCAL GT1 / MARCHWIEL GT1 / MARCHWIEL GT2 / WREXHAM GT1 | Asset Mod. |  | **33kV CB Modernisation**<br>33kV circuit breaker replacements at Maelor Creamery. | - | * | 2026/27 | Planned (ED2) |
| LEGACY LOCAL GT2 / NEWTOWN GT2 / OSWESTRY GT8 / WELSHPOOL GT1 | Voltage |  | **Newtown-Morda 33kV Reinforcement**<br>Additional 10MVAr STATCOM at Newton Grid substation, 33/11 kV step up transformer and outdoor circuit breaker.<br>Additional 33kV, 5MVAr MSC and outdoor circuit breaker at Morda Substation. . | - | 15.0 | 2027/28 | Planned (ED2) |
| | |  <br>Secure | **Newtown-Morda 33kV**<br>Flexibility services to manage the network risk during delivery of reinforcement. | 24.4 | - | 2023/24 to 2026/27 | Planned (ED2) |
| LEGACY LOCAL GT2 / NEWTOWN GT2 / OSWESTRY GT8 / WELSHPOOL GT1<br><br>OSWESTRY GT5 / WHITCHURCH GT1 | Fault level |  | **Fault Level Monitoring and Management**<br>Installation of Real Time Fault Level Monitoring equipment and Active Fault Level Monitoring at Oswestry Grid. | - | * | 2024/25 | Planned (ED2) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LEGACY LOCAL GT2 / NEWTOWN GT2 / OSWESTRY GT8 / WELSHPOOL GT1 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Milford. | - | * | 2027/28 | Planned (ED2) |
| OSWESTRY GT5 / WHITCHURCH GT1 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at West Felton. | - | * | 2027/28 | Planned (ED2) |

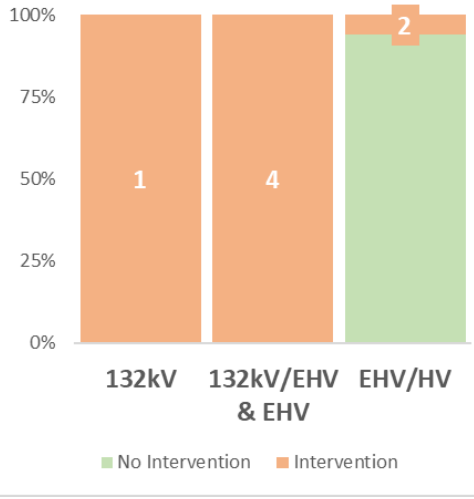
*These interventions could increase generation hosting capacity.

| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| COEDPOETH T1 / COEDPOETH T2 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 1.0 | - | 2027/28 | Planned (ED2) |
| FORDEN T1 | Thermal and Voltage |  | **Forden Primary Reinforcement** Installation of 11kV voltage regulator. | - | 1.4 | 2022/23 | Delivery |
| | |  | **Forden Primary Reinforcement** Enhanced transformer ratings. | | | | |
| FORDEN T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.3 | - | 2026/27 to 2027/28 | Planned (ED2) |
| GWERSYLLT T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 4.3 | - | 2025/26 to 2027/28 | Planned (ED2) |
| JOHNSTOWN T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.6 | - | 2026/27 to 2027/28 | Planned (ED2) |
| LLANDRINIO T1 | Thermal |  | **Llandrinio Primary Reinforcement** Enhanced transformer ratings | - | 1.3 | 2021/22 | Delivery |
| LLANDRINIO T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.7 | - | 2025/26 to 2027/28 | Planned (ED2) |
| LLANFYLLIN T1 / LLANFYLLIN T2 | Asset Mod. |  | **Primary Transformer Replacement** Replace Llanfyllin T1 and T2 with 7.5/10MVA units. | - | 2.2 | 2024/25 | Planned (ED2) |
| LLANIDLOES T1 / LLANIDLOES T2 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 1.5 | - | 2026/27 to 2027/28 | Planned (ED2) |
| RAVEN SQUARE T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.6 | - | 2027/28 | Planned (ED2) |

