SSEN DISTRIBUTION NETWORK DEVELOPMENT PLAN

Methodology & Assumptions

May 2026 Final Publication

Scottish & Southern Electricity Networks

CONTENTS

1. INTRODUCTION

The Clean Energy Package comprises European legislation (including EU Directive 2019/944)[1] to drive a unified energy strategy for delivering the Paris agreement. In December 2020, it was transposed into domestic legislation through a number of changes to the Electricity Distribution Licence. This included the introduction of standard licence condition (SLC) 25B. SLC 25B requires Distribution Network Operators (DNOs), including our two licensees Southern Electric Power Distribution plc (SEPD) and Scottish Hydro Electric Power Distribution plc (SHEPD), to publish a Network Development Plan (NDP), setting out their investment plans for the next five-to-ten-year period in relation to 11kV networks and above. It must include:

a) A description of those parts of the DNO's network that are most suited to new connections and distribution of further quantities of electricity;

b) A description of those parts of the DNO's network where reinforcement may be required to connect new capacity and new loads;

c) Information that supports the secure and efficient operation, coordination, development and interoperability of the interconnected system; and

d) Flexibility or Energy Efficiency Services that the DNO reasonably expects to need as an alternative to reinforcement.

To ensure consistency in reporting across all DNOs in terms of SLC 25B, the Energy Networks Association (ENA) prepared a report that sets out the agreed form of sharing data with stakeholders, customers, and consumers. The proposal for the Form of Statement of Network Development Plans was developed as part of Open Networks workstream, which proposed a standardised Standard Network Capacity Report. To meet the requirements of SLC 25B, the NDP is split into three distinct reports, as illustrated in Figure 1 below; the red box highlights the part this document represents:

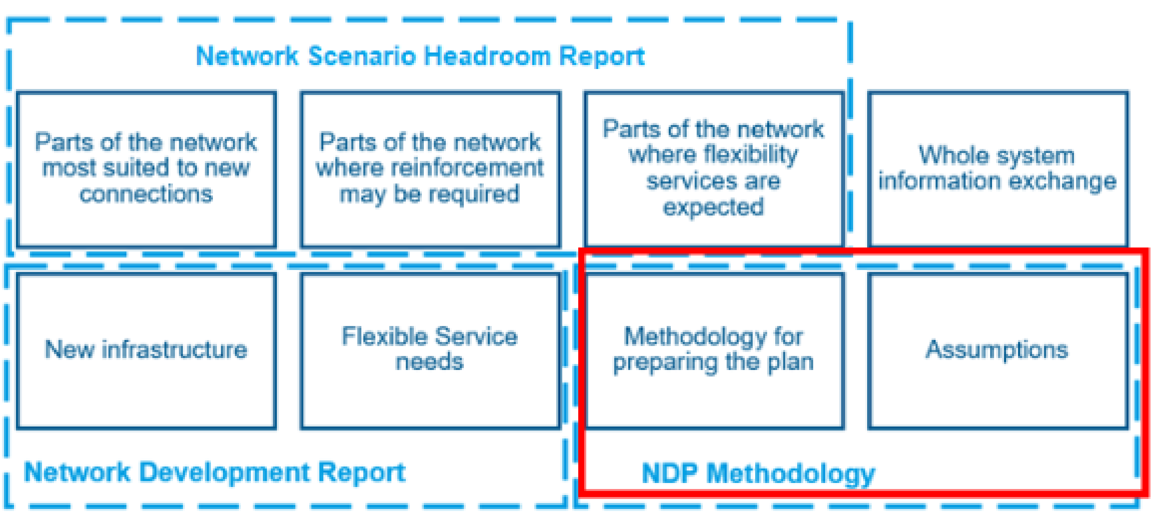

Figure 1: NDP Reporting Structure

Due to the constantly changing nature of capacity headroom, SSEN will also update the Network Scenario Headroom Report on an annual basis, also publishing on the 1st of May.

In the remainder of this section, we provide an overview of each of the documents comprising the NDP. We also provide further details on our Open Data Portal, which acts as a single point of access for our network data and our supporting documents, which can be used as supplementary information on the development of our network.

1.1. Network Development Plan (NDP) Methodology & Assumptions

The purpose of the NDP Methodology & Assumptions document is to ensure that the reports, forecasts, and calculations that make up the NDP are clear to the reader. It details the end-to-end network development process starting with forecasting to our best view development plan.

1.2. Network Development Report (NDR)

The NDR provides the reader with valuable additional information on key projects set for delivery in terms of new infrastructure to be installed and upcoming flexible services to be employed. The aim of the information is to provide users with visibility over our network plans and signpost requirements for flexibility services so that users can target developments.

The NDR provides a list of high-level plans for network interventions and flexible service requirements over the next 10 years along with the following information:

Flexibility services	New infrastructure
○ Magnitude; ○ Year of intervention & likely duration; ○ Location of the requirement; ○ Nature of requirement / flexibility product.	○ Timing and high-level scope of intervention; ○ Details of connectivity; ○ Asset quantities & approximate lengths; ○ Equipment ratings; ○ Approximate locations.

Table 1: Scope of the Network Development Report

1.3. Network Scenario Headroom Report (NSHR)

The main objective of the NSHR element of the NDP is to indicate where it is anticipated that there will be network capacity to accommodate future connections, where further capacity may be necessary and where flexibility services may be required.

The NSHR includes the following components of distribution networks:

- Substations where the greatest voltage is more than 20kV, normally:
- Bulk Supply Points, BSPs (typically 132/33kV or 132/11kV, 66/22kV), and
- Primary substations (typically 66/11kV, 33/11kV or 33/6.6kV, 22/11kV, 22/6.6kV)

- In Scotland, 132/33kV substations are known as Grid Supply Points (GSPs) rather than BSPs, due to the lower transmission/distribution boundary and would therefore be excluded from the network capacity reporting part of the NDP.

Date Range	Today to 2050
Data Granularity	Yearly to 2035; five yearly thereafter
Forecast Scenarios	Distribution Future Energy Scenarios (DFES)
Reported headroom/deficit	Demand & Generation
Network Coverage	Distribution voltages down to the secondary primary substation (typically 11kV)

Table 2: Requirements for NSHR

Further information on the NSHR methodology can be found in section 6 of this document.

1.4. NDP Consultation

In the March prior to our full NDP update, we release our public consultation on our NDP and all associated documents via our website, where we also provide instructions on how to respond. The consultation is open for a period of 28 days and aims to engage stakeholders, including developers, local authorities and generators on how they use the NDP. The consultation also provides an opportunity for stakeholders to offer feedback on improvements they would like to see.

As part of our consultation period, we also offer the opportunity for one-to-one engagement with our stakeholders.

Our approach aims to increase awareness of the NDP and how it fits in to the information that third parties can access and use to inform investment decisions. We ask stakeholders the following set of questions:

1. To help us understand how to help you, could you outline how you plan to use the information contained in this plan.

2. Does the Network Development Plan provide the information you need to understand our development plans for the network out to 2036? If not, what future improvements could be made?

3. Is the methodology and assumptions used to prepare this plan clear? If not, have you any feedback for future iterations?

4. Is the proposed format for the Network Headroom Report clear? Can you easily identify areas where there is capacity and where there are constraints?

The non-confidential feedback that we receive is published within the Network Development Report for each licence area, along with our acknowledgement and response to this valuable feedback. We will continue to engage with third parties to make them aware of the NDP and continue to seek stakeholder feedback prior to any major revision of the NDP. In advance of publishing the 2026 Network Development Plan, SSEN conducted a formal consultation on the draft NDP document suite comprised of the Methodology & Assumptions document, the Network Development Reports and the Network Scenario Headroom Report. The consultation was open for 28 days and closed on 27th April. No formal written responses were received. However, SSEN hosted a webinar on 14th April 2026, attended by a range of stakeholders including local authorities, developers, flexibility providers and industry participants. Questions raised during the session were addressed directly. Given the absence of formal responses, no material changes to the Methodology & Assumptions document were required as a result of the consultation process. In line with standard reporting procedures, a separate consultation document is produced only if feedback is received. As no formal responses were submitted, no summary document will be produced, and the NDP documents will be published as final, incorporating the updated data and the key points presented during the webinar.

