SP Energy Networks | DSO

Network Development Plan

Summary Document

May 2024

Contents

1 Welcome to our Network Development Plan

Welcome to our Network Development Plan (NDP) suite of documents. These explain how we plan to deliver the capacity our customers need to decarbonise, and set out where our network has capacity headroom to accommodate demand and generation growth. Sharing such data and working with our customers and stakeholders are critical to delivering a successful and just transition to Net Zero, so I thank stakeholders for the feedback we receive on these NDP documents.

Electricity networks are at the heart of the Net Zero transition. The scale of decarbonisation means that by 2050 the peak demand on our distribution network is forecast to double, and we could likely see a five-fold increase in connected generation and storage. In recent years we have seen a steady increase in connection rates of domestic, low carbon technologies. These trends are expected to accelerate, and we forecast that our customers are likely to connect up to eight million electric vehicles and heat pumps by 2050.

We know from detailed modelling that this new demand, generation, and storage will increasingly push the distribution network beyond what it is designed for, meaning that our network needs to evolve to enable our customers' Net Zero transition. This evolution will affect every area of our business. For example, we need to change the way that we plan and develop the network – we're doing this using enhanced forecasting and modelling tools to establish where, when, and how much network capacity we need to add to accommodate customer growth, and to best deliver that capacity by optimising across innovative, reinforcement, and flexibility service solutions.

The 24/7 role of network operations – managing the network in real time, keeping the lights on, and keeping our customers and staff safe – will soon also involve dispatching and settling thousands of flexibility service contracts. These are actions taken by our customers who have agreed to operate in ways that free up network capacity and avoid network constraints. Information, visibility, data, and automation will all be essential to enable us to safely and efficiently operate a more active distribution system and coordinate the range of operational tools available to us.

The unprecedented nature of these changes and capacity requirements will require a step increase in network interventions compared to historical levels. Our intervention plans need to be tailored to meet evolving customer needs and only target interventions where we can be sure they will deliver value for customers. We've ensured this in two ways.

First, we regularly test the flexibility market for every network capacity shortfall we have identified out to 2028. These market based solutions will play a key role in helping us manage the pace of the Net Zero transition. Flexibility services can help us defer or avoid new network capacity, can be deployed more quickly than other solutions, and can help democratise and bring competition to the energy sector.

Second, we have developed and continue to enhance our suite of industry-leading tools that can optimise our network investment plans. These systematically and impartially identify where, when, and how we need to intervene to provide the capacity that our customers need, having fairly considered flexibility, energy efficiency, innovative, and reinforcement solutions. Building on these, we are also developing tools for our stakeholders to help them understand how to optimise their plans and inform their decisions.

The outcome is a broad intervention plan that goes well beyond network reinforcement. Our RIIO-ED2 plan incorporates the use of flexibility at 1,352 sites across all voltages, and we will continue to test every viable network constraint for flexibility. We are using innovative world-first real time fault level measurement as business as usual, helping generators to connect more quickly and cheaply. And we are deploying a range of DSO capabilities – including enhanced forecasting, monitoring, and analytics – to maximise use of existing capacity, better target interventions, and increase the range of tools we have available to create capacity.

I am pleased to have this opportunity to share these plans and the resulting capacity headroom with you.

Scott Mathieson

Network Planning & Regulation Director

2 Introduction

2.1 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.

2.2 Introducing our NDP

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

In this context, Standard Licence Condition 25B came into force on 31 December 2020.[1] 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.[2]

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: Network 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 scenario headroom report** – the indicative demand and generation capacity available at each primary substation (down to and including the HV busbar). Forecasts are produced for every year for the first 10 years, and then for every five years after that out to 2050. These capacity forecasts must take account of known planned interventions which will increase capacity (i.e. those listed in Part 1).
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[3]:

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

[1] https://www.legislation.gov.uk/uksi/2020/1401/made/data.xht?view=snippet&wrap=true

[2] https://www.energynetworks.org/industry-hub/resource-library/on21-ws1b-p5-network-development-plan-(ndp)-form-of-statement-template-and-process-(22-dec-2021).pdf

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

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

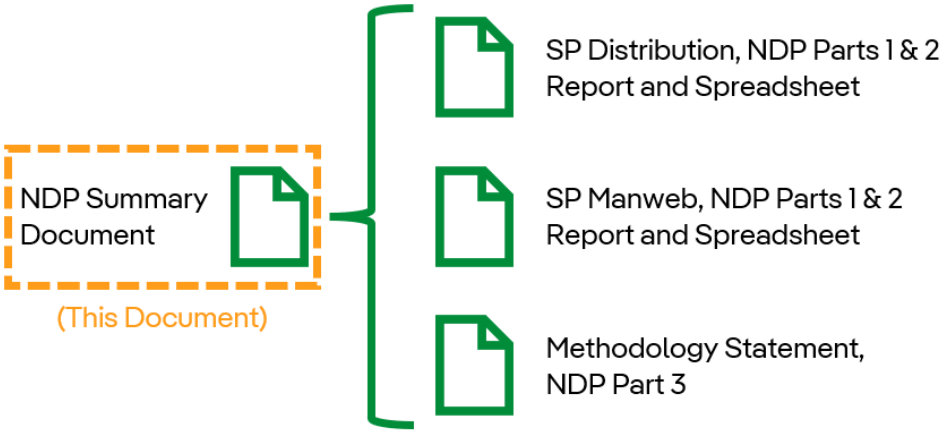


Figure 1: SP Energy Networks' NDP document map

2.3 Distribution Network options Assessment (DNOA)

For every location where our network assessments have identified that there will be insufficient network capacity to meet customer needs, we have a decision to make – how should we best intervene to provide the capacity? Our DSO Decision Making Framework[4] provides detail and transparency on the process we follow to impartially select optimal solutions and how we decide when and where to rely on flexibility services instead of other network interventions.

The outcome of these decisions is published in our NDP Part 1, where we list the interventions we have planned, grouped by GSP. Where these are driven by a requirement for capacity we provide a link to our detailed Engineering Justification Paper to give transparency in the decision making process at a scheme by scheme level.

We have also recently introduced the publication of Distribution Network Options Assessments (DNOA) to provide stakeholders with more information on individual scheme decisions. This provides an overview of the individual constraint, how we are managing it, and where flexibility forms part of our solution we provide details of the flexibility requirements at this location. As we move to monthly tendering for flexibility the annual DNOA publication will signpost upcoming longer-term requirements. We intend to publish our DNOA annually, but we may refresh information more frequently if there are any changes in our decision making at individual sites.

We trialled a sample of DNOA scheme pages in the draft NDP documents for consultation, which received positive stakeholder feedback. We will now provide scheme pages for all major load-driven interventions. There are links to DNOA scheme pages in the reporting of network interventions throughout the NDP Part 1.

[4] Our Decision Making Framework is available here: DSO Decision Making Framework - SP Energy Networks

2.4 How the NDP and DNOA fit with other data provision

Publishing our NDP and DNOA is just part of the measures 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 ongoing data provision includes:

- DFES forecasts[5] – these are forecasts for key customer demand and generation metrics up until 2050. We develop these considering a range of sources, including UK and devolved government targets and other industry forecasts. Given the uncertainties out to 2050, we create forecasts for multiple energy scenarios. These scenarios represent differing levels of customer ambition, government and policy support, economic growth, and technology development. Our stakeholders review our forecasts and we make changes based on their well-justified feedback. We will update our DFES annually.
- LTDS[6] – 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[7] – previously known as the System Wide Resource Register, this 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[8] – these provide a geographic view of where there is available network capacity to accommodate new generation.
- Flexibility tenders – 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.

