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

Network Development Plan

Summary document

PRINCIPAL PARTNER
UN CLIMATE CHANGE CONFERENCE UK 2021
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Contents

1 Foreword

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 delivering a successful and just transition to Net Zero, so I look forward to hearing your feedback on these NDP documents.

Our customers have told us they prioritise four things in their electricity supply: reliability, safety, cost-efficiency, and the freedom to consume when they want (domestic customers especially do not want to be compulsorily constrained).

The challenge is how to continue delivering these customer priorities against a radically changing energy landscape. As society decarbonises to Net Zero, a substantial proportion of customer transport and building heating will be electrified, significantly increasing demand. We are also going to see a further leap in renewable generation to power these, more customers actively participating in the energy system, and the electricity system operator (ESO) increasingly needing to utilise distribution-connected service providers. Without intervention, these new demand, generation, and behaviours will push distribution network power flows well beyond existing network capacity.

Creating the capacity our customers need is key to serving our customers' priorities, accommodating these system changes, and enabling Net Zero. Failure to do so is not something we should contemplate: barriers to essential decarbonisation and customers exposed to supply interruptions, connection delays, higher overall costs, and possible safety issues. Given this, our vision is: *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.*

The unprecedented nature of the changes will require a step increase in interventions compared to historical levels. We recognise that these interventions will have an impact on customer bills when many are facing fuel stress, so our intervention plan needs to be tailored to their needs and only target interventions where we can be sure they will deliver value for customers. We've ensured this in two ways.

Firstly, we have tested 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 and can help democratise and bring competition to the energy sector.

Second, we have delivered a step change in how intervention plans are developed, which sets the standard for others to follow. We combined our stakeholder-endorsed Distribution Future Energy Scenarios (DFES) forecasts, our new enhanced forecasting tools which predict electric vehicle and heat pump uptake for every single customer we serve, a new analytical platform containing a full connectivity model of our network (including all 48,000km of LV), flexibility tenders at over 1,500 sites, and a linear optimisation engine which identifies and sequences solutions for constraints. Together, these systematically identify where, when, and how we need to intervene to provide the capacity that our customers need, having fairly considered flexibility, energy efficiency, smart, innovative, and reinforcement solutions.

The outcome is a broad intervention plan that goes well beyond traditional 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, help generators connect more quickly and cheaply. And we are deploying a range of DSO capabilities – including enhanced forecasting, monitoring, and analytics – to help make more 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, and I look forward to hearing your thoughts on these NDP documents over the coming weeks.

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 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.[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 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[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.

Figure 1 shows the document map for these four documents.

[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

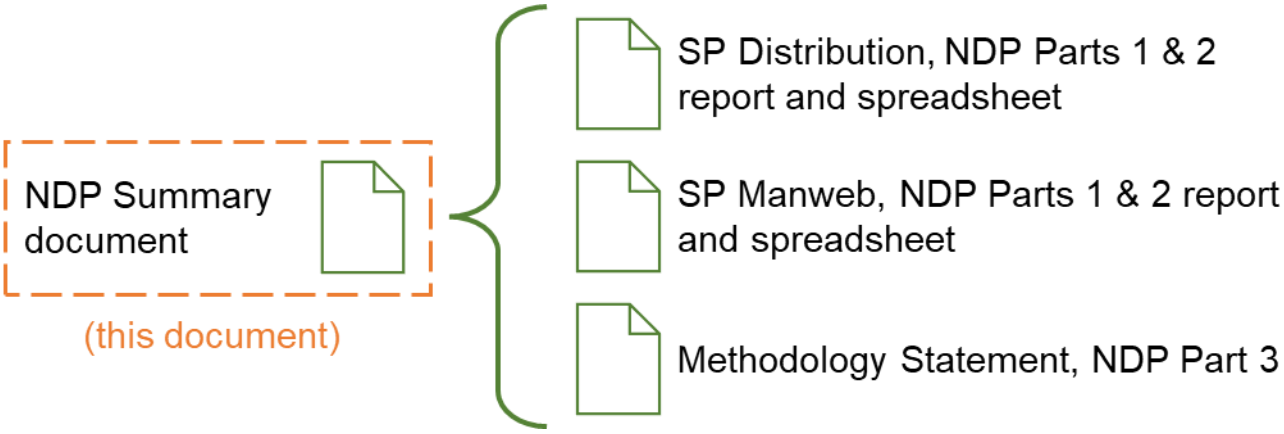


Figure 1: SP Energy Networks' NDP document map

2.3 Seeking stakeholder input

Our three 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 on these documents. Consultation questions and details on how stakeholders can feedback are in Section 4 of this summary document.

The consultation period will close **16 April 2022**. We will then publish the finalised versions of our three NDP documents by 29 April 2022. The NDPs will be updated every two years.

2.4 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 ongoing data provision includes:

- DFES forecasts[4] – 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[5] – 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[6] – 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[7] – 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. We run tenders twice annually.

[4] Our DFES is available here: https://www.spenergynetworks.co.uk/pages/distribution_future_energy_scenarios.aspx
[5] Our LTDS is available here: https://www.spenergynetworks.co.uk/pages/long_term_development_statement.aspx
[6] Available here: https://www.spenergynetworks.co.uk/pages/embedded_capacity_register.aspx
[7] Our heatmaps are available here: https://www.spenergynetworks.co.uk/pages/connection_opportunities.aspx