## 4.10 Lister Drive




**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.**




**5.1 MVA Capacity Released**

**41.3 MW of Flexibility**

| Pre-fault | Post-fault |
|---|---|
| 41.3 MW | 0.0 MW |

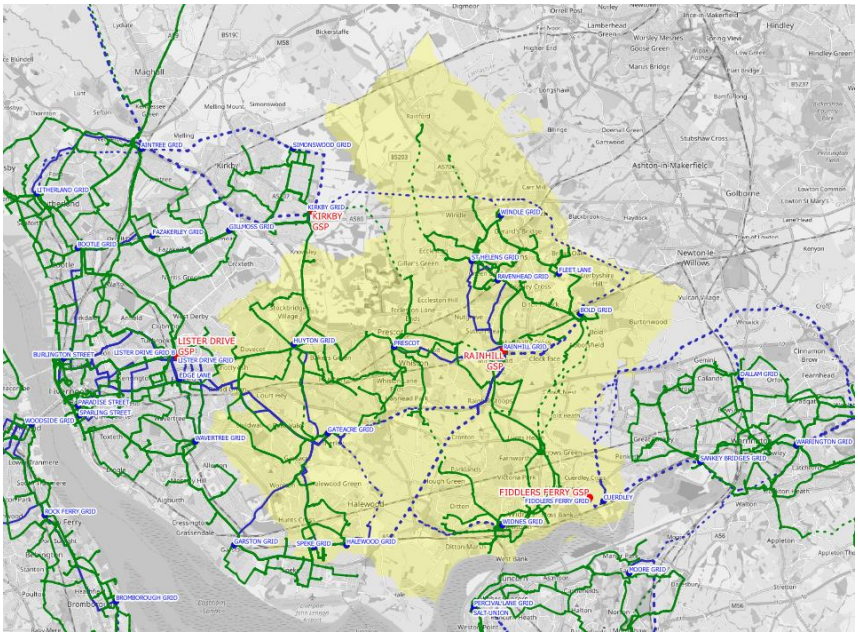
| 132kV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| Lister Drive 132kV group | Thermal | | **Lister Drive 132kV Reinforcement**<br>Install real time thermal monitoring equipment on 132kV circuit to Burlington St.<br>CMZ based automation scheme to trip Burlington St. – Bootle circuit and close either line or bus section beaker at Bootle.<br>Annual tendering for flexibility to reduce dependence on automation scheme and higher demand turnout. | - | 0.0 | 2023/24 | Planned (ED2) |
| | | Sustain | **Lister Drive 132kV**<br>Flexibility services to manage the network risk during delivery of reinforcement. | 41.3 | - | 2024/25 to 2027/28 | Planned (ED2) |

| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **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** 33kV 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) |

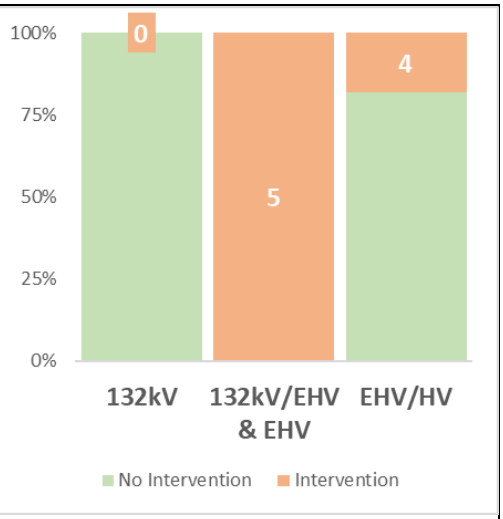
*These interventions could increase generation hosting capacity.

| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **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) |