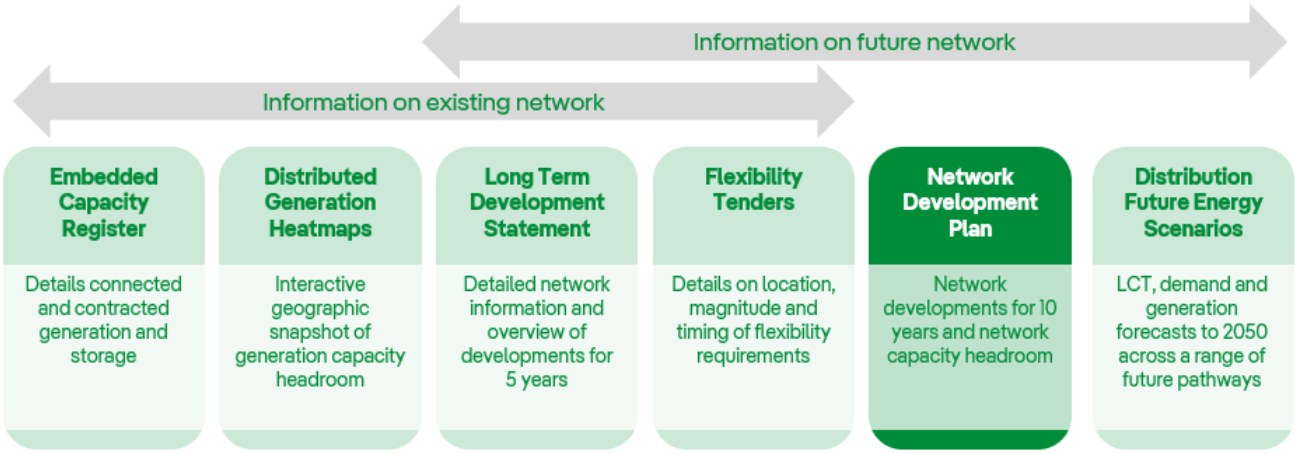
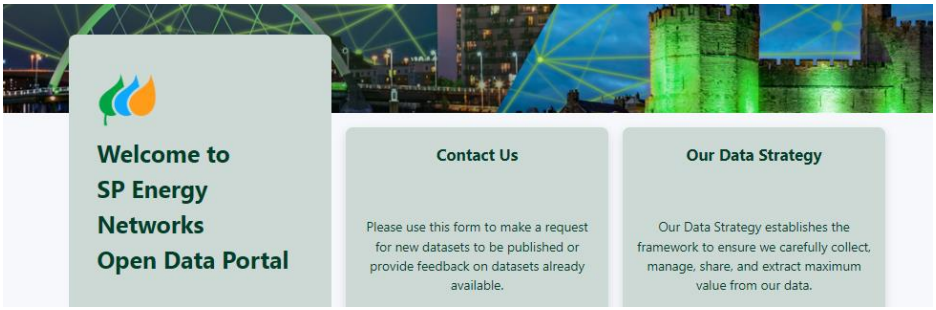


Figure 2: How our NDP fits in with other data provision

Looking forward to RIIO-ED2, given the value of data share 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[9] for more information on the network data we plan to share in RIIO-ED2 based on stakeholder input.

[5] Our DFES is available here: https://www.spenergynetworks.co.uk/pages/distribution_future_energy_scenarios.aspx
[6] Our LTDS is available here: https://www.spenergynetworks.co.uk/pages/long_term_development_statement.aspx
[7] Available here: https://www.spenergynetworks.co.uk/pages/embedded_capacity_register.aspx
[8] Our heatmaps are available here: https://www.spenergynetworks.co.uk/pages/connection_opportunities.aspx
[9] Our DSO Strategy. Available at: https://www.spenergynetworks.co.uk/userfiles/file/SPEN_DSO_Strategy_for_RIIO-ED2.pdf

2.5 Our commitment to open data



To enable us to efficiently and effectively share our data, we have developed and launched an online "Open Data Portal". This portal was launched in 2023 and can be freely accessed by our customers and stakeholders via the SP Energy Networks website. Our Open Data portal provides a single, easy-to-access interface for our users, enabling them to easily explore, filter, view, download and consume our available data. Via our portal, stakeholders can :

- Download data in multiple formats
- Consume data via an API
- Feedback on datasets
- Subscribe for datasets specific updates

3 Developing a network for Net Zero

Electricity networks are at the heart of the Net Zero transition. The scale of decarbonisation means that by 2050 the **peak demand on our distribution networks is forecast to double**, and we could likely see a **five-fold increase in connected generation and storage**. Over recent years we have seen a steady increase in connection rates of domestic low carbon technologies. These trends are expected to accelerate, and we forecast that our customers are likely to connect up to **eight million electric vehicles and heat-pumps by 2050**.

3.1 Our role as a Distribution System Operator

The energy landscape is undergoing a seismic shift. Developments such as in-home low carbon technologies, more cost-reflective supplier tariffs, and greater renewable generation and storage volumes, are reshaping the way we generate, distribute, and consume energy. DSOs play a pivotal role in the ever-evolving energy ecosystem, serving as the linchpin connecting energy producers with consumers, network operators with system operators, and service providers with buyers.

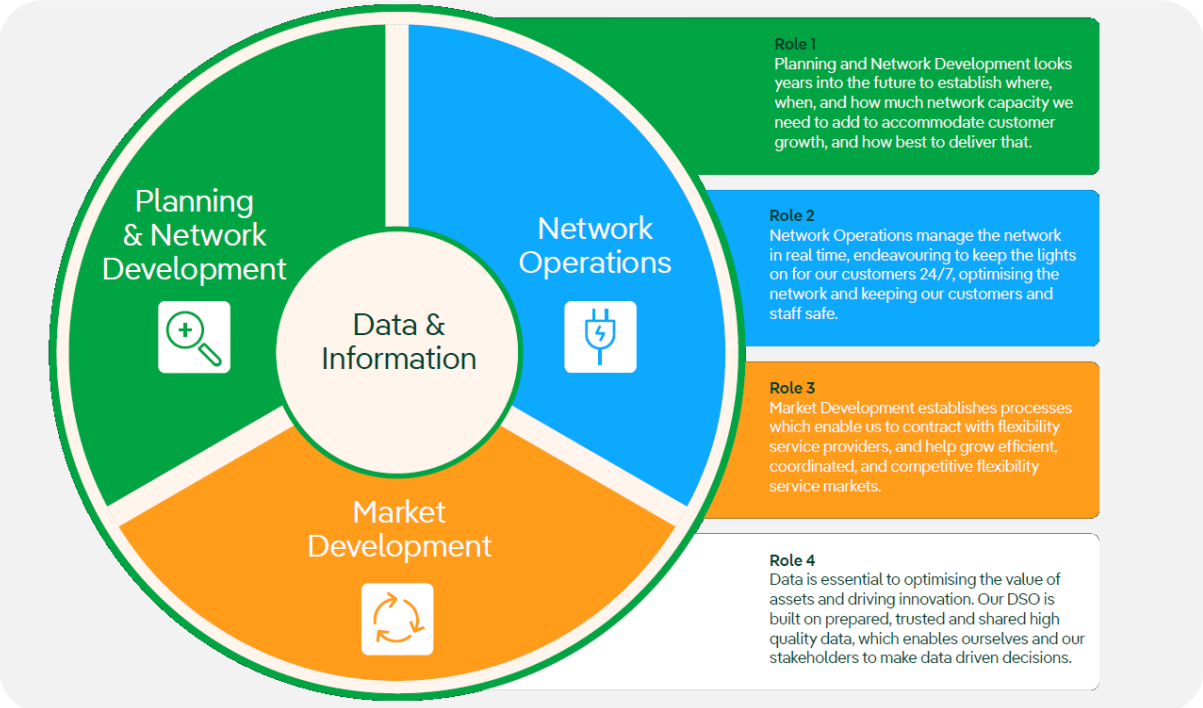
Our vision is for better, more accurate, and more informed system planning. This will be integrated with Regional Energy Strategic Planners, who should coordinate across the whole cross-vector energy system to inform our distribution future energy scenarios (DFES) forecasts. These DFES forecasts set out our customers' requirements across a range of decarbonisation scenarios. They are the foundation on which we develop our network. Therefore, to develop our DFES, we need to understand the behaviours and ambitions of our customers and stakeholders – our ability to accurately forecast our customers' network needs relies on collaborating with those seeking to access and use our network.