1.5. SSEN Open Data Portal

In October 2023, we launched our Open Data Portal[1] to drive forward net zero decisions. Our Data Portal is a single point of access to all the data SSEN publishes and a catalogue of data that brings visibility to our network assets, their location, their usage, and their performance. All documents related to the SHEPD and SEPD NDP submission are published on our Open Data Portal, along with other planning publications such as the Long-Term Development Statement, DFES, Capacity Heatmaps and Embedded Capacity Register (ECR). The timeline of these documents is shown in Figure 2. For further information on these publications please see the accompanying Network Development Report.

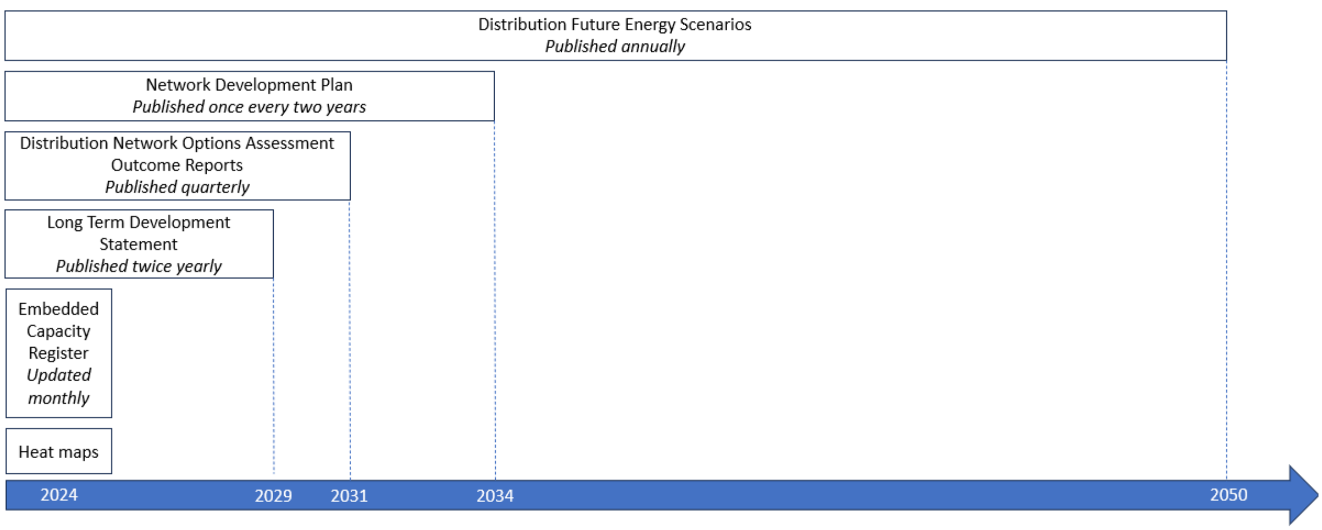

Figure 2: Planning horizons and frequency of publications for NDP and related documents

1.6. Related Publications

SSEN Distribution's NDP is informed and supplemented by multiple data sources that are publicly available. This section provides a high-level overview of these documents and provides the reader with an understanding of how each document can be used to provide a view of the network from today to 2050. Figure 2 shows how these documents fit together within our planning horizon.

1 https://data.ssen.co.uk/

1.6.1 Centralised Network View

SSEN Distribution regularly updates and publishes Centralised Network View for current state of the network on its website[2]. The purpose of the Centralised Network View is to assist in assessing areas where distribution connection opportunities may be available and detail where constraints exist through colour codes. Areas that have available capacity are highlighted in green, areas that have limited capacity are highlighted in amber and areas where there is no capacity are highlighted in red. As a result, this interactive tool can help inform large-scale developers where they can most likely connect without triggering significant reinforcement. The view presented is based on our connected and contracted background.

Please note that this view is subject to continual change as new connection offers are accepted and other connection agreements are cancelled. Further, the Centralised Network View does not utilise future energy scenarios or consider small scale developments such as low carbon technologies. Notwithstanding this, these maps provide a good indicator of headroom capacity.

1.6.2 Embedded Capacity Register (ECR)

The embedded capacity register[3] contains details of Distribution Energy Resource (DER) either connected or accepted to connect to our networks. It adopts the standard format for all GB DNOs and covers all generation and storage assets with capacity greater than or equal to 50kW. It also provides information on flexibility services that are being provided and network reinforcement to facilitate connections.

1.6.3 Long Term Development Statement

The purpose of the Long-Term Development Statement (LTDS)[4] is to provide information for anyone connecting to our EHV (132kV, 66kV, 33kV and 22kV) distribution system including the HV (11kV and 6.6kV) busbar of primary substations. It is designed to help parties that might wish to use or connect to our system to identify and evaluate their opportunities for doing so. Our statements include the following network data;

- The likely development of our distribution system;
- Our plans for modifying our distribution system; and
- Identification of parts of our distribution system that are likely to reach their capacity limit in 0 – 5 years.

As part of our forecasts, particularly for the NSHR, the investments proposed in the latest LTDS for the short-term period of 0 – 5 years prior to publication of the NSHR are reflected in the outputs of the NSHR.

The LTDS is published annually in November and updated every May to reflect the latest peak demands. For the purposes of the NDP, and as per SLC 25B, we align investments and demands to the latest LTDS to inform the NDP. This means that the LTDS released in the November prior to the NDP publication are used.

1.6.4 Distribution Future Energy Scenarios (DFES)

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2 Centralised Network View (ssen.co.uk)

3 Embedded capacity register - SSEN

4 Long term development statements (LTDS) - SSEN

SSEN Distribution's DFES publications are produced annually, providing projections of future electricity generation, demand, and network capacity needs through to 2050. The DFES analysis incorporates input from stakeholders such as local authorities and regional growth data, along with detailed assessments of upcoming housing, commercial and industrial developments.

The DFES uses four national energy pathways based on the National Grid ESO Future energy scenarios (FES), reflecting different pathways for decarbonisation and societal change. These pathways are:
Holistic Transition, Electric Engagement, Hydrogen Evolution and Counterfactual. Each pathway helps to forecast the future demand, generation, and flexibility requirements for the electricity network. These pathways provide the framework for SSEN's network forecasting and are used to assess long-term network development needs and inform the NDP.

1.6.5. Strategic Development Plans

SSEN publishes Strategic Development Plans (SDPs) for each GSP area across both license areas. SDPs provide long-term strategic blueprints for network development from present day through to 2050. They are designed to articulate how each network area may evolve under different future energy pathways and to identify the strategic interventions that may be required to enable decarbonization, economic growth, and community energy ambitions. SDPs are informed by extensive stakeholder engagement and are aligned with local authority development plans, housing allocations and net zero strategies.

SDPs complement the NDP by identifying long-term strategic network development needs, whilst the NDP provides more detailed medium-term assessment of capacity and constraints.

SDPs are published on a rolling basis and reviewed annually to reflect updated DFES assumptions, revised local authority plans and emerging development pipelines. They support a wide range of stakeholders, including local authorities developing Local Plans, developers exploring future connection opportunities, flexibility providers planning services, community energy groups assessing feasibility, and coordination with NESO and transmission operator.

1.6.6 Distribution Network Options Assessment (DNOA) – outcomes and methodology

Each year we publish our DNOA methodology report explaining our strategic development process and how we assess flexibility and network options to meet a system need[5]. This process provides stakeholders with greater transparency of the decisions we make. The DNOA methodology is published as a consultation and updated annually.

The DNOA methodology is then used as an integral part of our network development process. We are now publishing the outcomes of our DNOA process periodically on our website alongside the DNOA methodology. These outcomes provide a timely notification of both future flexibility opportunities as well as areas of new network interventions.

Going forwards a significant proportion of the NDR will come from DNOA outcomes, providing a snapshot forwards view of both flexibility opportunities and areas of network interventions that have already been published in DNOA outcome reports.