## 4.11 Rainhill




**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.**




**24.5 MVA Capacity Released**

**6.6 MW of Flexibility**

| Pre-fault | Post-fault |
|---|---|
| 6.6 MW | 0.0 MW |

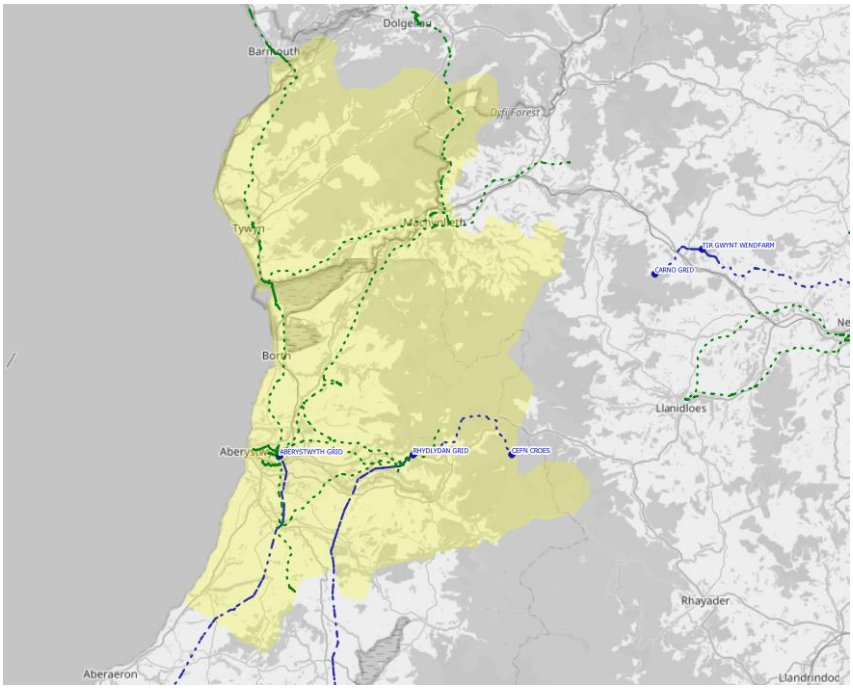
| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| BOLD G4A / PRESCOT GT1B / WIDNES GT1 / WIDNES GT2 | Fault level | | **SPM 33kV RMUs Fault Level Mitigation** Replace 33kV RMU at Hills Moss | - | * | 2023/24 | Planned (ED2) |
| 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) |

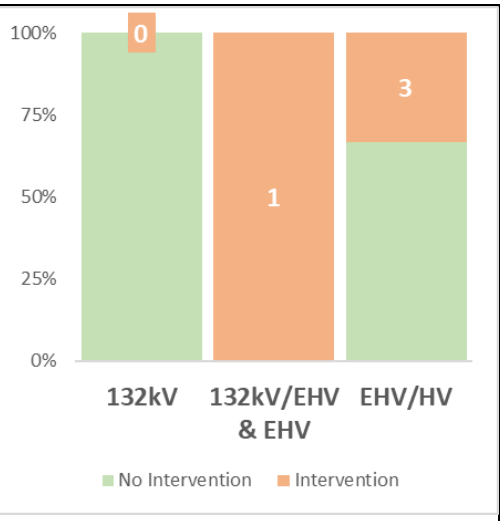
*These interventions could increase generation hosting capacity.

| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **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 |
| CHALON WAY T1 / TECHNOLOGY CAMPUS T1 / WOODVILLE ST T1 | 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 |

## 4.12 Swansea North




**This section of network is fed via two 132kV circuits from Rhos (WPD). This group supplies arond 22,000 consumers in Mid Wales, including Aberystwyth and Rhydlydan areas.**