We are developing industry leading tools that can optimise the investment plan for our network. Building on these, we are also developing tools for our stakeholders to help them understand how to optimise their plans and inform their decisions.

3.2 Our DSO Strategy

Establishing our central Distribution System Operation (DSO) functions, building on our previous track record of industry-leading asset management and asset data management was our priority for the beginning of the RIIO-ED2 period, whilst ensuring our Whole System ambitions are embedded in our teams and our activities.

At the heart of this organisational model are the three core DSO roles set out by Ofgem, supported by the fourth and fundamental role of Data and Information. These roles are shown below:



3.3 Delivering DSO infrastructure

We are delivering DSO network infrastructure, 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.

The following are key examples of the DNO network infrastructure and tools we are in the process of delivering:

1. **Scalable network management and flexibility dispatch infrastructure** – these enable greater use of customer flexibility, automation, and smart tools to provide capacity instead of reinforcement. These include a flexibility platform to schedule, dispatch, and settle flexibility, and 22 constraint management zones (CMZs). CMZs fulfil a number of functions, one of which is ANM which enables renewable generators to connect more quickly and at lower cost where they would otherwise trigger capacity reinforcements. The next generation of CMZs we will deliver in RIIO-ED2 will also 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. Figure 3 shows existing and planned CMZs.

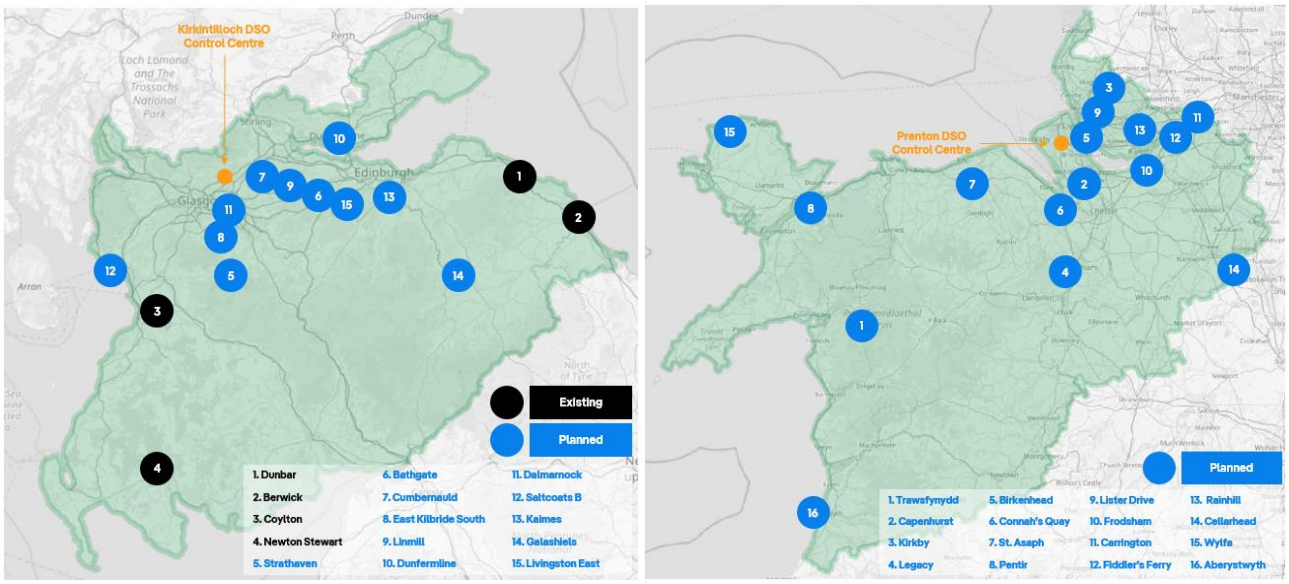


Figure 3: CMZ rollout

2. **Operational IT and telecoms** – the network's nervous system, which our flexibility, innovative, and smart interventions to provide capacity depend on. This includes investing to deliver the reliable, cyber-secure, low latency communication network that DSO outputs and other DSO infrastructure depend on.
3. **Network visibility** – visibility of network demand, generation, and power flows is important to help us efficiently and safely plan and operate the network to meet our customers' needs. We are rolling out real time fault level monitoring and LV monitoring across our network and are making greater use of smart meter data. We are deploying LV monitoring at over 14,000 LV substations. This will extend monitoring coverage to 76% of customers.
4. **Enhanced forecasting** – by better forecasting customer requirements we can better respond to them with more efficient and timely interventions to provide capacity. We will continue to use our industry-leading EV-Up and Heat-Up forecasting tools and continue to calibrate to keep them accurate. We will work with Ofgem and stakeholders as the Regional Energy Strategic Planners are established, and support the RESPs as they coordinate across the whole cross-vector energy system to inform our distribution future energy scenarios (DFES) forecasts.
5. **Simulation and modelling** – as the network will be operated closer to limits than ever before, Network planning is becoming more complex and we are enhancing our planning tools and capability in response. Combined with measures to increase network visibility, these help us to make high quality planning and operational decisions to help ensure there is sufficient network capacity. Enhanced planning tools such as our Engineering Net Zero platform enable us to offer better tools and data for stakeholders.

3.4 Delivering DSO Outputs

We will deliver a comprehensive set of DSO outputs. These describe what and how we will deliver DSO. Many of these outputs are enabled by the DSO infrastructure we plan to deliver, and nearly all directly or indirectly support the provision of network capacity.

The following are some examples of these outputs for each of the three Ofgem defined DSO roles:

Planning & Network Development

- ✓ High quality, data-driven intervention decisions that fairly compare all viable options (including flexibility and energy efficiency) and consider whole system outcomes.
- ✓ Planning processes and intervention decisions which are clear and transparent – stakeholders can follow the progress and decisions for all EHV and 132kV constraints.
- ✓ Network planning data made publicly available.

Network Operations

- ✓ Getting more out of existing network capacity by operating closer to limits, managing technical losses, and making more use of operational interventions like flexibility services instead of reinforcements.
- ✓ Whole system operational coordination to ensure system efficiency, stability, and resilience.
- ✓ Empowering customers and flexibility providers through more data, greater transparency, and more efficient markets.

Market Development

- ✓ Supporting flexibility market growth through data share, reduced barriers to participation, and enabling multiple market participation.
- ✓ More efficient flexibility market functioning through data-driven near-time and real-time notifications, operational coordination with the ESO, and a clear governing framework.
- ✓ Giving users confidence that we are a neutral market facilitator through transparency and external assurance.

Whole system working will be a key aspect of DSO so customers' capacity needs are considered holistically. We will support this through a range of measures including our new Strategic Optimisers team. This will partner with local authorities and regional governments to support the implementation of public EV charging and heat electrification initiatives, working with GDNs on outages, and significantly increasing data sharing.

In summary, our DSO Strategy gives us the planning and operational tools and capabilities we need to support the growth and use of flexibility service markets, analyse and share data, enable greater transparency and competition, help us coordinate across the whole system, and enhance our ability to plan and operate a more complex system. These will deliver a network with greater flexibility and optionality to meet our customers' capacity needs as GB transitions to Net Zero.

4 NDP Part 1 - Network Developments

4.1 Forecasting and modelling the changes

To efficiently plan and operate our network to accommodate our customers' requirements, we first need to understand what these requirements are. We do this by developing Distribution Future Energy Scenario (DFES) forecasts[10], and then comparing these against Net Zero compliant scenarios from the Electricity System Operator (ESO)[11] and the Climate Change Committee (CCC)[12] to identify the range of Net Zero compliant investment scenarios.