We have already started this process with this NDR including the outputs of our first DNOA outcomes report. These outcomes are either shown in Part 1 for flexibility opportunities or Part 2 for network interventions (for projects in detailed development and delivery).

Some projects are listed in Part 1 and 2 as in 'initial development'. These projects have yet to complete the DNOA process.

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5 Publications & Reports - SSEN

1.7. External Policy Drivers

The NDP operates within a dynamic policy and regulatory landscape shaped by the Clean Power 2030 mission, unprecedented growth in connections applications and increasing coordination requirements across energy systems planning. The electricity sector is undergoing fundamental transformation with distribution networks evolving from passive delivery infrastructure to active enables of decarbonisation. Achieving Clean Power 2030 requires accelerated deployment of renewable generation and demand electrification, creating material implications for network capacity requirements, connection timescales and prioritisation.

In October 2024, the NESO was established to act as an independent system planner and operator to help accelerate Great Britain's energy transition. NESO was previously the Electricity System Operator (ESO) but has been expanded to enable it to look holistically across electricity, gas and other forms of energy.
NESO act to inform Ofgem's decision making on strategic energy planning of the electricity networks and therefore, we work closely with NESO to develop our plans and incorporate insights. Through being the ESO, NESO already had the responsibility to plan the Transmission network but now also has a role in shaping the Distribution network through the introduction of the Regional Energy Strategic Plans (RESPs). NESO has launched its first transitional Regional Energy Strategic Plan (also known as tRESP) to inform the network investments by electricity distribution network operators (DNOs) between 2028-33. This plan (launched on 30 January 2026) forms a key part of NESO's new responsibilities as strategic energy planner for the whole of Great Britain.

Network planning is responding to these policy developments while maintaining consistency in methodology to support long-term infrastructure investment decisions. This section addresses key policy developments and regulatory changes that impact the NDP framework. For each area, the section will address the policy change, its implications for network planning and how SSEN has incorporated these requirements into the NDP forecasting, capacity assessment and investment prioritisation process. Th ensures the NDP remains aligned with evolving industry requirements, and supports delivery of government clean energy targets, as well as providing stakeholders transparency on how external policy drivers shape network planning.

1.7.1. NESO Future Energy Scenarios

To identify the future requirements of the electricity network, SSEN commissions Regen to produce the annual Distribution Future Energy Scenarios (DFES). The DFES provides a forward-looking view of how demand and generation may evolve under different scenarios as we move towards the national 2050 net zero target.

Historically the DFES analysis is based on the National Energy System Operator (NESO) Future Energy Scenarios (FES), while incorporating more granular stakeholder insights from agencies such as local authorities and new demand and generation connection applications. The FES pathways are summarised in Figure 3.

More recently the NESO has introduced Regional Energy Strategic Plans (RESPs) publishing the transitional RESPs in early 2026. RESPs will provide an alternative bottom up forecasts for DNOs to use for planning purposes. The tRESP provides some pathway elements which SSEN now use in their central forecast.

The remainder of SSEN's forecasts remain based on the Holistic Transition DFES scenario as the central case scenario. This will be updated when the full RESPs are published in late 2028.

Any more recent unforeseen demand changes, for example customer connection requests, are also considered in our forecasts to ensure that the projected load more accurately reflects what we expect to see in the future.

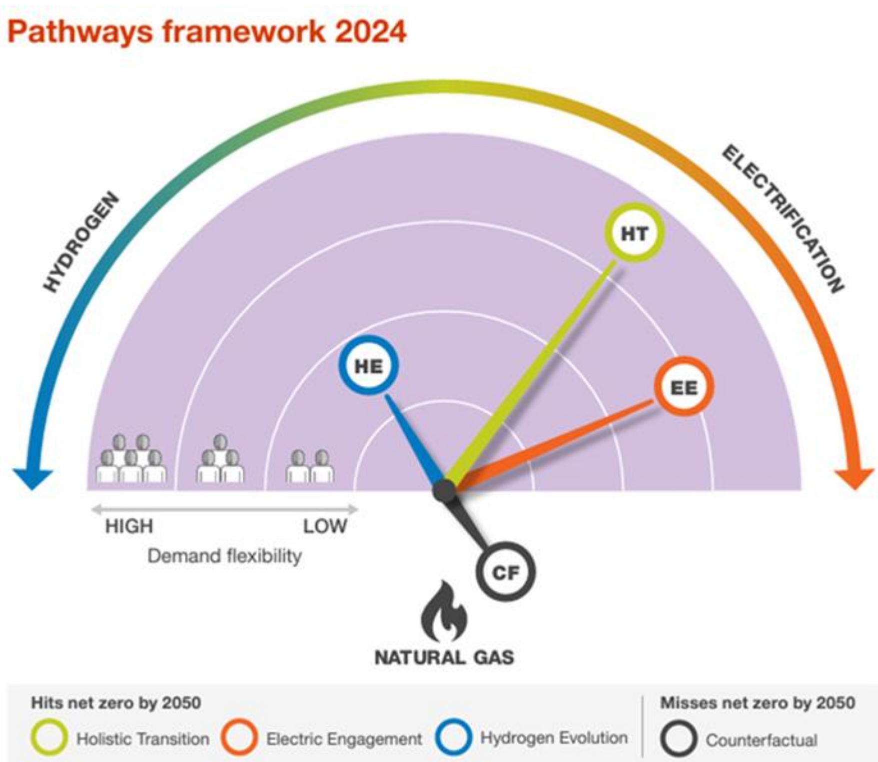

Figure 3: The FES Scenario framework[6]

[Further information on the FES framework can be found in the DFES 2024 introductory report.]

For the purposes of the NDP, we provide the forecast for all scenarios represented in Figure 3 within our NSHR. When reading the NSHR the following acronyms are used:

Scenario	Acronym
Holistic Transition	HT
Electric Engagement	EE
Hydrogen Evolution	HE
Counterfactual	CF

6 https://www.neso.energy/document/321871/download

1.7.2. CP2030 Action Plan and Connections Reform

Alongside using the latest DFES, we gain an up-to-date view of contracted connections in the SDP area to ensure our planning and forecast reflects the latest view of network requirements. Information summarising the interest in connections and applications by substation is available through the Long Term Development Statement as well as our interactive Network Map. Clean Power 2030 (CP2030) is the UK Government's mission to achieve a fully decarbonised electricity system by 2030, announced in July 2024. The CP2030 Action Plan provides generation and storage technology capacity allocations required to achieve a low carbon power system by 2030. Connections Reform is reordering the queue based on project readiness to accelerate progress towards delivering CP2030 in GB and is due to conclude in 2027. As such this impacts the forecast of how we see generation and storage technologies growing on our network. DFES 2025 has focused on analysing the impacts of CP2030 and Connections Reform on generation and storage projections through looking at the potential results of the reform process while recognising that this process is ongoing. In December 2025, NESO announced the updated connections queue which began the process for us as a DNO to go through and revise connection agreements. DFES 2025 does not currently reflect the latest updates but once all updated contracts have been accepted, we'll work with Regen to incorporate this into DFES 2026. For reference, DFES 2025 contains data from connections in the queue as of August 2025.

1.7.3. Integration with tRESP

NESO's transitional Regional Energy Strategic Plan (tRESP), published on 30 January 2026, provides an additional strategic planning layer alongside the national FES framework, identifying regional energy infrastructure needs through stakeholder engagement and regional analysis. NESO has published its transitional Regional Energy Strategic Plan (tRESP), which is being used by DNOs to ensure consistent investment planning. tRESP identifies strategically important energy infrastructure needs across Scotland, England and Wales, drawing on nearly 2,500 submissions through the RESP forums. It provides NESO's independent view of where proactive distribution investment is required to support regional energy ambitions and national net zero targets.

tRESP will directly inform SSEN's ED3 business plan, with strategic investments identified through the tRESP process being reflected in ED3 submissions and subsequent Network Development Plan publications. Where tRESP priorities align with SSEN's internal planning, this strengthens the investment case and supports regulatory justification. The DFES will incorporate tRESP insights to ensure alignment and consistency. DFES projections for both SHEPD and SEPD are validated against the corresponding tRESP regional plans. Where tRESP identifies specific local projects that are not captured in SSEN's DFES dataset, these are reviewed, crosschecked and incorporated where supported by sufficient evidence.