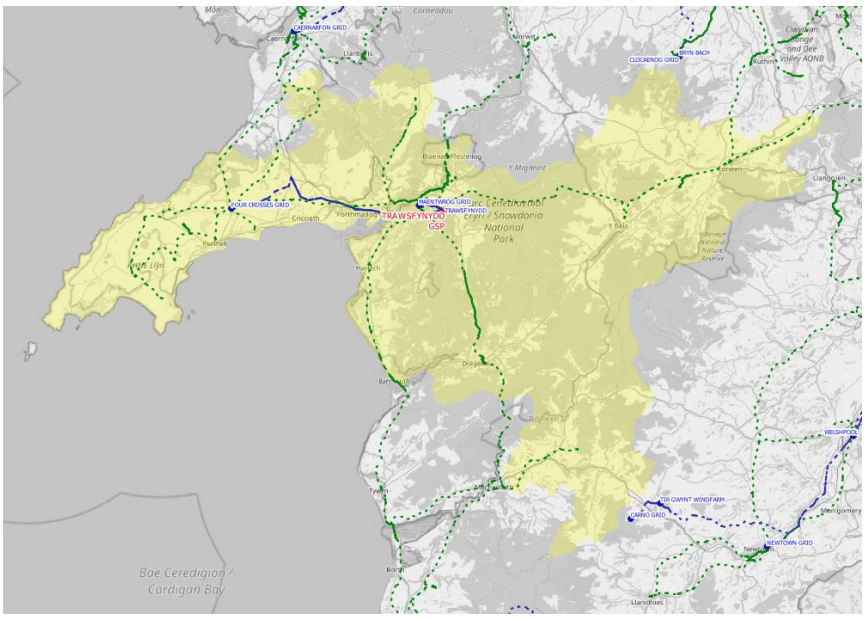

| 11.2 MVA Capacity Released | |
|---|---|
| **10.4 MW of Flexibility** | |
| **Pre-fault** | **Post-fault** |
| **10.4 MW** | **0.0 MW** |

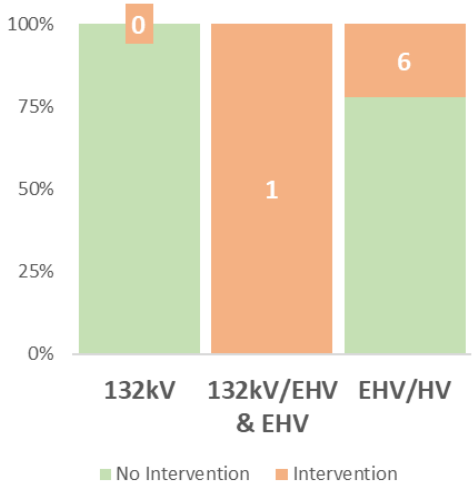
| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| ABERYSTWYTH GT2 / RHYDLYDAN GT1 | Voltage | | **Aberdyfi-Harlech 33kV Reinforcement** Installation of 10MVAr STATCOM, 33/11kV step up transformer and 33kV board extension at Aberdyfi. | - | 10.0 | 2027/28 | Planned (ED2) |
| | | Secure | **Aberdyfi-Harlech 33kV Reinforcement** Flexibility services to manage the network risk during delivery of reinforcement. | 8.7 | - | 2023/24 to 2026/27 | Planned (ED2) |
| ABERYSTWYTH GT2 / RHYDLYDAN GT1 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Llanilar. | - | * | 2023/24 | Planned (ED2) |
| ABERYSTWYTH GT2 / RHYDLYDAN GT1 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Aberdyfi. | - | * | 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 (MVA)** | **Expected By** | **Status** |
| BOW ST T1 | Thermal | Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 1.1 | - | 2027/28 | Planned (ED2) |
| LLANILAR T1 | Thermal | Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.6 | - | 2026/27 to 2027/28 | Planned (ED2) |
| MACHYNLLETH T1 | Asset Mod. | | **Primary Transformer Replacement** Replace T1 with a 7.5/10MVA unit. | - | 1.2 | 2025/26 | Planned (ED2) |