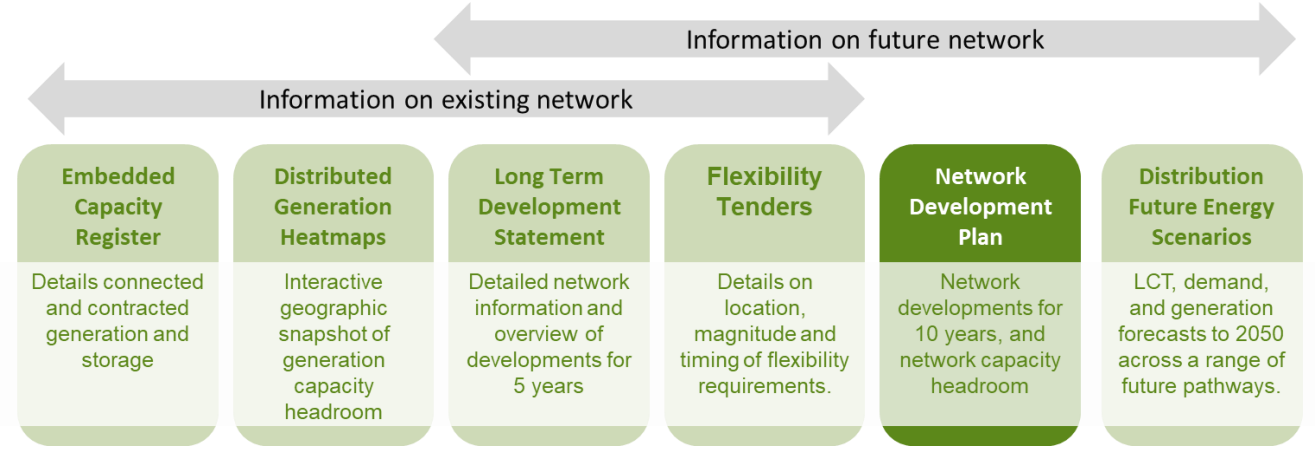


Figure 2: How our NDP fits in with other data provision

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[8] for more information on the network data we plan to share in RIIO-ED2 based on stakeholder input.

2.5 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 on 1 December 2021[9]. There is significant overlap between the two publications: the work we need to do to produce the NDP is the same that was done to create our RIIO-ED2 Business Plan, and all the EHV and 132kV interventions that increase capacity that we included in our RIIO-ED2 Business Plan need to be included within the NDP. So where our suite of NDP documents refers to RIIO-ED2 interventions and the RIIO-ED2 process, it is because they are directly relevant to the NDP.

Providing capacity (the scope of the NDP) is only one part of planning and developing a network. This means the interventions covered in our NDP are only a subset of those we need to make through RIIO-ED2. For a good summary overview of the full range of measures we're taking to ensure we have a safe, reliable, and efficient network, please see our Future System Strategy.[10]

[8] Our DSO Strategy is Annex 4A.3 of our RIIO-ED2 Business Plan. Available at: https://www.spenergynetworks.co.uk/userfiles/file/Annex%204A.3%20-%20DSO%20Strategy%20.pdf
[9] 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
[10] 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

3 NDP summary – developing a network ready for Net Zero

Our customers prioritise four main things in their electricity supply: reliability, safety, cost-efficiency, and the freedom to consume when they want (domestic customers especially do not want to be compulsorily constrained). The challenge for us is how to continue delivering these customer priorities against a radically changing energy landscape, not least significant demand and generation growth as customers decarbonise.

Common to meeting these different priorities is the need to efficiently provide the capacity our customers need in the timescales they need it. We will do this to accommodate customer demand and generation growth, deliver a Just Transition to Net Zero, and ensure the continued safe, reliable, and efficient operation of the distribution network and wider system.

3.1 A changing energy landscape

Our distribution network was largely developed in the 1960s' to deliver electricity from big transmission-connected fossil fuel power stations to our customers. The network was configured into four main voltage levels for this, and was sized to accommodate industrial, commercial, and typical domestic demand. Just one in ten homes were electrically heated, and there were no EVs beyond the occasional milk float.

This model has incrementally evolved over many years to meet changing customer needs. We have rolled out monitoring and control across the higher voltage networks, although the LV network remains largely unmonitored. We have materially improved network reliability through better asset management. And we have delivered new technologies, such as Active Network Management (ANM), to offer quicker and lower cost connections and accommodate renewable generation growth.

In short, the story of the last 60 years is one of customers' needs evolving steadily and incrementally. Our existing network capacity, planning tools, operational systems, and internal processes are tailored to these customer needs.

This slow evolution is now over. The energy landscape is changing fast as the way our customers generate, use, and interact with energy evolves. Three key trends are driving this:

- **Decarbonisation** – in response to the climate emergency, we need to achieve Net Zero greenhouse gas emissions by 2045 in Scotland and 2050 in England and Wales. To deliver this decarbonisation, we need to electrify a significant proportion of transport and building heating. We also need to complete the transition of our generation mix from fossil fuel to zero carbon generation by 2035.[11] These changes will significantly increase the levels of demand and generation that we need to connect to the distribution network for our customers.
- **Decentralisation** – the volume of generation which is smaller-scale and connected to the distribution network rather than the transmission network is increasing. This decentralisation has two effects: we must find ways to accommodate more customer generation than the distribution network is currently designed for; and as traditional transmission-connected generators close the electricity system operator (ESO) has an increasing reliance on this DG and other controllable customer assets connected to the distribution network (collectively known as distribution energy resources, DER) to maintain GB system stability.
- **Democratisation & digitalisation** – means the rise of the active domestic customers (aka prosumer). Smart meters, home energy management systems, intelligent domestic and electric vehicle (EV) storage, specialist aggregators and suppliers – these are all reducing the barriers for domestic customer participation in the energy system. Democratisation has two effects: domestic customer consumption profiles are becoming less predictable and more dynamic; and we can increasingly work with many individual customers and communities, rather than just large DG or industrial customers, to source vital network and system services.