1.7.4. Strategic Energy Needs (SENs)

Strategic Energy Needs represent areas of energy requirements deemed critical for long-term development of the distribution network. They are identified based on stakeholder submissions and subsequent analysis of alignment with the strategic needs of the nation or region. They serve as an input for scenario development and investment prioritisation, ensuring that strategic energy requirements are incorporated into planning decisions in line with NESO guidance. SENs serve as an input to the identification of Strategic Investment (SI) Need, which represents areas where proactive network investment ahead of demonstrated need may be warranted to support strategically important energy, economic, or decarbonisation priorities.

It should be noted that, due to timing constraints, SENs have not been utilised in this report. As our planning methodology evolves and guidance develops further, SENs will play a more prominent role in future cycles.

2. THE HIGH-LEVEL STRATEGIC DEVELOPMENT PROCESS

The Network Development Plan contains a range of information developed through our network planning process. As such it is a key requirement of this report to provide further information on our network planning process. SSEN's high level strategic development process is shown below in Figure 3 which performs this function. It is comprised of three main stages which are then explained in further detail through this report;

- **Developing future forecasts** – working with stakeholders to understand their future energy needs and converting these using the Future Energy Scenarios (FES) to produce future Distribution Future Energy Scenarios (DFES) to be used in our strategic development process. This is described further in Section 3 of this report.
- **Creating a Strategic Plan** – using power system analysis to understand the future requirements of our networks. Further context can be found in Section 4.
- **The Distribution Networks Options Assessment (DNOA) process** – in this process we develop detailed options involving both flexibility and network solutions to meet future system needs. We then assess these options through industry approved cost benefit analysis. Further detail can be found both in Section 5 and our annually published DNOA methodology report[7].

7 Publications & Reports - SSEN

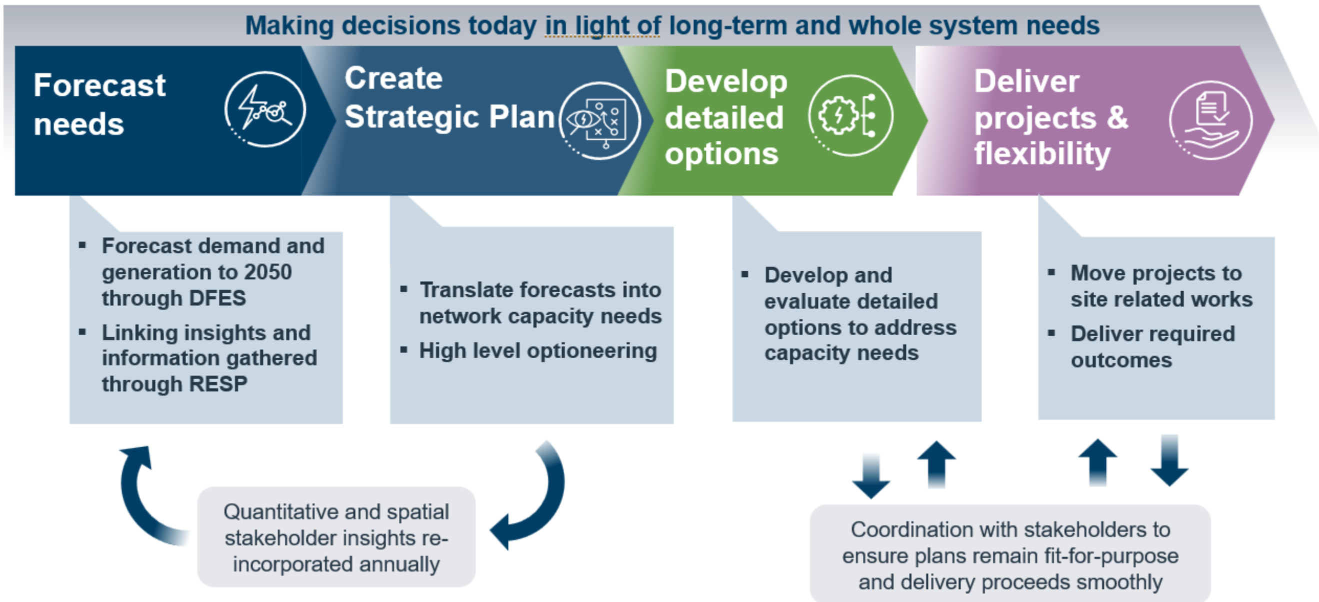

Figure 4: SSEN Strategic Development Process

3. DEVELOPING FUTURE FORECASTS

This section describes how we combine regional insights from local stakeholders with the national Future Energy Scenarios (FES) framework to develop a range of future scenarios referred to as the Distribution Future Energy Scenarios (DFES. This section addresses key policy developments and regulatory changes that impact the NDP framework and methodology. This ensures the NDP remains aligned with evolving industry requirements while providing stakeholders with transparency on how external policy drivers shape network development plans.

3.1. Development of DFES

We produce our DFES annually. Relevant FES and t-RESP data is provided for DFES production through a series of standardised building blocks as per a predefined national process.

Whilst these building blocks provide a starting point we need to more greatly understand the detailed future needs of our communities and stakeholders. We do this through a number of channels:

- **The Connections Pipeline** – Over the near term the DFES projections are heavily influenced by the pipeline of projects and new developments that can be identified in the planning system. We therefore build a dataset of these requirements from our connections database and by direct discussion with developers and stakeholders.

- **Regional analysis** – Investigative work to understand at a local level;
  - The viability of use cases and business models that would align with assumptions made around increased uptake or reduction of technologies connecting to the network.
  - Specific regional policy, regulation and other decision making that could affect both the near term and long-term trajectories for specific technologies, such as wind planning policy, electric vehicle charger deployment or heat pump uptake.

- **Stakeholder engagement** – We approach Local Authorities and other key stakeholders to understand their future energy needs. Each Local Authority is asked to provide data to evidence their future needs and these are built into the DFES projections. selection, with each being assessed in accordance with an open and transparent evidence assessment framework.

It takes between six to nine months to produce the DFES each year. Underlying data is published on our data portal, and summary reports on our website. These summary reports also provide greater detail on our DFES process and the factors considered.

We have used the latest available DFES and t-RESP to produce both the data within the NDR and the NSHR For this NDP this is the 2025 DFES as published in December 2025 and updated with t-RESP information in March 2026 which will be finalised for the final publication. The draft of the NDR will use the 2024 DFES data which will be refreshed with the latest 2025 DFES and t-RESP data for the final publication on 1st May 2026.

The anticipated growth in electric vehicle uptake represents a significant driver of future demand growth across SSEN's license areas. EV charging demand – across domestic, workplace, fleet and en-route use cases – is explicitly modelled within the DFES scenarios and incorporated into substation-level load forecasts. The t-RESP and CPAs for EV's and residential pumps provide an additional layer of consistency, ensuring that the technology volume predictions and translated into load forecasts are in a manner aligned with NESO's regional frameworks. Where this forecast demand growth is identified as likely to result in network constraints, it informs the identification of load-related needs and subsequent DNOA process. Primary network reinforcement identified through this process including transformer uprating and feeder reinforcement at 11kV and above, serves to release capacity that supports future EV connections.

3.2. Deriving Load Estimates

To forecast load growth within the SHEPD and SEPD licence areas, it is critical to identify the existing load on these networks, both for demand (import), and generation (export). Once identified, these existing loads are referred to as 'baseline' load for which future growth, from the DFES, is added on top of. Whilst these calculated values do consider seasonal differences, they are calculated as the 'worst cases' of the network within the previous year.