## 4.13 Trawsfynydd



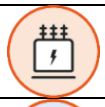
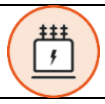




**This section of network is fed via two 120MVA 275/132kV SGTs. This group supplies arond 41,000 consumers in North Wales, including the Llyn peninsula, Porthmadog, and Machynlleth areas.**

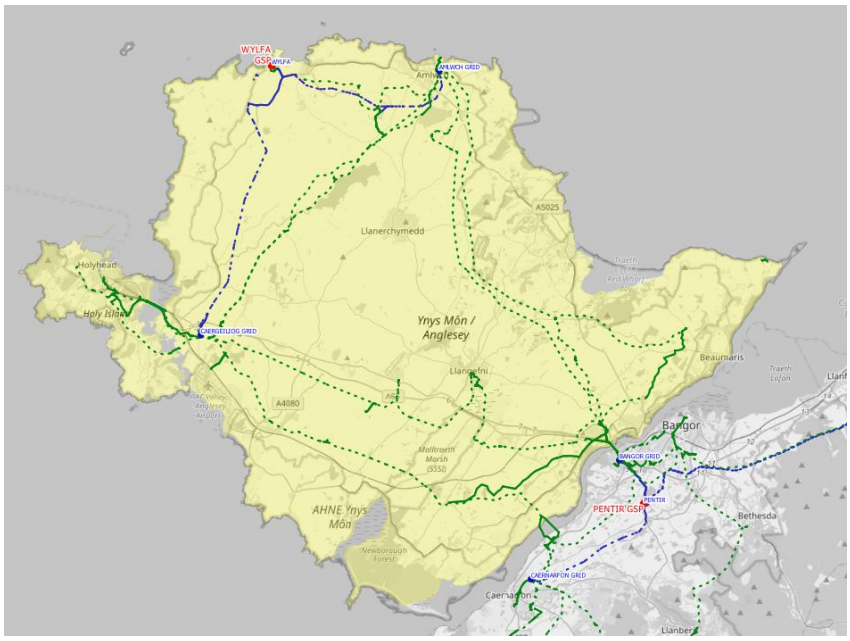
| | |
|---|---|
| **22.4 MVA Capacity Released** | |
| **18.1 MW of Flexibility** | |
| **Pre-fault** | **Post-fault** |
| **18.1MW** | **0.0 MW** |

| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| FOUR CROSSES GT2 / MAENTWROG GT1 / MAENTWROG GT2 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Manod. | - | * | 2024/25 | Planned (ED2) |
| FOUR CROSSES GT2 / MAENTWROG GT1 / MAENTWROG GT2 | Asset Mod. | | **33kV CB Modernisation** 33kV circuit breaker replacements at Rivals. | - | * | 2025/26 | Planned (ED2) |
| FOUR CROSSES GT2 / MAENTWROG GT1 / MAENTWROG GT2 | Voltage | | **Aberdyfi-Harlech 33kV Reinforcement** Installation of 33kV, 5MVAr MSC and replacement of 33kV AIS breakers with 5-panel switch board at Harlech primary substation. | - | 5.0 | 2025/26 | Planned (ED2) |
| FOUR CROSSES GT2 / MAENTWROG GT1 / MAENTWROG GT2 | Thermal | | **Maentwrog-Porthmadog 33kV Reinforcement** Overlay 11km of cable and establish new 33kV circuit between Maentwrog and Porthmadog. Extend 33kV switchboard at Maentwrog and Porthmadog Substations. | - | 15.0 | 2026/27 | Planned (ED2) |