3.2 Forecasting and modelling the changes

To better quantify these drivers and ensure we meet our customers' changing electricity needs, we forecast what their electricity requirements are going to be into the future. We do this by developing Distribution Future

[11] https://www.gov.uk/government/news/plans-unveiled-to-decarbonise-uk-power-system-by-2035

Energy Scenario (DFES) forecasts[12], and then comparing these against Net Zero compliant scenarios from the Electricity System Operator (ESO)[13] and the Climate Change Committee (CCC)[14] 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.[15]

Investment scenario	Total SP Energy Networks uptake by 2028		
	EVs	Heat pumps	Additional DG
High scenario	1.03m	0.81m	+6.37GW
Baseline scenario	0.67m	0.37m	+4.95GW
Low scenario	0.65m	0.34m	+4.95GW

Table 1: Our RIIO-ED2 low, baseline, and high scenario

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 (1,557 sites), 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[16] for more information on this process.

3.3 NDP Part 1 – 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.

[12] Our 'Distribution Future Energy Scenarios', republished with our RIIO-ED2 final submission Business Plan, are included as RIIO-ED2 Business Plan Annex 4A.6. Available at: https://www.spenergynetworks.co.uk/pages/distribution_future_energy_scenarios.aspx

[13] The Electricity System Operator's '2021 Future Energy Scenarios', published July 2021. Available at: https://www.nationalgrideso.com/future-energy/future-energy-scenarios/fes-2021

[14] The Climate Change Committee's 'Sixth Carbon Budget', published December 2020. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/

[15] 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.

[16] See footnote 5.

Our NDP primarily focusses on the first of these and only covers the other three where they increase capacity. Please see our Future System Strategy[17] 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 3.3.1.
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 3.3.2.

Combined these interventions form Part 1 of our NDP, and are summarised in Section 3.3.3.

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 3.3.4.

3.3.1 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 load vision statement: *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. Based on our network assessments, we will need to upgrade 484km of LV cable and intervene on 1,406 HV/LV substations within RIIO-ED2 to maintain a safe and secure electricity supply to our customers, and facilitate the uptake of the LCTs. This is ten times the RIIO-ED1 intervention rates for LV cable.
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 will embed this innovation into business-as usual in RIIO-ED2 at 41 sites including (fault level monitoring at 38 sites and active fault level management at three sites). Our planned expenditure to manage fault level is broadly comparable to RIIO-ED1, this is only made possible due to our ground-breaking innovation in this area.

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:

- **Flexibility** use across **1,352 sites at all voltage levels**, deferring £36m of reinforcement in the Baseline Scenario (£145m in the High Scenario). This includes over 450MW across 77 locations at primary substations and above – these are listed in detail in Part 1 of our NDP.

[17] See footnote 10.

- Our RIIO-ED2 baseline load plan will deliver **1,180MW** of additional network capacity across all voltage levels through a range of smart, innovative and reinforcement solutions. 540MW of this is at primary substations and above and is listed in detail in Part 1 of our NDP.
- **68 innovations** developed by us and others as BAU, saving our customers £87m. This includes world-first real time fault level monitoring (RTFLM) at 38 sites and active fault level management (AFLM) at 3 sites to connect generation more quickly & cheaply where there might otherwise be a fault level capacity shortfall.
- **43,384 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[18] 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[19] and SP Manweb[20] for more information on the interventions themselves.

3.3.2 Non-load – other interventions which create capacity

In addition to load-driven interventions (Section 3.3.1), 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[21], 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). Please see our Network Performance Strategy for more information on how we will deliver a reliable network.[22]

Network risk – safeguarding reliability by keeping our assets healthy

- We are on track to deliver 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 Network Asset Risk Strategy for more information on how we will manage network risk.[23]

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

[18] See footnote 5.
[19] See footnote 3.
[20] See footnote 4.
[21] Asset health (aka condition) is one of two components of network risk.
[22] Our Network Performance Strategy is Annex 4A.5 of our RIIO-ED2 Business Plan. Available at: https://www.spenergynetworks.co.uk/userfiles/file/Annex%204A.5%20-%20Network%20Performance%20Strategy%20.pdf
[23] Our Network Asset Risk Strategy is Annex 4A.4 of our RIIO-ED2 Business Plan. Available at: https://www.spenergynetworks.co.uk/userfiles/file/Annex%204A.4%20-%20Network%20Asset%20Risk%20Strategy.pdf

- 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.[24]

3.3.3 NDP Part 1 – summary of 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.[25] Figure 3 and Figure 4 summarise the interventions by driver (i.e. why we need to make the them) for SP Distribution and SP Manweb respectively. Figure 5 and Figure 6 summarise the interventions by type (i.e. how we are making them) for SP Distribution and SP Manweb respectively. As a reminder, Figure 3 to Figure 6 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.

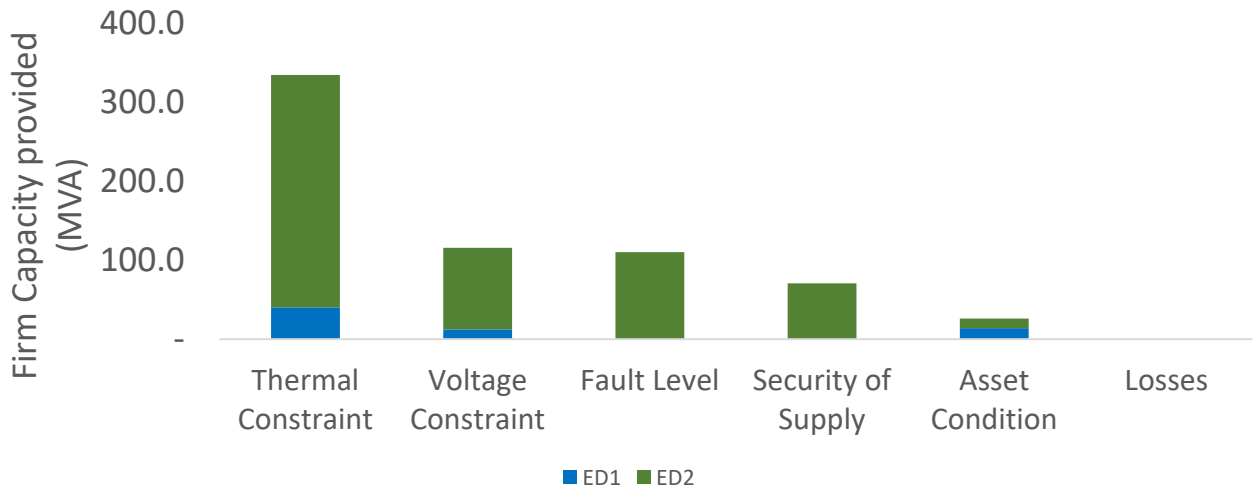


Figure 3: SP Distribution summary of interventions by driver to 2028

[24] Our Losses Strategy is Annex 4A.8 of our RIIO-ED2 Business Plan. Available at: https://www.spenergynetworks.co.uk/userfiles/file/Annex%204A.8%20-%20Losses%20Strategy%20FINAL.pdf