All Net Zero compliant scenarios show a significant increase in the volume of customer demand and generation that we will need to serve on our distribution network. This is primarily due to the electrification of transport (more EVs), the electrification of heat (more heat pumps), and more renewable generation (DG). Table 1 shows these values for the low, baseline, and high investment scenarios.[13]

Table 1: Our low, baseline and high scenarios (DFES Mar 2024)

Investment scenario	Total SP Energy Networks uptake by 2028		
	EVs	Heat pumps	Additional DG
High scenario	1.04m	0.77m	+7.83GW
Baseline scenario	0.72m	0.40m	+5.61GW
Low scenario	0.64m	0.34m	+4.70GW

The magnitude of these changes is significant and unprecedented – customer needs have never changed at this scale or rate before.

We model the impact of these scenarios on our network using enhanced forecasting and modelling tools. We combine our investment scenarios, enhanced forecasting tools which predict EV and heat pump uptake for every customer we serve, our ENZ (Engineering Net Zero) Model (a full network analytical model including all 48,000km of LV), flexibility tenders for every single forecast constraint, and an optimisation engine which impartially analyses and sequences all viable technical and non-technical solutions (including flexibility and energy efficiency) to create bespoke intervention plans for every constraint.

This approach systematically identifies where, when, and how we need to intervene. We're not building a plan on statistical estimates – we're addressing individual known constraints using market tested solutions. This data-driven approach means we build efficient targeted intervention plans – this keeps costs efficient for our customers and ensures they get the capacity they need to decarbonise. This is a step change in how investment plans are developed, which sets the standard for others to follow.

Please see our NDP Methodology Statement for more information on this process, and our DSO Decision Making Framework[14] for more information on process we follow to decide when and where to rely on flexibility services instead of another network intervention.

[10] Our DFES is available at: https://www.spenergynetworks.co.uk/pages/distribution_future_energy_scenarios.aspx
[11] The Electricity System Operator's "2023 Future Energy Scenarios", published July 2023. Available at: https://www.nationalgrideso.com/future-energy/future-energy-scenarios-fes
[12] The Climate Change Committee's "Sixth Carbon Budget", published December 2020. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/
[13] The baseline scenario represents the best approach for our customers assuming the appropriate regulatory mechanisms are in place. The low and high range mark the lower and upper range of credible Net Zero pathways.
[14] Our Decision Making Framework is available here: DSO Decision Making Framework - SP Energy Networks

4.2 Responding to the challenge

Our forecasting and modelling showed that customer-led changes out to 2050 are far beyond what the network, our operational systems, and our internal processes are designed for. This creates four core areas we must deliver:

Create additional network **capacity**	Manage increasing **complexity**	Respond to increasing network **criticality**	Manage deteriorating asset **condition**
so we can accommodate our customers' EVs, heat pumps, and generation	to safeguard the distribution network and whole system, and to enable new markets and services to operate safely	as our customers become increasingly dependent on their electricity supply for all their activities	as utilisation and criticality increase due to greater levels of demand and generation

Our NDP primarily focusses on the first of these and only covers the other three where they increase capacity. Please see our RIIO-ED2 business plan for our holistic strategy on how we plan to respond to all of these.

We will deliver capacity in two main ways:

1. Load-driven interventions, such as flexibility and reinforcement, whose purpose is to increase network capacity – Section 4.3.
2. Non-load interventions, such as to manage network risk or losses, which will increase capacity despite this not being the primary reason for making them – Section 4.4.

Combined these interventions form Part 1 of our NDP, and are summarised in Section 4.5.

We are also making a range of DSO interventions, such as network visibility and network management tools, that support capacity increase by enabling us to make better use of existing capacity, better target load-driven interventions, and increase tools we have available to create capacity. These are beyond the scope of the NDP, but they will help deliver capacity so we have summarised them in Section 3.

4.3 Load-driven interventions – delivering the capacity our customers need

These are the interventions we make whose purpose is to increase capacity. These are governed by our vision to: *maintain a safe, secure and reliable network by efficiently delivering the capacity our customers need to decarbonise, in the timescales they need it – so that they can use LCTs immediately and at full capacity.*

Our network modelling showed that three network areas in particular require a significant increase in intervention in the coming decade:

1. **LV service cables and cut out units**. LV service cables and cut out units are the network assets which connect individual households to the LV network. 560,000 of our customers are supplied by looped services; this is where multiple properties share a single service cable. The forecast electrification of domestic heat and transport means household demand could triple, dangerously overloading these assets. We need to start intervening on these assets to remove this barrier to customer LCT uptake. Our Baseline scenario demonstrates the need to intervene on over 43,000 LV looped service cables and cut out units within RIIO-ED2. This is over 50 times the load-driven RIIO-ED1 intervention rate.
2. **The LV network.** This is the section of network that runs from local substations to just outside customers' properties. As households are supplied from the LV network, the tripling of household demand that affects LV services and cut out units also impacts the LV network.
3. **Switchgear.** These are the network assets which safely isolate the network in the event of a fault. They are rated to cope with a certain level of fault current that flows in the event of an asset failure ('fault level'). As generators are a source of fault current, increasing volumes of generation will lead to an increase in fault level. Our modelling demonstrates the need to intervene on 28 of our 33kV substations, 4 HV substations and 4 HV interconnected groups within RIIO-ED2. In RIIO-ED1, we used innovation to successfully develop fault level monitoring technology. We are embedding this innovation into business-as usual with deployment in RIIO-ED2 at 41 sites (fault level monitoring at 38 sites and active fault level management at three sites).

If we don't respond in these areas in RIIO-ED2 there will be a safety risk to customers, 2050 Net Zero will be unachievable, and the network will be overloaded, exposing customers to supply interruptions and higher overall costs. It is absolutely in our customers' interests for us to deliver additional capacity.

To deliver this additional capacity we impartially assessed a range of flexible, energy efficiency, smart, innovative, and reinforcement solutions and different delivery options. Based on this, our interventions include:

- We plan to use flexibility at over 1,300 sites at all voltage levels. This includes over 450MW across 77 locations at primary substations and above – these are listed in detail in Part 1 of our NDP.
- Our RIIO-ED2 baseline load plan will deliver over 1.2GW of additional network capacity across all voltage levels through a range of smart, innovative and reinforcement solutions. 755MW of this is at primary substations and above and is listed in detail in Part 1 of our NDP.
- Over 43,000 looped service interventions so customers can safely connect EVs and HPs. As these are interventions at LV, they are not detailed within our NDP.

Please see our NDP Methodology Statement[15] for more information on how we identified the load interventions needed to provide the capacity our customers need. Please see our NDP Part 1 reports for SP Distribution[16] and SP Manweb[17] for more information on the interventions themselves.

4.4 Non-load – other interventions which create capacity

In addition to load-driven interventions (Section 4.3), we will also make a range of asset management interventions to manage losses and safeguard network risk, resilience, and reliability. Some of these will increase capacity, even though this isn't the primary reason for making them – these are included in the NDP. Others will safeguard existing capacity be ensuring a reliable, healthy[18], and resilient network – these are beyond the scope of the NDP, but we have summarised them here as they contribute to capacity availability.

Network reliability – keeping the capacity available for our customers

- We have a strong track record on reliability. On average over RIIO-ED1 our customers have experienced some of the lowest levels of interruption across industry.
- In RIIO-ED2, we will reduce the likelihood of unplanned customer interruptions occurring by 19% by optimising network risk (see below), integrating asset risk data into our network planning and operational tools, greater use of technology and data (e.g. network automation, predictive fault analytics, and satellite analysis), and by increasing our network's resilience to a range of external factors (see below).
- In RIIO-ED2, we will reduce the duration of unplanned interruptions by 19% by finding faults more quickly with digital tools and data, using post-fault flexibility, automatically reconfiguring networks, and adopting a DSO organisational structure that enables DSO and DNO staff to closely coordinate (e.g. during storms when staff from across the organisation help with the response).