For the demand baseline calculations, or importing from the substation, the peak demand profile of each Primary and BSP substation for each season (Winter, Summer, Spring and Autumn) is identified from the previous year's measured data and consists of 48 half-hourly average readings, which represent a 24-hour period. Figure 5 below shows an example baseline demand profile for each season. These half-hourly readings correspond to the day where the peak demand of each substation occurred for each season. These demand values account for downstream generation where monitoring is present by adding this to the net reading from the substation. For generation capacity that does not have monitoring, output assumptions are made based on generator type, region and time of day. For generation baseline, a net value of minimum demand, maximum generation is calculated. The minimum demand value is calculated in a similar method to the maximum demand outlined above.

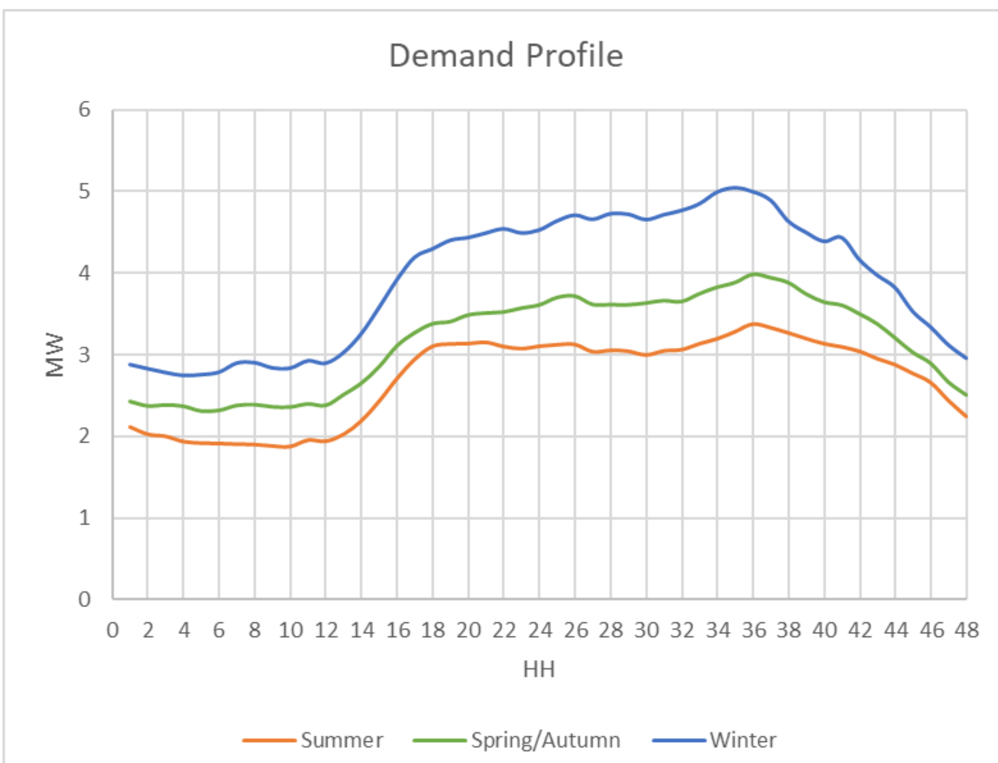

Figure 5: Typical Demand Profile

Where available, FES grid supply point (GSP) projection data has been used to provide an SSEN DFES to FES reconciliation. Regional building blocks were sometimes unavailable or not directly comparable due to the sub-technology division. In these cases, national FES projections have been used for reconciliation.

For DFES 2025, we worked closely with the RESP team to ensure alignment between our forecasts and the pathways. The DFES 2025 Holistic Transition scenario has been an input for the development of tRESP and as such the technology building blocks are well-aligned. We're now in the process of beginning further sensitivities, reconciliation and analysis to ensure the outputs of tRESP are ingested into the DFES and our load forecast for use in our ED3 and long-term planning.

When investigating load-related needs, for the SDPs and in the DNOA process, we'll use the tRESP pathways to create our load forecast and perform sensitivity analysis against the four DFES scenarios. The Common Planning Assumptions (CPAs) from the output of tRESP will be applied when creating our load forecast. We're continuing to work closely with other DNOs and RESP team on this approach and the iterative nature of our SDPs allows us to be flexible to changes at a regulatory level.

Pathways

The tRESP outputs provide a single pathway for the period 2025-2035 which splits into three long-term pathways for the period 2035-2050. This consists of volume predictions of selected technologies at a Grid Supply Point level as well as by tRESP area and indicatively by local authority area.

Common Planning Assumptions (CPAs)

The CPAs allow for consistent translation of the technology volumes from the tRESP Pathways into a load forecast. We've been engaging closely with NESO on the CPAs so that we can integrate them into our load forecast for use in our SDPs and wider network modelling. The tRESP includes CPAs for EVs, residential heat pumps and residential energy efficiency.

3.3. Demand Profiles

With the baseline data and technology projections for all seasons and scenarios up to 2050, we are able to model expected future demand using a number of diversified profiles for each technology. These include connected capacity of storage and low carbon demand technologies, as well as projections for new housing growth and new commercial and industrial developments at each substation up to 2050, for both licence areas. More specifically, the key demand technologies which are utilised by SSEN Distribution to produce the forecasted peak demand profiles for each substation are as follows:

- Electric Vehicle Chargers (Domestic off-street, Domestic on-street, Workplace, Fleet, Enroute local, Destination, Car Park)
- Domestic Heat Pumps (Hybrid, Non-Hybrid)
- Domestic Direct Electric Heating
- New Developments (Domestic, Factory and Warehouse, Hospital, Hotel, Medical, Office, Other, Restaurant, Retail, School & College, Sport & Leisure, University, Data Centres)
- Air Conditioning
- Battery Storage (Standalone Grid Services)

A seasonal half-hourly demand profile is produced for each demand and storage category listed above. These profiles are combined with the installed capacity projections for demand at each substation.

The aggregated power profiles of the projected installed capacity of demand are combined with the baseline peak demand profile of each substation to create its forecasted peak demand profile for each season, for each year to 2050 under all DFES scenarios. The below example shows a winter profile forecast for one substation in the year 2030 and under the HT scenario.

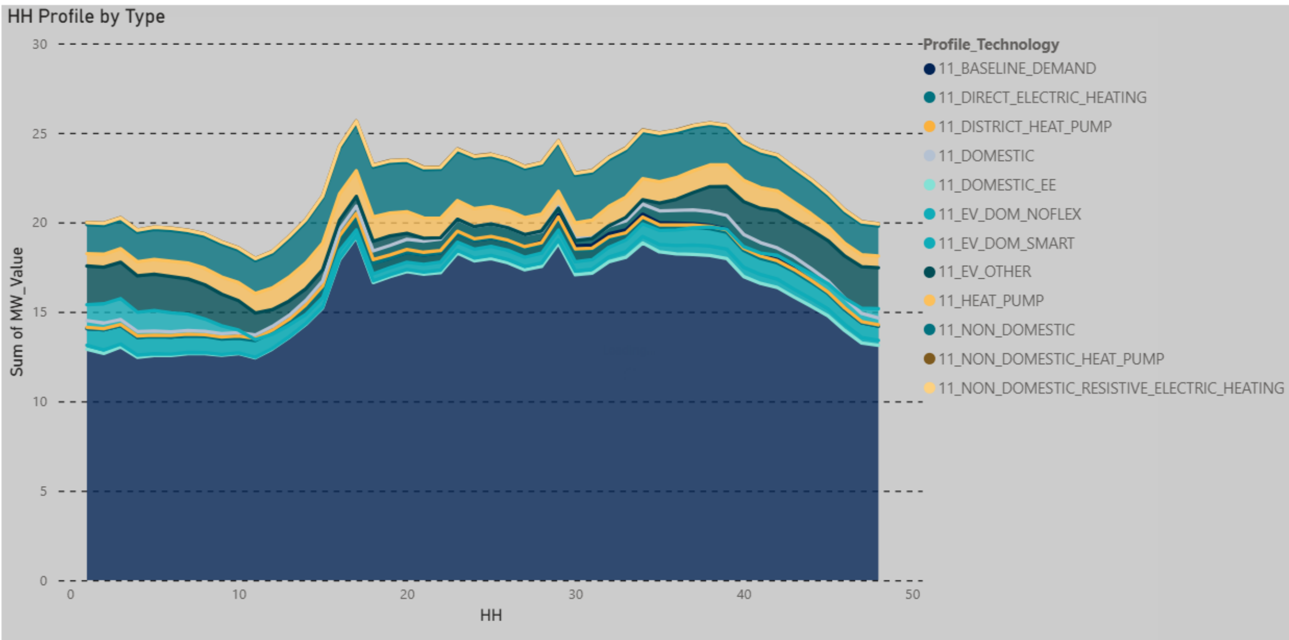

Figure 6: Future Substation Demand Profile Example

3.4. Generation Profiles

SSEN's DFES analysis produces scenario forecasts for the connected capacity of distributed generation and storage at each Primary Substation up to 2050, for both licence areas. More specifically, the key distributed generation and storage technologies which are utilised by SSEN Distribution to produce the forecasted net flow profiles for each substation are the following:

- Renewable Energy Generation technologies including:
  - Solar PV
  - Onshore and Offshore Wind
  - Hydropower
  - Marine

- Waste and Bio-Resource electricity generation including:
  - Biomass
  - Sewage and Landfill Gas
  - Anaerobic Digestion

    - Energy from Waste

- Fossil Fuel Electricity Generation technologies including:
    - Diesel
    - Natural Gas

- Battery Storage

A seasonal half-hourly generation profile is produced for each distributed generation and storage category listed above. These profiles are combined with the installed capacity forecasts for distributed generation and storage at each substation.

4. IDENTIFYING LOAD-RELATED NEEDS

4.1. Compliance with industry security planning standards

We have a licence condition to plan our electricity distribution in a way that provides an acceptable level of security of supply. Primary consideration is compliance with security planning standard P2. The P2 planning standard defines the level of spare capacity ('redundancy') that must be provided at each level of the network and for increasing groups of load. The network planning standard aims to provide electricity supply reliability commensurate the with the amount (MW) of group demand or generation. P2 thus influences the number of discrete circuits or transformer units needed to supply communities and neighbourhoods. Load-related expenditure improves our network resilience and minimises the frequency and duration of outages our customers experience.

Compliance with P2 security planning standard is a key driver of our investment proposals at EHV where it is usual to duplicate network components to ensure group demand can be supplied during fault conditions (forced outages).

In addition, it is a licence obligation that we comply with other industry codes and engineering recommendations in our overall design, such as G99 and G100 for embedded generators, which may impact specific load related works. Safety is also of paramount importance and there is an ongoing requirement for compliance with several statutory instruments and regulations, such as the Electricity Safety, Quality and Continuity (ESQCR) Regulations 2002.

4.2. Security planning standards in SHEPD

The geographical characteristics of our SHEPD network means that meeting the GB-wide security of supply standards can be costly and uneconomic for our customers in the North of Scotland. In some such cases an agreed and approved 'alternative planning standard' has been applied8. We have plans to address these issues

8 https://www.ofgem.gov.uk/sites/default/files/docs/2006/04/7806b---notice-pursuant-to-section-11%282%29-of-the-electricity-act-1989-schedule-2-2704_0.pdf

at several Primary substations classified as exempt in accordance with this alternative standard over the next few years. We are also investigating an innovative solution to increase security of supply in areas where traditional reinforcement, or use of DNO owned standby generation to provide network resilience, is prohibitively costly.

4.3. Identifying load-related needs

In SEPD (South) our Primary Network includes those operating at 132kV and 33kV. In SHEPD (North of Scotland), the Primary, or 'EHV', network comprises only 33kV, as 132kV is a Transmission voltage throughout the SHEPD licence area.

The methodology used to identify EHV load-related needs is consistent across both licence areas although data has been obtained from separate, network specific DFES projections. Our process combines existing network models used for producing the Long-Term Development Statement (LTDS) submission, contracted connections and associated reinforcement data, and the demand and generation projections from the DFES. This data allows us to replicate the scenarios of the DFES and our modified baseline scenario within a system model for each year of assessment. At EHV we have undertaken comprehensive load-flow modelling to assess the prospect of future network security 'non compliances', based on the range of input scenarios set out above.

Using power system analysis software, we have assessed our system out to 2050 using the following:

Thermal assessment – to identify any assets which are at risk of thermal overload due to the increase in demand and/or generation. Thermal overloading can decrease the expected lifetime of an asset, trip system protection leading to customer outages and increase the likelihood of asset failure if overloaded for a prolonged period.

Voltage assessment – to identify any areas of the network which may experience high or low voltage beyond statutory limits. This can be caused by the increase in demand and/or generation. High voltages can result in damage to equipment and can trip system protection leading to customer outages. Low voltage can also cause damage to motorised appliances and will increase losses on the system.

Fault level assessment – to identify any areas of the network where the fault level exceeds 95% of the rating of system protection due to the increase in demand and/or generation. If a fault occurs and the fault level exceeds the interrupting current rating of the connected switchgear, this may cause severe damage to assets and more importantly risk the safety of anyone around these assets at the time of fault. This assessment has been run at worst case (maximum demand/maximum generation) and any fault levels identified to be more than the switchgear rating has been considered for reinforcement.

These assessments have been undertaken for normal operating arrangements and all credible first and second outage conditions where required, highlighting the system constraints and limitations by year, season and scenario.

For longer term needs we use power system analysis software to take a higher level view of future system needs across all four DFES backgrounds.

4.4. Developing strategic options

We develop high level options to resolve future system needs in our Strategic Development Planning process. These high level options consider system needs through to 2050 ensuring our proposals efficiently deliver for industrial growth and decarbonisation. Our proposals are reviewed annually and published in our Strategic Development Plans.

SDPs may identify options that are needed within the next 10 years. These options are passed forwards into our DNOA process for detailed optioneering. The use of flexibility is considered at this stage of the process.

5. OPTIONEERING – THE DISTRIBUTION NETWORK OPTIONS ASSESSMENT PROCESS (DNOA)

This stage in our strategic development process forms a critical part of the process where high level load related needs are developed further to understand and assess network and non-network options. This is our DNOA process with a methodology refreshed annually in consultation with stakeholders[9]. The high level DNOA process is summarised below.

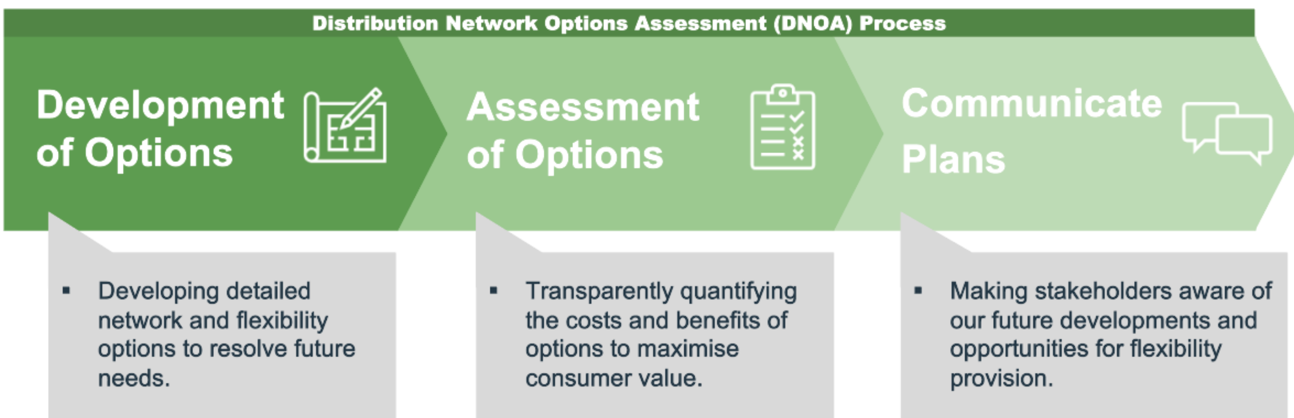

Figure 7: Distribution Network Options Assessment (DNOA) Process

5.1. Developing options to meet system needs

For the constraints anticipated across each voltage level studied, and for each credible future pathway, we identify options for providing the capacity shortfall.