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

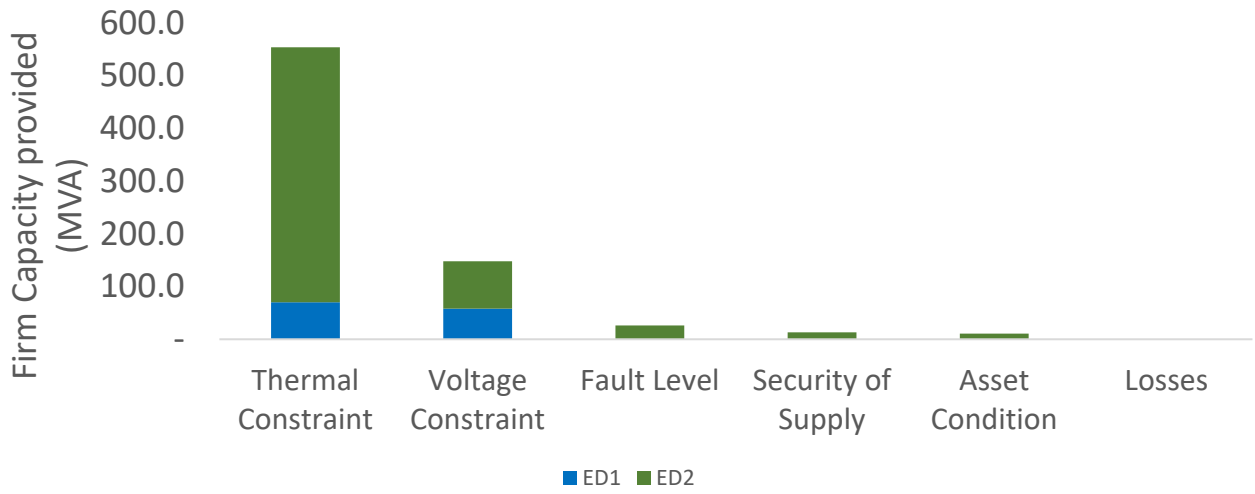


Figure 4: SP Manweb summary of interventions by driver to 2028

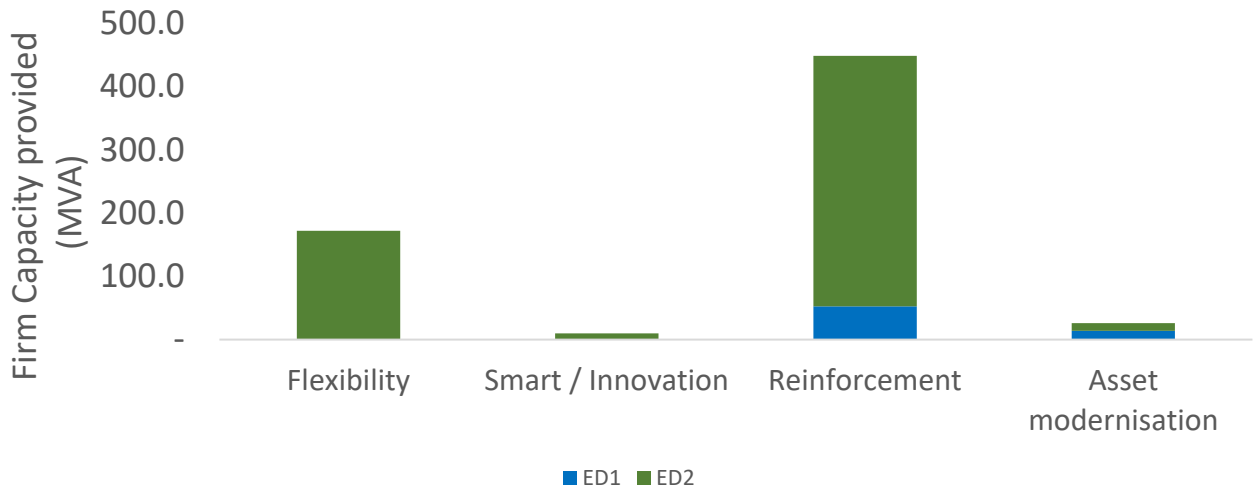


Figure 5: SP Distribution summary of interventions by type to 2028

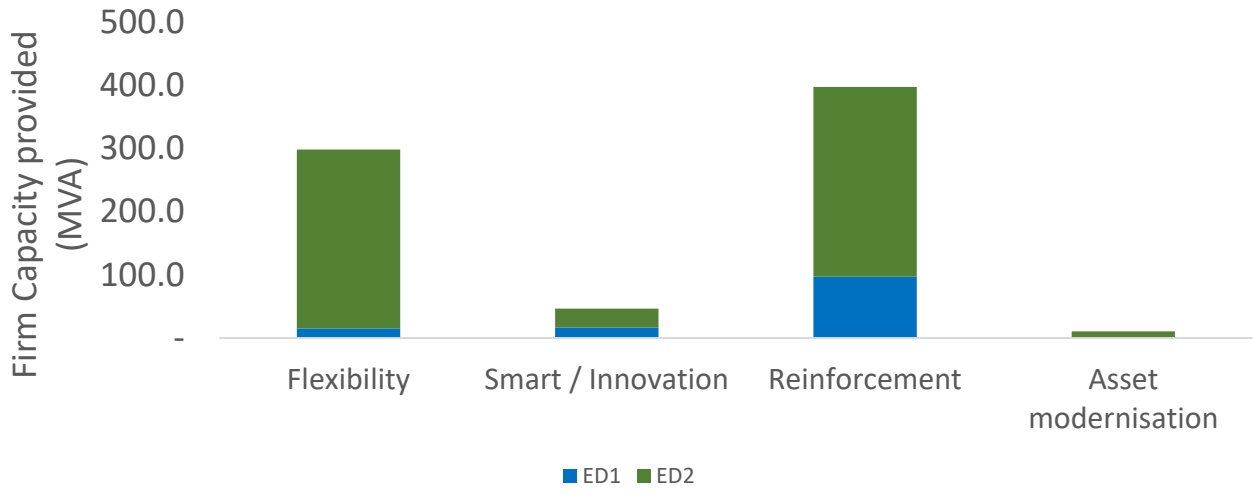


Figure 6: SP Manweb summary of interventions by type to 2028

Figure 3 and Figure 4 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 5 and Figure 6 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.

3.3.4 DSO – delivering enabling DSO tools to support capacity creation

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. To do this, our DSO Strategy is in three parts: DSO infrastructure, a new DSO functional model, and the DSO outputs we will deliver.

New DSO infrastructure

These can be categorised into six types:

1. **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 – it helps us get more out of existing network capacity and make more targeted, timely, and efficient intervention to provide capacity. As part of this we plan to roll out real time fault level monitoring and LV monitoring across our network. In RIIO-ED2 we will deploy LV monitoring at 14,102 LV substations. This will extend monitoring from 8% to 52% of secondary substations rated at ≥200kVA, increasing coverage from 14% to 76% of customers.
2. **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 introduce an annual calibration exercise to keep them accurate.