Network risk – safeguarding reliability by keeping our assets healthy

- We have delivered our RIIO-ED1 asset risk reduction in full. We have managed emerging risks and embedded efficiencies for RIIO-ED2. In 2019, Ofgem recognised the quality of our asset risk systems.
- We are carrying greater risk on like-for-like assets entering RIIO-ED2 compared to RIIO-ED1. Delivering our RIIO-ED1 funded targets means our underlying asset base will deteriorate by 21.8%. We are managing a far greater challenge in RIIO-ED2, so we have increased our investment for RIIO-ED2.
- For RIIO-ED2, we have embedded leading optimisation techniques within our asset risk planning. This has enabled a reduction in asset deterioration from 2.7% p.a. in RIIO-ED1, to 1.1% p.a. in RIIO-ED2. We will invest £355.7m to deliver a 'monetised risk' reduction of £813.5m (using industry common risk values). This keeps our asset base healthy in the most efficient targeted way. Please see our RIIO-ED2 Business Plan for more information on how we will manage network risk.[19]

[15] See footnote 5.
[16] See footnote 3.
[17] See footnote 4.
[18] Asset health (aka condition) is one of two components of network risk.
[19] Our RIIO-ED2 Business Plan is available at: https://www.spenergynetworks.co.uk/pages/our_riio_ed2_business_plan.aspx

Network resilience – safeguarding reliability by ensuring resilience to a range of external factors

- In RIIO-ED2, we are improving our network resilience to Climate Change and reducing external threats by: expanding flood resilience and vegetation management (to Storm Resilient standards, ETR 132), employing digital security measures at all our sites, and investing in increased cyber and fire resilience.

Network losses – freeing up existing network capacity

- In RIIO-ED2, we will undertake a range of measures to manage technical and non-technical losses. These include combining smart meter and network monitoring data to identify non-technical losses, replacing high-loss equipment, and increasing standard conductor sizes. The great majority of these will increase capacity, but only on the HV and LV network and so aren't included within the NDP. Please see our Losses Strategy for more information on how we will manage losses.[20]

[20] Our Losses Strategy is available at:
https://www.spenergynetworks.co.uk/userfiles/file/SPEN_Revised_Losses_Strategy_Final_Issue_1.pdf

4.5 NDP Part 1 – Summary of capacity from our planned interventions

Our NDP Part 1 combines the load and non-load interventions which increase capacity that we plan to make on our 33kV and 132kV network.[21] Figure 4 and Figure 5 summarise the interventions by driver (i.e. why we need to make the them) for SP Distribution and SP Manweb respectively. Figure 6 and Figure 7 summarise the interventions by type (i.e. how we are making them) for SP Distribution and SP Manweb respectively. As a reminder, Figure 4 to Figure 7 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.

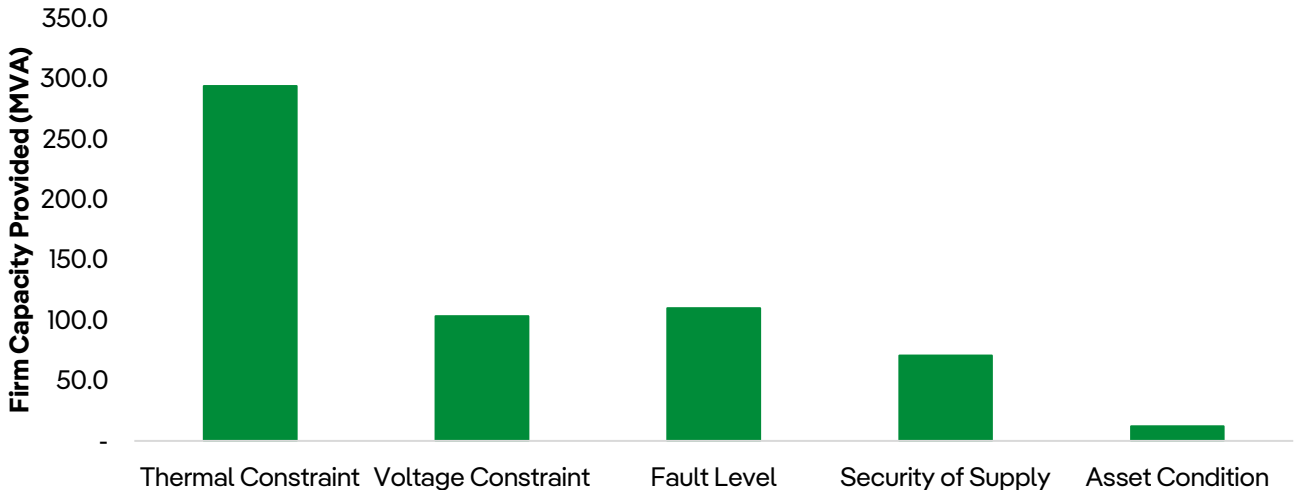


Figure 4: SP Distribution summary of interventions by driver to 2028

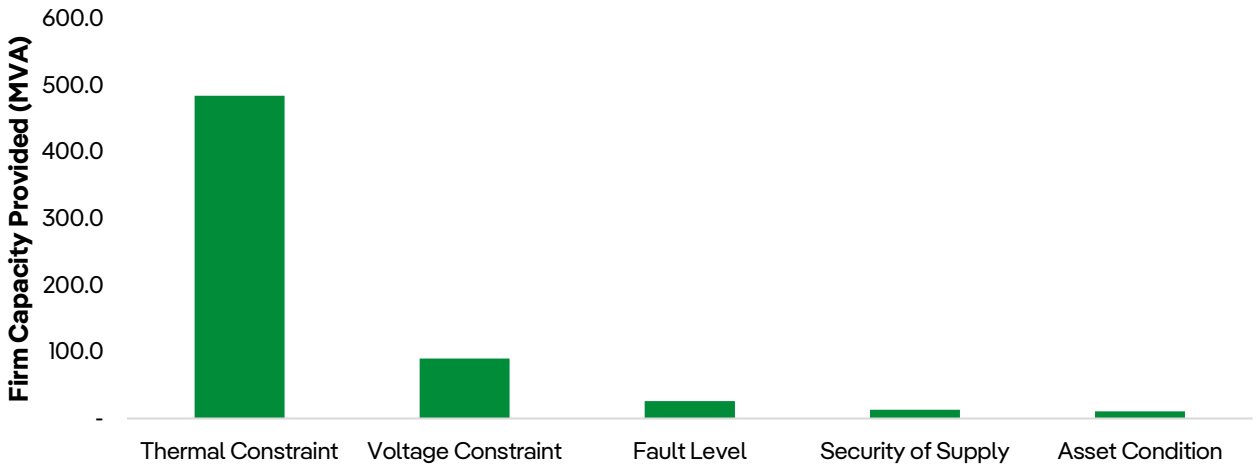


Figure 5: SP Manweb summary of interventions by driver to 2028

[21] The NDP includes interventions made on 11kV switchboards within primary substations.