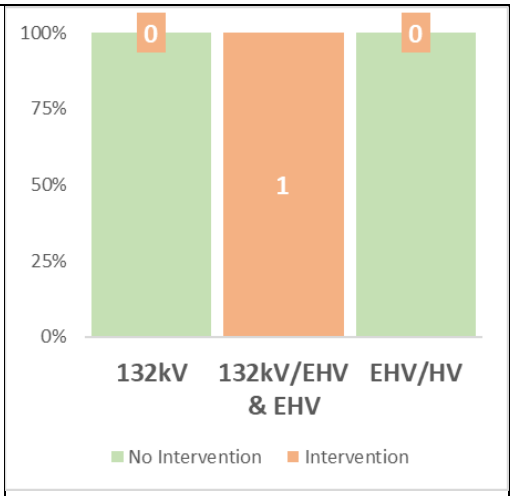
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | |  Sustain | **Maentwrog-Porthmadog 33kV Reinforcement** Flexibility services to manage the network risk during delivery of reinforcement. | 14.0 | - | 2023/24 to 2025/26 | Planned (ED2) |
| FOUR CROSSES GT2 / MAENTWROG GT1 / MAENTWROG GT2 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Rhoslan. | - | * | 2026/27 | Planned (ED2) |

| EHV/HV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| ABERSOCH T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 1.4 | - | 2025/26 to 2027/28 | Planned (ED2) |
| BLAENAU FFESTINIOG T1 | Asset Mod. |  | **Primary Transformer Replacement** Replace T1 with a 7.5/10MVA unit | - | 1.2 | 2026/27 | Planned (ED2) |
| CEMMAES RD T1 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.3 | - | 2027/28 | Planned (ED2) |
| EDERN T1 | Thermal |  | **Flexibility Services for High Utilisation Groups** Enhanced transformer ratings. | - | 0.0 | 2023/24 | Planned (ED2) |
| | |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 1.8 | - | 2024/25 to 2027/28 | Planned (ED2) |
| MACHYNLLETH T2 | Thermal |  Secure | **Flexibility Services for High Utilisation Groups** Flexibility services to manage thermal constraints. | 0.6 | - | 2027/28 | Planned (ED2) |
| RIVALS T1 | Asset Mod. |  | **Primary Transformer Replacement** Replace T1 with a 7.5/10MVA unit | - | 1.2 | 2023/24 | Planned (ED2) |

## 4.14 Wylfa




This section of network is fed via **two 240MVA 400/132kV SGTs. This group supplies arond 38,000 consumers in the isle of Anglesey.**




**17.7 MVA Capacity Released**

**0.0 MW of Flexibility**

| Pre-fault | Post-fault |
|---|---|
| 0.0 MW | 0.0 MW |

| 132kV/EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| AMLWCH GT1 / CAERGEILIOG GT1 / CAERGEILIOG GT2 | Thermal and Voltage | | **Caergeiliog 33kV Reinforcement** Install new 60MVA GT at Caergeiliog substation from NG 132kV circuit near Caergeiliog (~2km).<br><br>**Llangaffo – Llanfair PG Circuit** Install 11km of new build 33kV cable **Bangor – Llanfair PG Circuit** New 33kV 400mm XLPE circuit. | - | 17.7 | 2021/22 | Delivery |
| AMLWCH GT1 / CAERGEILIOG GT1 / CAERGEILIOG GT2 | Thermal and Voltage | | **Bangor – Llanfair PG MVDC circuit** Operate the existing 33kV circuit to be operated as DC circuit ±27kVDC. | | | 2022/23 | Delivery |

| EHV Interventions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Network Area** | **Driver** | **Type** | **Solution** | **Flexibility (MW)** | **Increase in Firm Capacity (MVA)** | **Expected By** | **Status** |
| AMLWCH GT1 / CAERGEILIOG GT1 / CAERGEILIOG GT2 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Llangefni Ind Est. | - | * | 2024/25 | Planned (ED2) |
| AMLWCH GT1 / CAERGEILIOG GT1 / CAERGEILIOG GT2 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Llandyfrydog. | - | * | 2025/26 | Planned (ED2) |
| AMLWCH GT1 / CAERGEILIOG GT1 / CAERGEILIOG GT2 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Llanddeusant. | - | * | 2026/27 | Planned (ED2) |
| AMLWCH GT1 / CAERGEILIOG GT1 / CAERGEILIOG GT2 | Asset Mod. |  | **33kV CB Modernisation** 33kV circuit breaker replacements at Llanfaelog. | - | * | 2027/28 | Planned (ED2) |