3. **Simulation and modelling** – 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. This helps keep our network safe, efficient, and reliable for our customers as we transition to Net Zero. Central to this is our new central network planning and operational tool – our ENZ Platform. This combines network data sources (enhanced and near-time forecasts, network monitoring, smart meters, weather correction, LCT notifications, asset condition data) with a whole network model to create a real-time data-driven, whole network analytical model. This tells us what is happening on the network now, and in planning and operational timescales.
4. **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 from 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 7 shows existing and planned CMZs.

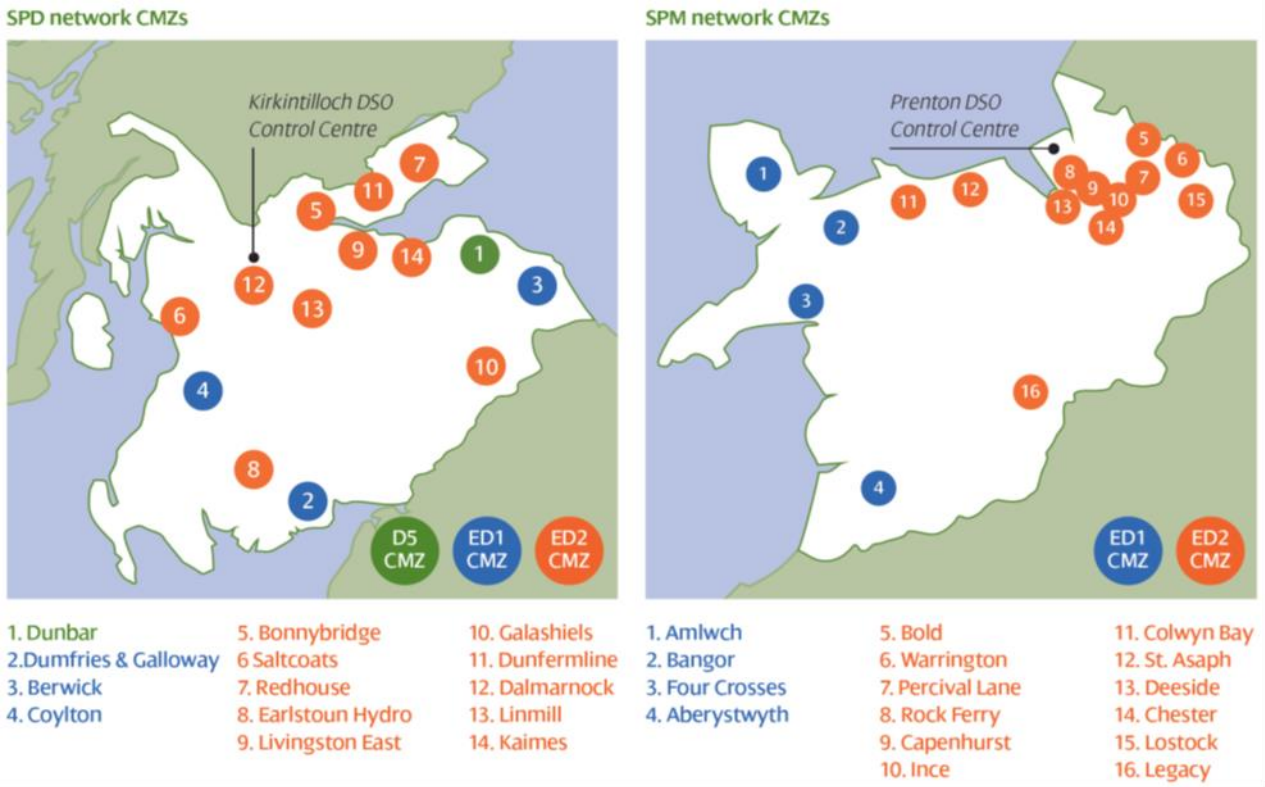


Figure 7: CMZ rollout

5. **Operational IT and telecoms** – the network's nervous system, which our flexibility, innovative, and smart interventions to provide capacity depend on. This includes investing £221.4m in RIIO-ED2 to deliver the reliable, cyber-secure, low latency communication network that DSO outputs and other DSO infrastructure depend on.
6. **Digitalisation and IT platforms** – needed for our forecasting, modelling, flexibility platforms, and data sharing capabilities. Like with operational IT and telecoms, these are enabling investments which allow us to use a wider range of interventions to provide capacity.