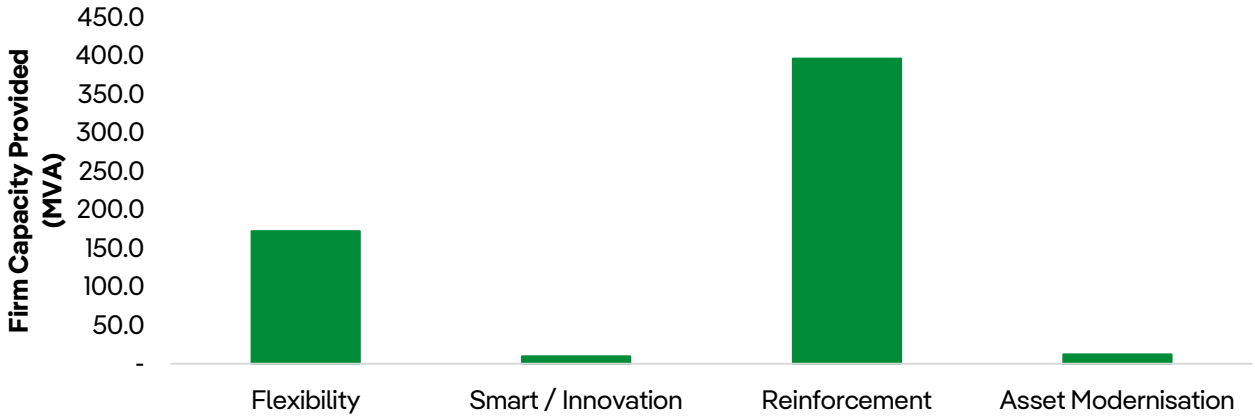


Figure 6: SP Distribution summary of interventions by type to 2028

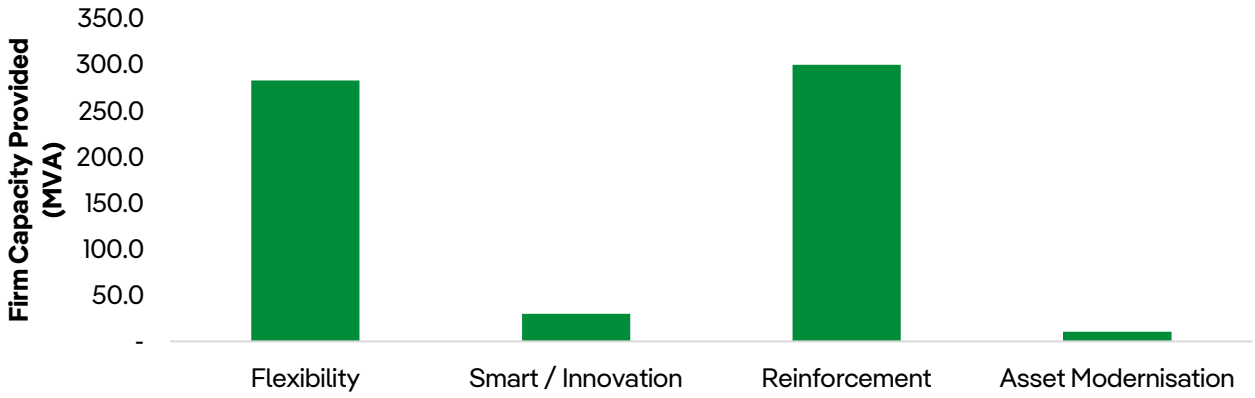


Figure 7: SP Manweb summary of interventions by type to 2028

Figure 4 and Figure 5 show that the need to provide thermal capacity is the main driver of interventions (an explanation of the different types of capacity/constraints is available in our NDP Methodology Statement). Figure 6 and Figure 7 show 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.

5 NDP Part 2 – Network Headroom

We have calculated network scenario headroom by combining existing network capacity, planned interventions, and forecast demand and generation growth.

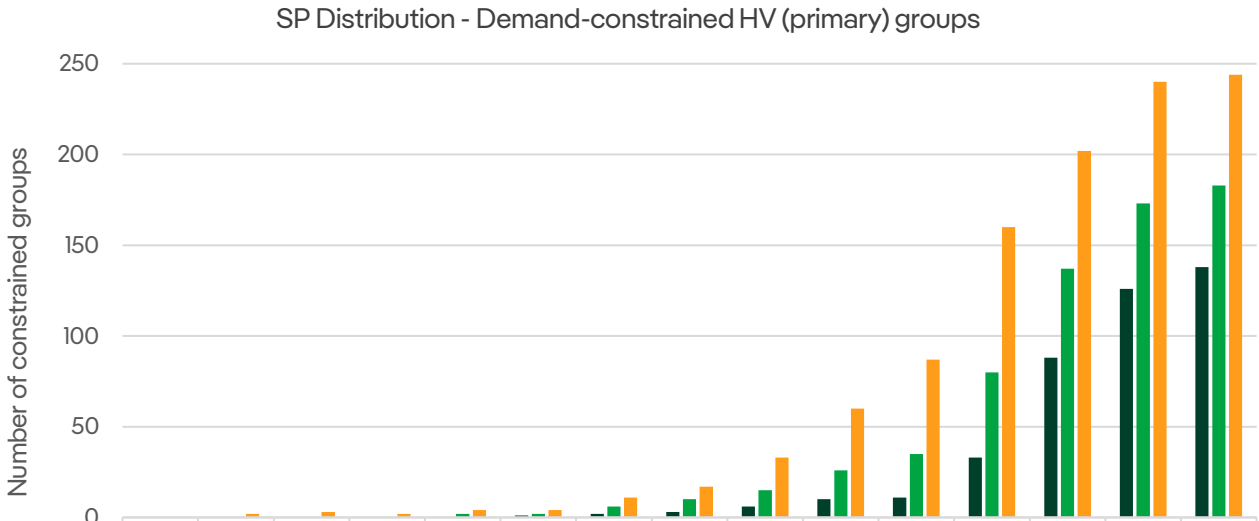
The results paint a vivid picture – without additional capacity, customer demand and generation growth will overwhelm network capacity. Ofgem must permit the investment we need so we can provide our customers with the capacity they need.

5.1 Demand capacity headroom

Figure 8 and Figure 9 show the number of primary substation groups in SP Distribution and SP Manweb with demand constraints out to 2050. To give context to the results, in total there are 391 primary substation groups in SP Distribution and 339 in SP Manweb. The results given for 2022/23 are actual observed constraints rather than forecast data.

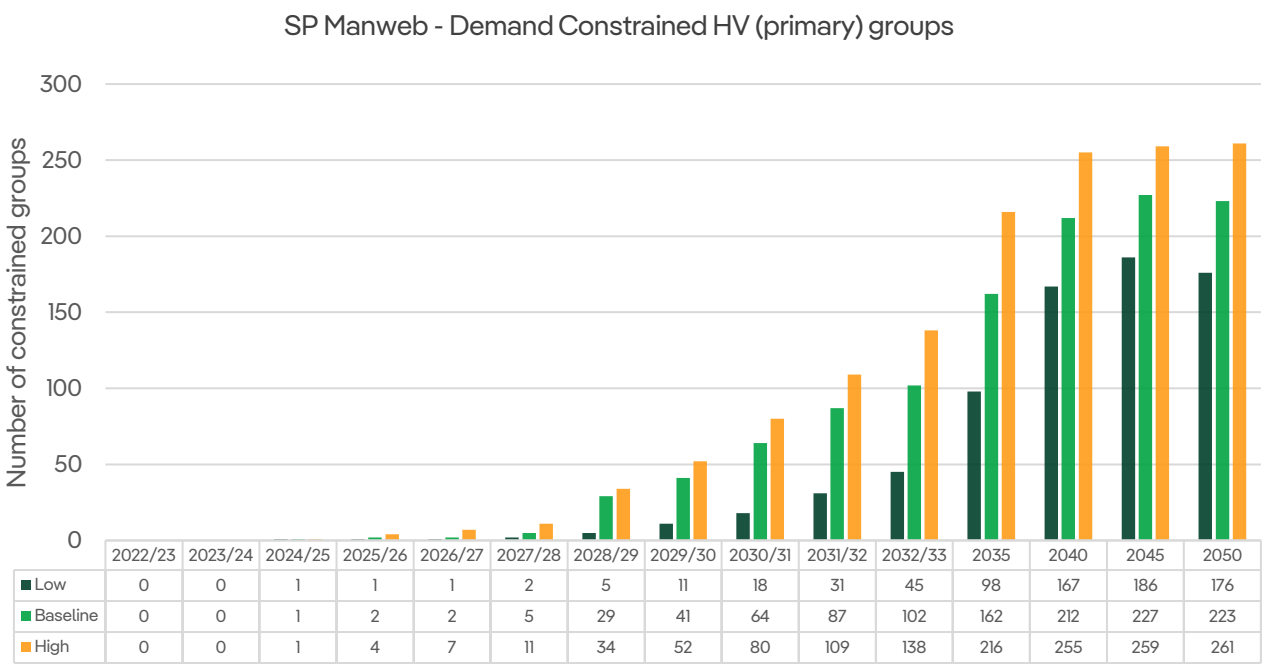
Demand growth is increasing from now out to 2050 due to the decarbonisation of heat and transport. This isn't fully reflected in Figure 8 and Figure 9, which show the number of constrained primary groups only increasing after 2028, as this constraint data incorporates our planned RIIO-ED1 and RIIO-ED2 investments (i.e. there are few constraints up to 2028 as we have already 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 and capacity 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 unachievable, and the network would be overloaded, exposing customers to safety risks, supply interruptions, and higher overall costs.