# 5 Part 2 – Network Capacity Headroom

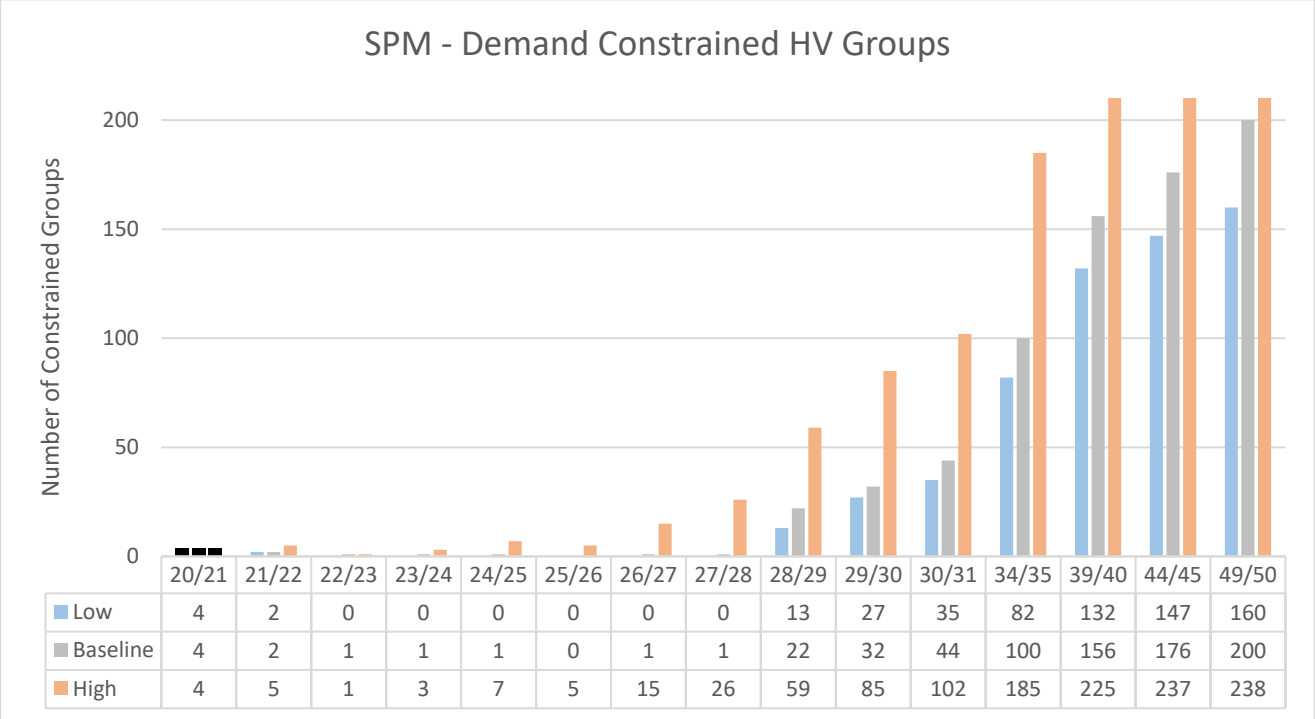
This section provides a forecast of post-intervention headroom across all network groups out to 2050. We've calculated this post-intervention headroom by combining our existing network model, our scenario forecasts, and our known intervention plans.

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).