New DSO functional model

DSO involves big changes for us – changes to outputs, activities, ways of working, infrastructure and systems, and interactions with customers and stakeholders. Given the magnitude of these changes, and the importance to Net Zero, system stability, and our customers of getting it right, it is essential that our organisation is correctly structured to deliver DSO.

For this reason, we will create a discrete DSO directorate within SP Energy Networks by the start of RIIO-ED2. It will be responsible and accountable for delivering DSO, including planning and network development, network operation, and market development. It will have its own dedicated director reporting to the SP Energy Networks CEO, external assurance of load-related intervention decisions, and an independent panel of expert stakeholders.

This new DSO directorate is one measure we're taking to increase transparency, address concerns about perceived conflicts of interest, and give our customers confidence that we are a neutral market facilitator. This is important – our customers, stakeholders, and service providers must have confidence in us and the markets we interact with, as their involvement is essential for enabling Net Zero efficiently, maintaining system stability, and promoting competition in service provision; customers benefit from all of these.

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 and new DSO directorate we plan to deliver, and nearly all directly or indirectly support the provision of network capacity. A summary of outputs against 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 operation

- ✓ 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, external assurance, and a discrete DSO directorate.

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.

3.4 NDP Part 2 – Network capacity headroom

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

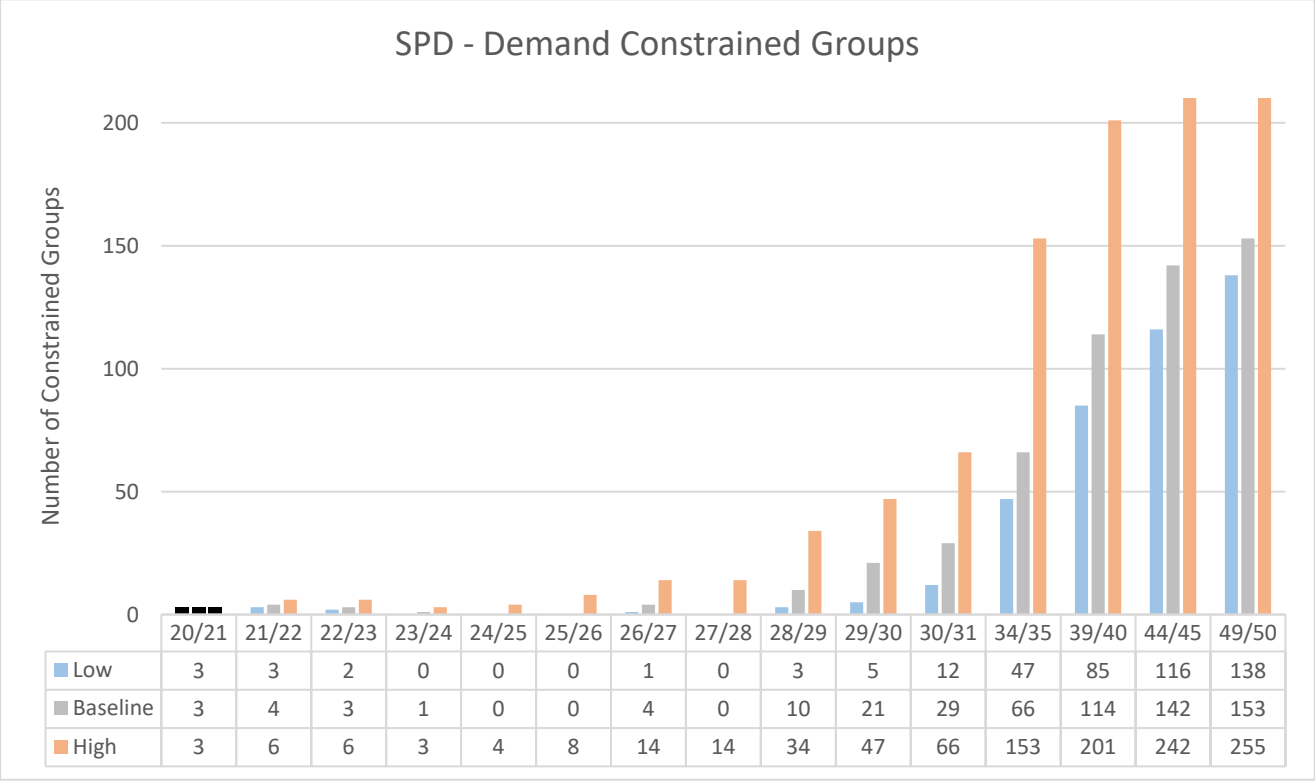
The results paint a vivid picture – without additional capacity, customer demand and generation growth will overwhelm network capacity. Ofgem must permit the investment we need so we can provide our customers with the capacity they need.

3.4.1 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. There are 383 primary substation groups in total in SP Distribution and 341 in SP Manweb. The results given for 2020/21 are actual observed constraints rather than forecast data.