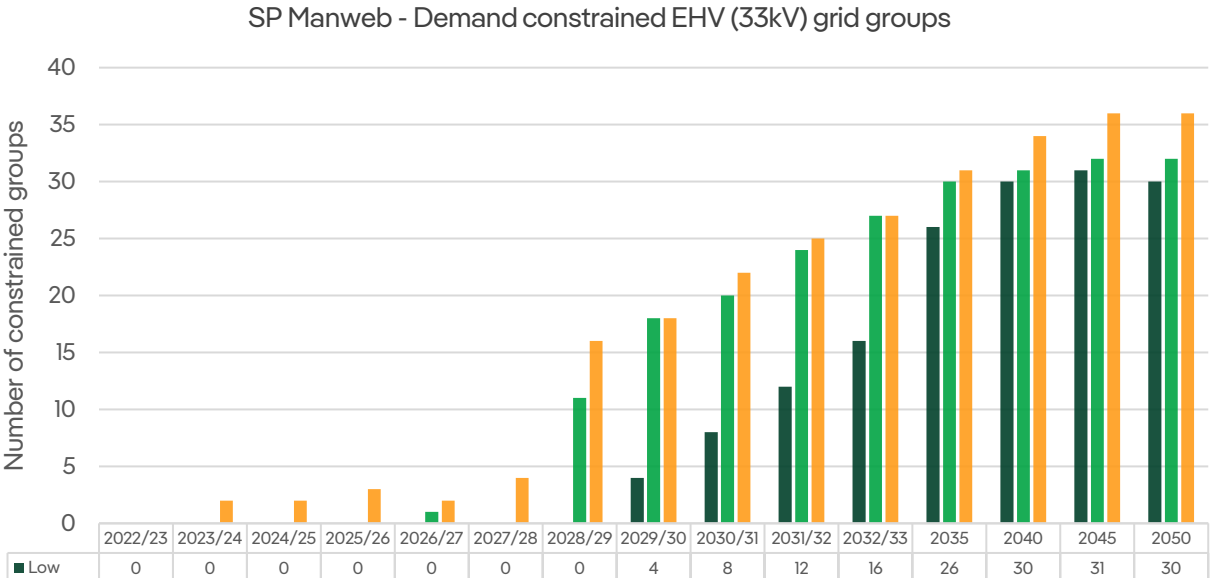
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2035	2040	2045	2050
Low	0	0	0	0	0	1	2	3	6	10	11	33	88	126	138
Baseline	0	0	0	0	2	2	6	10	15	26	35	80	137	173	183
High	0	2	3	2	4	4	11	17	33	60	87	160	202	240	244

Figure 8: SP Distribution number of demand constrained primary substation groups



	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2035	2040	2045	2050
Low	0	0	1	1	1	2	5	11	18	31	45	98	167	186	176
Baseline	0	0	1	2	2	5	29	41	64	87	102	162	212	227	223
High	0	0	1	4	7	11	34	52	80	109	138	216	255	259	261

Figure 9: SP Manweb number of demand constrained primary substation groups



	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2035	2040	2045	2050
Low	0	0	0	0	0	0	0	4	8	12	16	26	30	31	30
Baseline	0	0	0	0	1	0	11	18	20	24	27	30	31	32	32
High	0	2	2	3	2	4	16	18	22	25	27	31	34	36	36

Figure 10: SP Manweb number of demand constrained EHV (33kV) grid groups

5.2 Generation capacity headroom

Figure 11 and Figure 12 show the number of primary substation groups in SP Distribution and SP Manweb with generation constraints out to 2050. There are 391 primary substation groups in total in SP Distribution and 339 in SP Manweb. The results given for 2022/23 are actual observed constraints rather than forecast data.

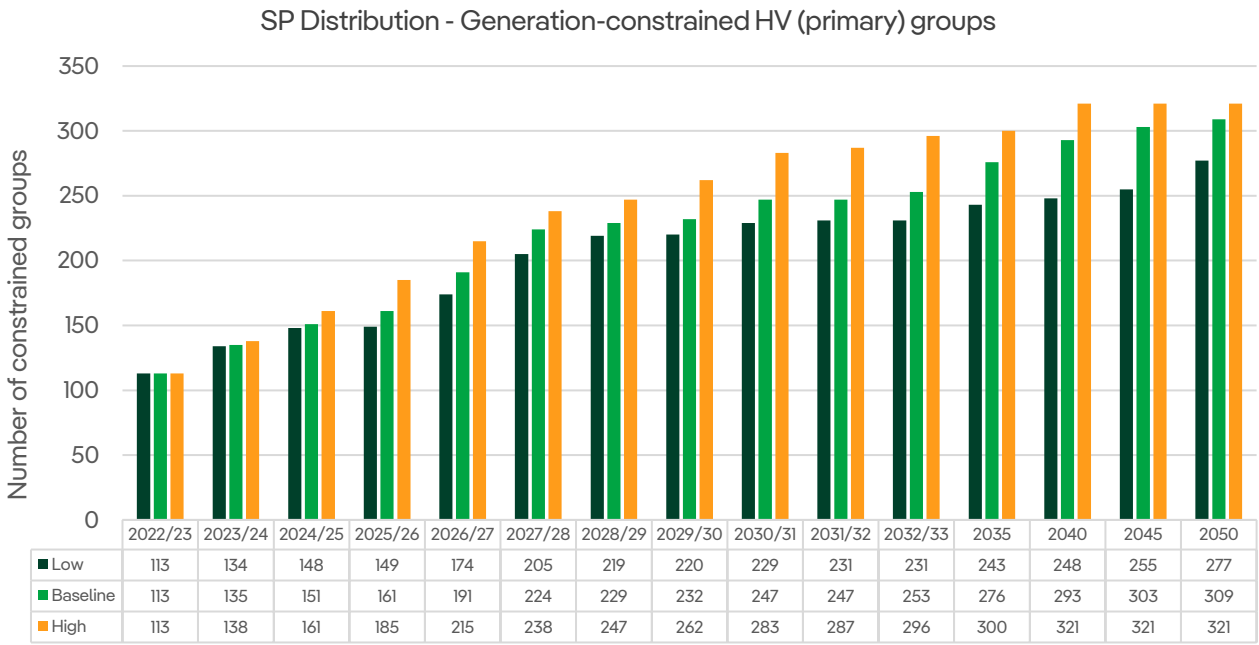
Generation growth is increasing from now out to 2050. This isn't fully reflected in Figure 11 and Figure 12, which show the number of constrained primary groups only increasing after 2028, as this constraint data incorporates our planned RIIO-ED1 and RIIO-ED2 investments (i.e. there are reducing constraints 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 11 and Figure 12 show 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 11 and Figure 12 do not incorporate upstream constraints beyond our network boundary. However these are flagged within the Part 2 spreadsheets.