## 5.1 Demand headroom results

Demand growth is increasing from now out to 2050 due to the decarbonisation of heat and transport. This isn't 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.




| | 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 |

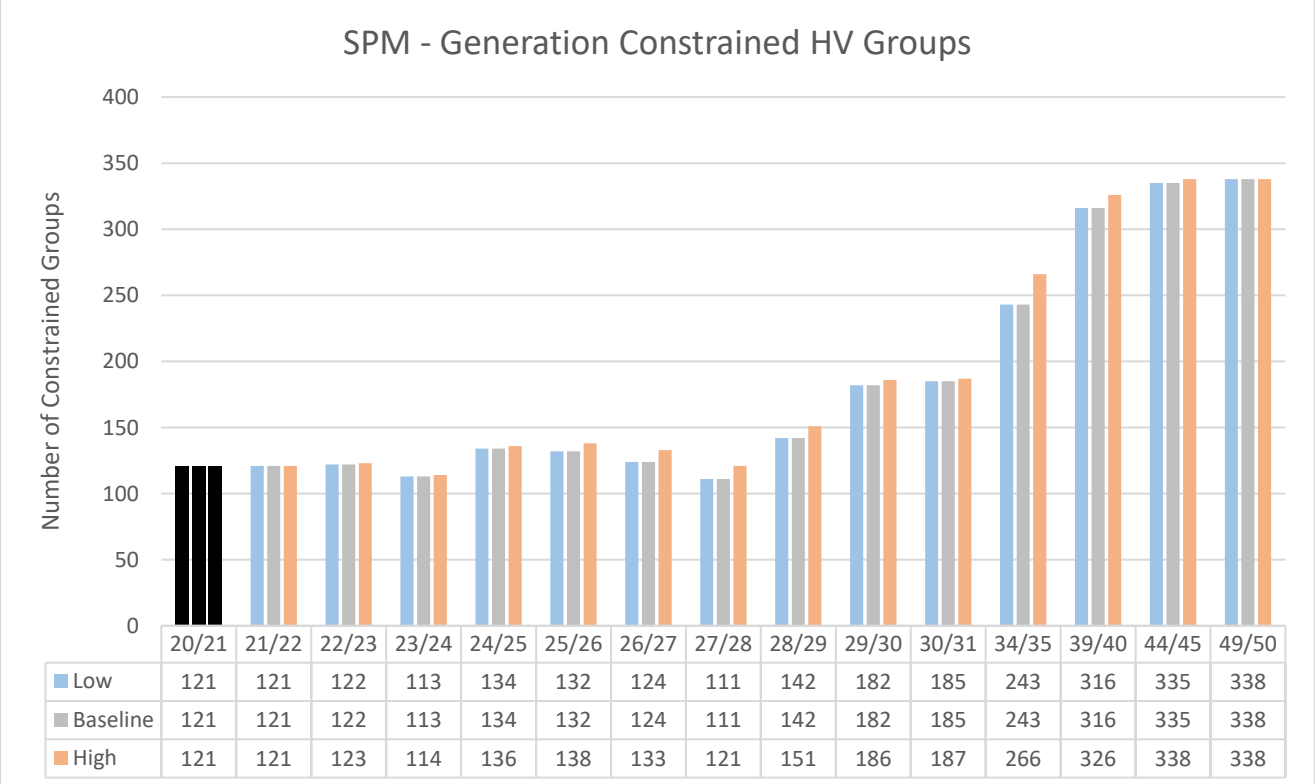
**Figure 5: SP Manweb number of demand constrained primary substation groups**

## 5.2 Generation headroom results

Generation growth is increasing from now out to 2050. This isn't 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.




| | 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 |

**Figure 6: SP Manweb number of generation constrained primary substation groups**

# 6 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 (CO2) 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. https://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.

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:

i. 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: http://www.legislation.gov.uk/ukpga/2008/27/contents

ii. 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: http://www.legislation.gov.uk/asp/2019/15/contents/enacted

iii. 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: https://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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