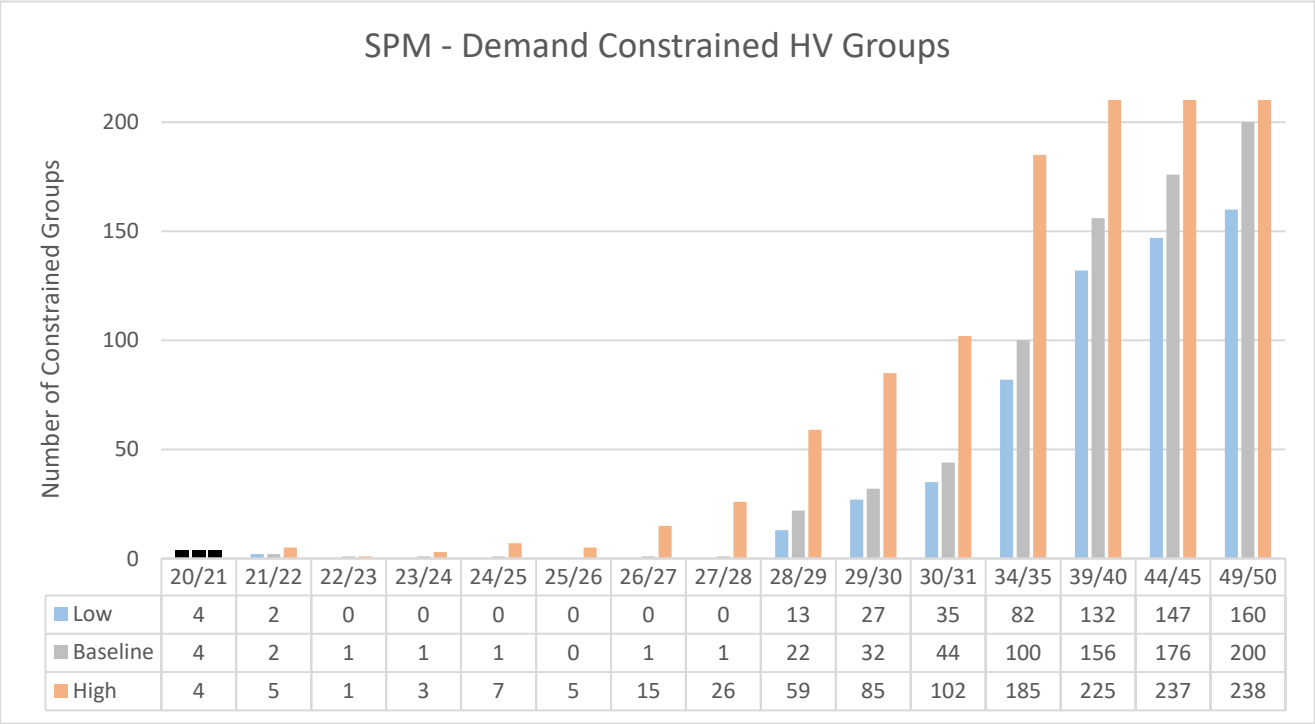
Demand growth is increasing from now out to 2050 due to the decarbonisation of heat and transport. This isn't reflected in Figure 8 and Figure 9, which show the number of constrained primary groups only increasing after 2028, as this constraint data incorporates our planned RIIO-ED1 and RIIO-ED2 investments (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. 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	3	3	2	0	0	0	1	0	3	5	12	47	85	116	138
Baseline	3	4	3	1	0	0	4	0	10	21	29	66	114	142	153
High	3	6	6	3	4	8	14	14	34	47	66	153	201	242	255