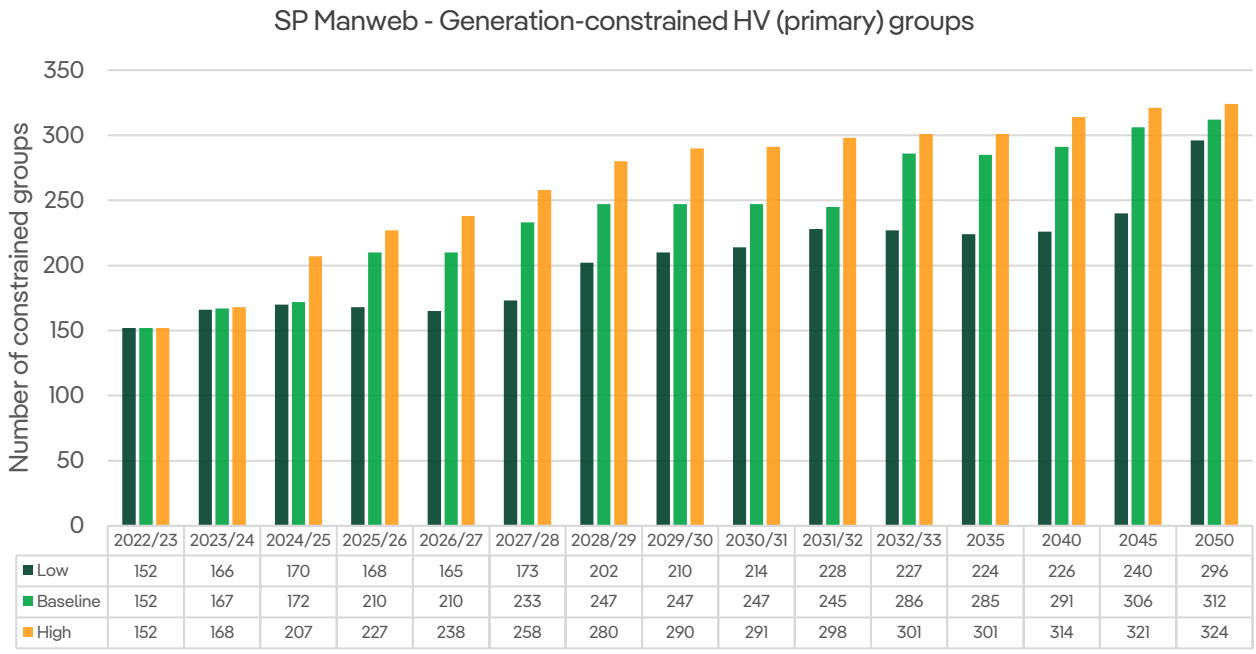
Figure 12 is of particular note – it shows that without intervention over 90% of the 335 SP Manweb Primary substation groups will be constrained by 2050.

Renewable generation connecting to our networks will be a key part of the energy supply that GB needs to decarbonise. We can accommodate it through a range of firm and flexible arrangements providing Ofgem authorises the investment.



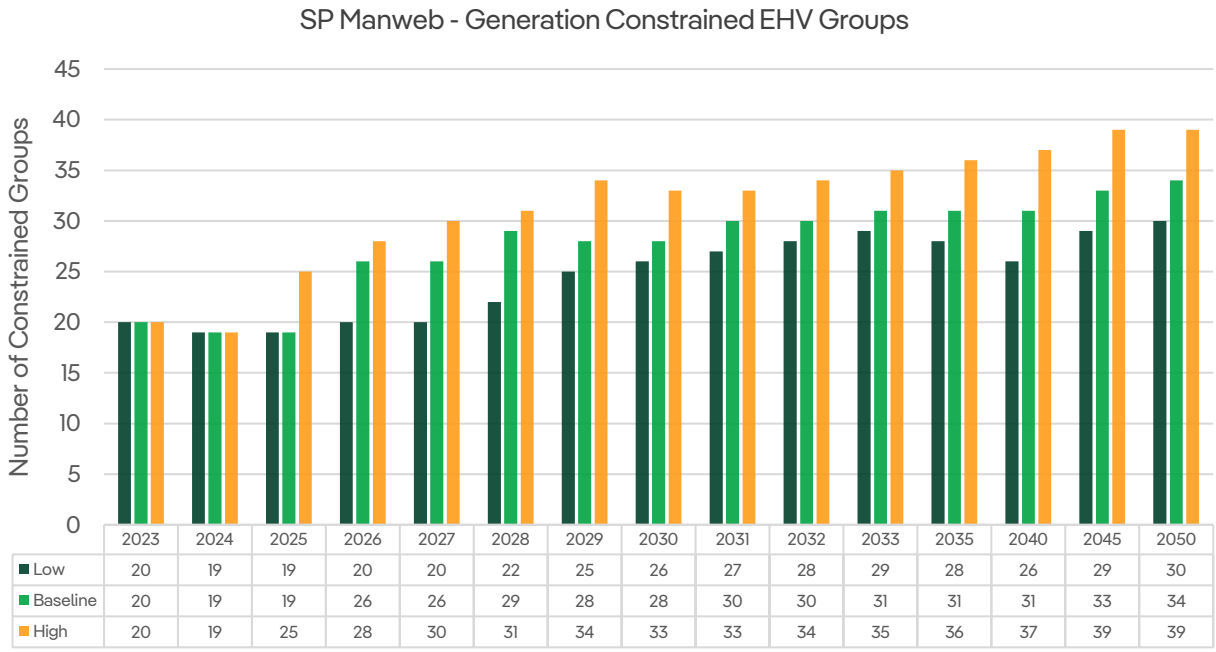
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2035	2040	2045	2050
Low	113	134	148	149	174	205	219	220	229	231	231	243	248	255	277
Baseline	113	135	151	161	191	224	229	232	247	247	253	276	293	303	309
High	113	138	161	185	215	238	247	262	283	287	296	300	321	321	321

Figure 11: SP Distribution number of generation constrained primary substation groups



	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2035	2040	2045	2050
Low	152	166	170	168	165	173	202	210	214	228	227	224	226	240	296
Baseline	152	167	172	210	210	233	247	247	247	245	286	285	291	306	312
High	152	168	207	227	238	258	280	290	291	298	301	301	314	321	324

Figure 12: SP Manweb number of generation constrained primary substation groups



	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2035	2040	2045	2050
Low	20	19	19	20	20	22	25	26	27	28	29	28	26	29	30
Baseline	20	19	19	26	26	29	28	28	30	30	31	31	31	33	34
High	20	19	25	28	30	31	34	33	33	34	35	36	37	39	39

Figure 13: SP Manweb number of generation constrained EHV (33kV) grid groups

6 Stakeholder feedback

Our NDP documents are now out for consultation until **22 April 2024**.

We recognise that stakeholders views and plans can change. It is important that we keep in step with our stakeholder requirements to ensure that we continue to plan and develop our networks with the most up-to-date information. Given the purpose of the NDP is to share information with stakeholders it's important that these documents meet our stakeholders' needs. We therefore welcome stakeholder views.

Our NDP documents were last consulted upon in 2022. A summary of the feedback received and the actions we took is available in our NDP Methodology Statement.

Responses to the following questions, and other feedback on the NDP documents, would be welcomed until **22 April 2024** and can be emailed to systemdesignteam@spenergynetworks.co.uk.

We will then publish the finalised versions of our NDP documents by **01 May 2024**.

Network Development report (document)

1. How could/will our Network Scenario Headroom and Development report be used by your community/business?
2. Are there any ways we could improve the information contained within our Network Scenario Headroom and Development report?
3. Do you find the links to the DNOA scheme pages useful? Do you find the layout of information within these scheme pages useful? Are there any ways we could improve the information contained within these pages?

Network Scenario Headroom part (documents and spreadsheets)

4. How could/will our Network Scenario Headroom data tables be used by your community/business?
5. Do you find the information contained within our Network Scenario Headroom data tables useful? If not, how could it be improved?
6. Do you find the presentation of headroom for the Low, Baseline, High scenarios helpful? If not, how could they be improved?

Methodology report (document)

7. Do you support the steps/process we have followed to produce our Network Development Plan (NDP)?

Other

8. Do you make use of any other data sources we publish? LTDS, heatmaps, ECR, DFES, etc. (tick all that apply)
9. Are there any other parameters you would like to see included within our NDP?
10. Are there any other comments or feedback you would like to make?

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