In addition to conventional solutions (such as asset-based reinforcement), we ensure that flexibility is prioritised in the assessment and justification process through a flexibility first approach for ED2. In this approach, the application of a flexible solution is considered for all constraints identified on our EHV system, as part of our broader actions on implementation of Whole Systems thinking. On our lower voltage networks, our load-related expenditure proposals take full account of a range of different sources of flexibility.
To provide a baseline for comparison, all technical assessments include a ‘do minimum’ option. This usually represents the lowest-cost conventional solution to ensure compliance with the required engineering standard (e.g. P2).
The following options are considered for each intervention requirement wherever practicable:

- Flexible solutions that allow capacity to be released more efficiently.

9 Publications & Reports - SSEN

- Conventional asset reinforcement to provide an increase in capacity – i.e. replacement of an asset with one of larger capacity.
- Installing additional conventional assets, such as adding a parallel circuit
- Reconfiguration of the network (often in combination with asset replacement or addition)- for fault level issues, for example, splitting busbars to reduce fault level.
- Whole system solutions, such as meeting distribution network needs through works on the transmission network.

All selected solutions are cross-checked against our other intervention plans to ensure coordination with no double-counting of solution expenditure (e.g. load-related and non-load related).

5.2. Use of flexibility services

In ED2, SSEN Distribution made the commitment to ensure that any future system need must consider the procurement of flexibility services. By taking a flexibility first approach, we aimed to accommodate the growth in Low Carbon Technologies (LCTs) and support the changing way our customers use our network, whilst continuing to ensure we met our obligations to develop and maintain an efficient, co-ordinated and economical distribution system. Procuring flexibility services is considered a smart and efficient way to manage network capacity, allowing us to respond quickly to future network requirements.

SSEN Distribution is committed to our revised target of 2 GW cumulative capacity of flexibility procured over the five-year RIIO-ED2 price control. As of 2025/26 we have deferred over £236m of network reinforcement investment through the efficient use of flexibility services, securing nearly 1 GW of capacity. We have successfully signed 35 providers to our Overarching Agreement and recently transitioned to our market platform, ElectronConnect, to facilitate our flexibility markets.

5.3. Use of Flexibility in RIIO-ED3

Ofgem’s Sector Specific Methodology consultation for ED3 indicated a shift in the prevailing approach for flexibility in ED3 from the “Flexibility First” principle toward a broader application of flexibility for purposes such as delivery optimisation, accelerating connections, outage management, and curtailment reduction. This will allow us to tender across more CMZs and create additional opportunities for flexibility providers. We’re also updating our CBA processes and standardising products and platforms through Elexon to ensure alignment with ED3 and better value for customers while balancing flexibility service procurement with efficient delivery of strategic network investment. We remain committed to growing participation in our flexibility markets and implementing stakeholder feedback to create an inclusive and efficient flexibility marketplace.

5.4. Assessing our options

Currently we justify future network investments through Engineering Justification Papers (EJPs) which are submitted to Ofgem alongside a deterministic Ofgem directed CBA. We use other deterministic CBAs to support investment decisions; the Common Evaluation Methodology (CEM) for flexibility and the Whole System CBA for cross-vector and strategic needs comparisons.

Cost-benefit analysis is reviewed on an annual basis as part of the DNOA methodology. This ensures we are utilising latest information. on flexibility unit costs and may result in acceleration or deferral of strategic investment.

6. NETWORK SCENARIO HEADROOM REPORT METHODOLOGY

This section provides further context on the methodology employed to develop our Network Scenario Headroom Reports.

6.1. Demand Headroom

This section describes the methodology behind the calculation of the available demand headroom at each Primary (132-66-33-22 kV/11-6.6 kV) and BSP (132-66 kV/33-22 kV) substation in the SEPD licence area and each Primary (33/11 kV) substation in the SHEPD licence area. Note that GSP substations (132 kV/33 kV) are not included in the SHEPD licence area as these are classed as Transmission infrastructure.

Given the rapidly changing consumption patterns of new demand and storage technologies, it is becoming more difficult to identify the single worst-case network condition that will determine the available demand headroom of a substation. Therefore, the demand headroom calculation is based on seasonal peak demand profiles with minimum coincident generation, both for the baseline substation demand and the forecasted demand and storage technologies.

The calculated peak value of the demand profile of each substation, from the DFES projections. was then compared with its firm capacity to identify the available demand headroom or deficit.
Based on the above, the demand headroom is defined, per DFES scenarios, per substation, per year (up to 2050), as follows:

Demand Headroom = Substation Firm Capacity – Forecasted Maximum Demand

It must be highlighted at this point that this exercise mainly focuses on the available demand headroom at the substation level only. Within this analysis, the methodology has considered potential circuit limitations for radial circuits since this is considered within the published firm capacity values. However, for highly interconnected ring networks, there is a possibility that the methodology would provide an overestimate of the available headroom, as this might be reduced by circuit limitations. To account for some of the upstream circuit limitations or interconnected networks, the headroom methodology considers any upstream circuit constraints for substation groups which were identified to require reinforcements.

Furthermore, the demand headroom at each substation is calculated by considering the diversity between its baseline peak demand profile and the seasonal power profiles for each demand and storage technology projected to connect to this specific substation. This means that we are not using the 'traditional' demand connection assessment which utilises an absolute maximum demand value for both existing and proposed load.

Based on all of the above, it is possible that additional factors might limit the available demand headroom at each substation, which would be identified as part of a formal connection assessment carried out by SSEN Distribution.

It must be noted that there may be upstream constraints beyond the primary substation or bulk supply point due to substation groups or GSP constraints. Upstream constraints are highlighted in within the Network Headroom Report; however, these constraints are not reflected in the headroom capacity values. Where an upstream constraint is identified any new connection will require a detailed system study to determine the actual headroom capacity.

Data

Component	Dataset	Description	Assumptions
Demand	Demand Forecast	Demand projection per substation for the 4 Distributed Future Energy Scenarios (DFES)	Half-hourly profiles for both the baseline peak demand and the forecasted demand and storage technologies
Capacity	Firm Capacity	Current firm capacity per substation calculated based on transformer name plate rating and asset policy documents	The base firm capacity per year per substation is added to any additional capacity that is planned to become available
	Planned Released Capacity	New firm capacity which is expected to become available per substation	
	Transformer Nameplate Rating	The transformer nameplate rating taken from the SSEN Distribution Asset Management database	In the LTDS for the SHEPD licence area, several substations are reported as having zero firm capacity in accordance with Engineering Recommendation P2/8. In such instances, the transformer nameplate rating—adjusted using the appropriate seasonal factors—is applied as the substitute firm capacity value for the purposes of the headroom calculation.

Table 3: Demand Headroom Data and Assumptions

6.2. Generation Headroom

This section describes the methodology behind the calculation of the available generation headroom at each Primary (132-66-33-22 kV/11-6.6 kV) and BSP (132-66 kV/33-22 kV) substation in the SEPD licence area and each Primary (33/11 kV) substation in the SHEPD licence area. Note that GSP substations (132 kV/33 kV) are not included in the SHEPD licence area as these are classed as Transmission.

Given the rapidly changing generation patterns of new distributed generation and storage technologies, it is becoming more difficult to identify the single worst-case network condition that will determine the available generation headroom of a substation. Therefore, the generation headroom calculation is based on seasonal minimum demand profiles with maximum coincident generation, both for the baseline substation demand and for the forecasted distributed and storage technologies.

The aggregated generation profiles of the projected installed capacity of distributed generation and storage were combined with the baseline minimum demand profile of each substation to create its forecasted net flow profile for each season, for each year to 2050 under all DFES scenarios. The net flow through the transformers of a substation can be either forward (negative/demand) or reverse (positive/reverse power flow).

The maximum value of the net flow profile of each substation was then compared with its transformer nameplate rating in order to identify the available generation headroom or deficit.