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



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

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

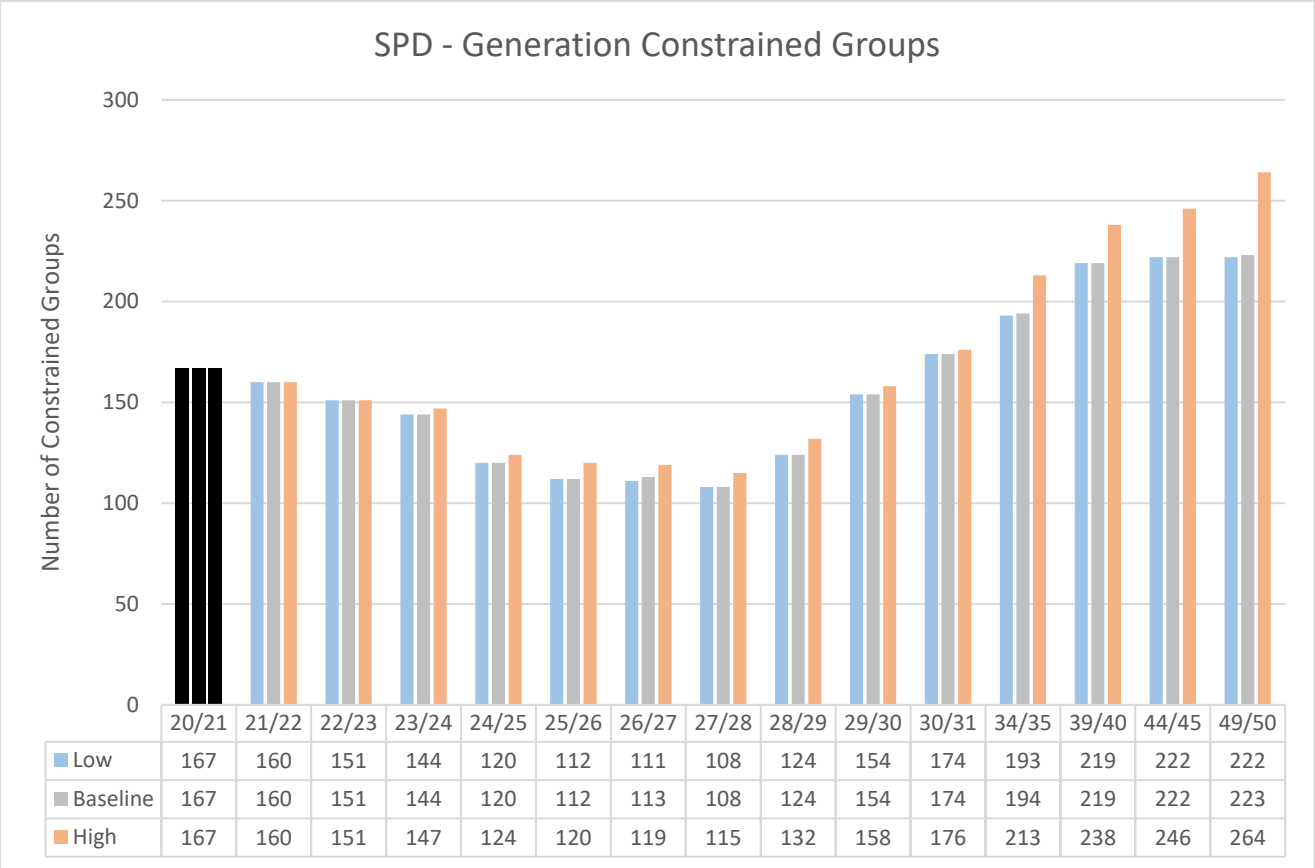
3.4.2 Generation capacity headroom

Figure 10 and Figure 11 show the number of primary substation groups in SP Distribution and SP Manweb with generation constraints out to 2050. There are 383 primary substation groups in total in SP Distribution and 341 in SP Manweb. The results given for 2020/21 are actual observed constraints rather than forecast data.

Generation growth is increasing from now out to 2050. This isn't reflected in Figure 10 and Figure 11, 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).

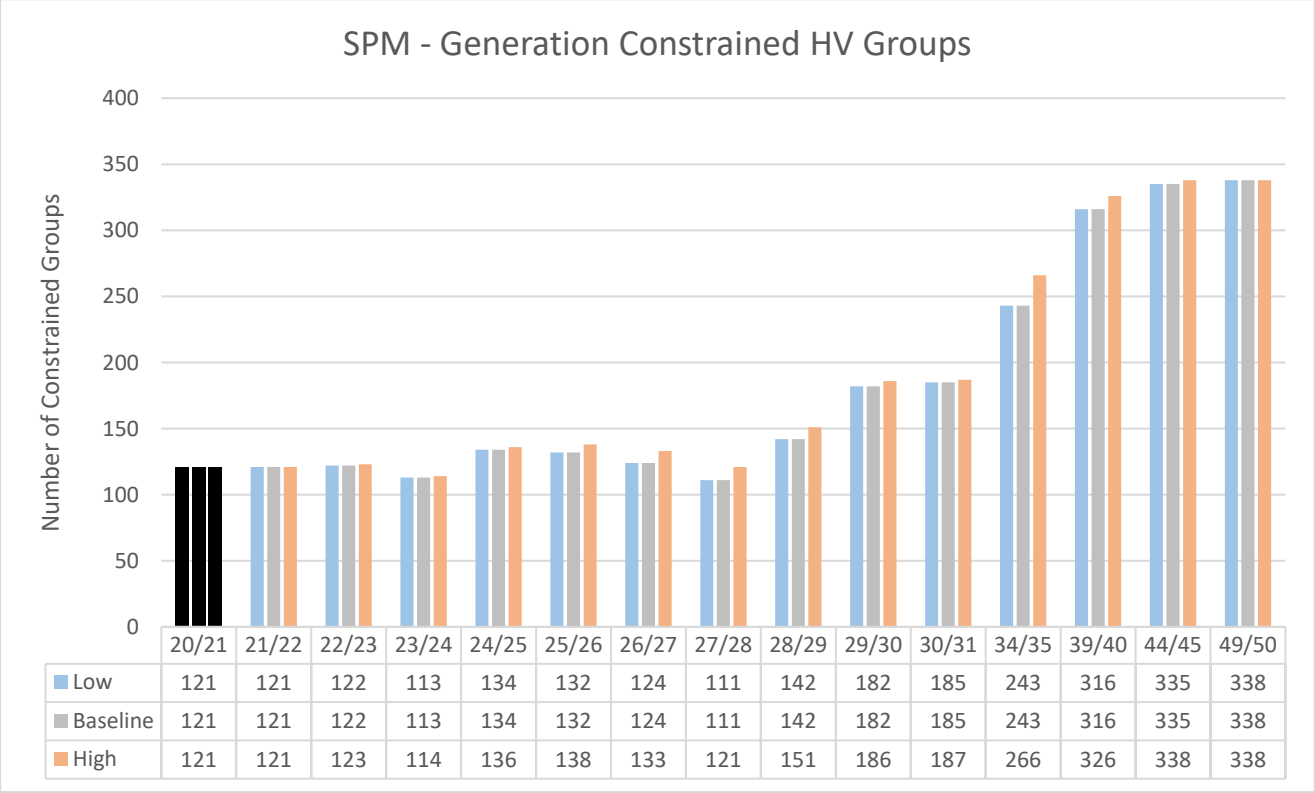
These figures show that we are not reducing all known generation constraints within RIIO-ED2. Some key points:

1. Figure 10 and Figure 11 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 10 and Figure 11 do 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	167	160	151	144	120	112	111	108	124	154	174	193	219	222	222
Baseline	167	160	151	144	120	112	113	108	124	154	174	194	219	222	223
High	167	160	151	147	124	120	119	115	132	158	176	213	238	246	264

Figure 10: SP Distribution number of generation constrained primary substation groups



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

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

Figure 11 is of particular note – it shows that without intervention all but three of the 341 SP Manweb Primary substation groups will be constrained by 2050 without interventions.

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.

4 Your views and next steps

Our three 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 look forward to hearing stakeholders' views.

Responses to the questions below, and other feedback on this document, would be welcomed by 6pm on 16 April 2021 and can be emailed to **riio_ed2@spenergynetworks.co.uk**.

Network Development report (pdf)

1. How could/will our Network Capacity Headroom and Development report be used by your community/business?
2. Are there any ways we could improve the information contained within our Network Capacity Headroom and Development report?

Network Capacity Headroom part (pdf+spreadsheets)

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

Methodology report (pdf)

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

Other

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

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