Based on the above, the generation headroom is defined, per DFES scenarios, per substation and per year (up to 2050), as follows:

Generation Headroom = Transformer Nameplate Rating – Forecasted Maximum Net Flow

It must be highlighted at this point that this exercise mainly focuses on the available generation headroom at the substation level only. Within this analysis, the methodology has taken into account potential circuit limitations for radial circuits, since this is considered within the published transformer nameplate ratings. However, for highly interconnected ring networks, there is a possibility that the methodology would provide an overestimate of the available headroom, as this might be reduced by circuit limitations. To account for some of the upstream circuit limitations or interconnected networks, the headroom methodology considers any upstream circuit constraints for substation groups which were identified to require reinforcements, as shown in our Network Development Report.

Potential voltage constraints and upstream transmission constraints have not been considered within the analysis.

Furthermore, the generation headroom at each substation is calculated considering the diversity between its baseline minimum demand profile and the seasonal generation profiles for each distributed generation and storage technology, which is projected to connect to this specific substation. This means that we are not using 'traditional' generation connection assessment, which utilises absolute minimum demand values and maximum existing and forecasted generation output. Therefore, the total generation headroom identified for each substation also includes the available headroom for flexible generation connections.

The above means that it is possible that additional factors might limit the available generation headroom at each substation, which would be identified as part of a formal connection assessment carried out by SSEN Distribution.

It must be noted that there may be upstream constraints beyond the primary substation or bulk supply point due to substation groups or GSP constraints. Upstream constraints are highlighted in within the Network Headroom Report; however, these constraints are not reflected in the headroom capacity values. Where an upstream constraint is identified any new connection will require a detailed system study to determine the actual headroom capacity.

Data

Component	Dataset	Description	Assumptions
Generation	Generation Forecast	Generation projection per substation for the 4 Distributed Future Energy Scenarios (DFES)	Half-hourly profiles for the forecasted distributed generation and storage technologies
Capacity	Transformer Nameplate Rating	The transformer nameplate rating taken from the SSEN Distribution Asset Management database.	Enhanced emergency transformer ratings were not considered as part of this analysis

Table 4: Generation Headroom Data and Assumptions

6.3. Methodology Assumptions

Overall Methodology Assumptions

- Available Demand and Generation headroom was calculated at the substation level only.
- Within this analysis, the methodology has taken into account potential circuit limitations for radial circuits, since this is considered within the published firm capacity values. However, for highly interconnected ring networks, there is a possibility that the methodology would provide an overestimate of the headroom as circuit limitations may reduce the headroom at substations. To account for some of the upstream circuit limitations:

  - The headroom methodology considers any upstream circuit constraints for substation groups which were identified to require reinforcements, please see our Network Development Report.
  - This is done by adjusting the generation and demand capacity, as well as generation and demand at affected substations, to produce an illustrative headroom which incorporates upstream circuit limitations.

- Upstream transmission constraints are shown as a “Yes” or “No” however their impact on capacity is not considered in the headroom calculation.
- When firm capacity was not available, the transformer nameplate rating was utilised for the calculation of the demand headroom
- The combination of half-hourly baseline demand profiles and half-hourly power profiles for each demand, distributed generation and storage technology were used to calculate the available demand and generation headroom at each substation.
- Regarding the fault level calculations, it must be highlighted that at most sites, not all circuit breakers would be subject to the fault currents provided.

6.4. Limitations

As stated in the assumptions above, the available demand and generation headroom was calculated at the substation level only. Upstream thermal capacity limitations have been considered by adjustments to generation and demand capacities as well as demand and generation for any substations requiring investment as determined by our “best view” scenario: Holistic Transition.

Additionally, headroom calculations consider the diversity between substation baseline demand profiles and the half-hourly profiles for each demand, distributed generation and storage technology, making this analysis different from using maximum values as per our ‘traditional’ connection assessments. Based on the above, especially for the generation headroom, the values calculated also include the headroom for flexible generation connections.

Given the points raised above, it is highly likely that additional factors might limit the available demand and generation headroom at each substation, which would be identified as part of a formal connection assessment carried out by SSEN Distribution.

The information presented within the NDP is accurate at the point of publication. Future forecasts under the DFES may differ over time as a consequence of government policy, a change in consumer habits, changes to generation portfolio through new connections etc. In addition, our proposed investments may change because of changing forecasts and agreed allowances as set by Ofgem as part of each Distribution Price Control period. Although the NDP provides a view of the future in terms of our investments and potential network constraints; we would encourage any party using this information in their decision-making process to engage with us ahead of lodging an application to connect or offer flexible services

Appendix - Summary of changes

The NDP Methodology and Assumptions document has been updated to reflect evolving regulatory requirements, stakeholder feedback, and industry developments. The appendix summarises the key changes made to the 2026 edition. Core planning methodologies in section 2-6 remain unchanged to reflect continuity in our strategic network development approach.

Section	Change Type	Description	Purpose
1.6.1	Enhanced	Centralised Network View	Reflect the updated publication related to NSHR
1.6.5	New	Strategic Development Plans	Clarify SDP purpose, methodology and relationship to NDP
1.6.6.	Enhanced	DNOA section expanded from 2024 version	Provide greater transparency on how the DNOA process impacts and informs our NDP
1.7	New	External Policy Drivers section added	Address key policy developments and regulatory changes impacting NDP framework and methodology
1.7.1	New	NESO Future Energy Scenario substation	Explain updated FES framework and how it provides implications for DFES development
1.7.2	New	CP2030 Action Plan and Connections Reform	Address UK government's Clean Power 2030 mission and implications for accelerated deployment timescales
1.7.3	New	Integration with t-RESP subsection	Explain NESO's RESP and alignment with SSEN planning
3.2	Enhanced	Deriving Load estimates	Explain the methodology for integrating t-RESP CPAs into DFES forecasts
5.2 and 5.3	Enhanced	Use of Flexibility services and Use of Flexibility in RIIO-ED3	Reflect the updated flexibility procurement target volumes for RIIO-ED3 planning period

Glossary

Acronym	Definition
AIS	Air Insulated Switchgear
ANM	Active Network Management
BAU	Business as Usual
BSP	Bulk Supply Point
CB	Circuit Breaker
CBA	Cost Benefit Analysis
CER	Consumer Energy Resources
CF	Counterfactual
CMZ	Constraint Managed Zone
CT	Consumer Transformation
DER	Distributed Energy Resources
DESNZ	Department for Energy Security and Net Zero
DFES	Distribution Future Energy Scenarios
DNO	Distribution Network Operator
DNOA	Distribution Network Options Assessment
DSO	Distribution System Operation
DSR	Demand Side Response
EE	Electric Engagement
EHV	Extra High Voltage
EJP	Engineering Justification Paper
ER P2	Engineering Recommendation P2
NESO	National Energy System Operator
NGET	National Grid Electricity Transmission
ENA	Electricity Networks Association
EV	Electric Vehicle
FES	Future Energy Scenarios
FS	Falling Short

GIS	Gas Insulated Switchgear
GSPs	Grid Supply Point
HE	Hydrogen Evolution
HT	Holistic Transition
HV	High Voltage
kV	Kilovolt
LAEP	Local Area Energy Planning
LCT	Low Carbon Technology
LENZA	Local Energy Net Zero Accelerator
LV	Low Voltage
LW	Leading the Way
OHL	Overhead Line
PSS	Primary Substation
PV	Photovoltaic
NSHR	Network Scenario Headroom Report (part of the Network Development Plan)
MW	Megawatt
MVA	Mega Volt Ampere
ODM	Operational Decision Making
RESOP	Regional Energy System Operation Planning
RIIO-ED1/2	Revenue = Incentives + Innovation + Outputs, Electricity Distribution 1 / 2 (regulatory price control periods)
SDP	Strategic Development Plan
SEPD	Southern Electric Power Distribution
SLC	Standard Licence Condition
SSEN	Scottish and Southern Electricity Network
ST	System Transformation
UM	Uncertainty mechanism
VFES	Vulnerability Future Energy Scenarios
WSC	Worst Served Customers

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