Proposals for the Form of Statement of Network Development Plans

Open Networks

WS1B P5

December 2021 | Version 2

DOCUMENT CONTROL

Authorities

Version	Issue Date	Authorisation	Comments
1	19/08/21		
2	01/12/21		Inclusion of stakeholder feedback and NDP form of statement
3	16/12/21	Steering Group	Approved

Related documents

Reference 1	Proposed DNO Standard Network Capacity Report - WS1B P5 - Nov 2020 https://www.energynetworks.org/assets/images/ON20-WS1B-P5%20Proposed%20Standardised%20Network%20Capacity%20Report-PUBLISHED.23.12.20.pdf
Reference 2	Proposals for the Form of Statement of Network Development Plans - WS1B P5 - Aug 2021 https://www.energynetworks.org/assets/images/Resource%20library/ON21-WS1B-P5%20Network%20Development%20Plan%20Form%20of%20Statement%20(19%20Aug%202021).pdf

Change history

Version	Change reference	Description
1		Initial issue
2		Inclusion of stakeholder feedback and NDP form of statement

Distribution

Publicly available

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Acronyms

CEP	Clean Energy Package
CIM	Common Information Model
DFES	Distribution Future Energy Scenarios
DNO	Distribution Network Operator
ECR	Embedded Capacity Register
ENA	Energy Networks Association
EREC	Engineering Recommendation
EVs	Electric Vehicles
FoS	Form of Statement
HPs	Heat Pumps
LCTs	Low Carbon Technologies
LTDS	Long Term Development Statement
NHR	Network Headroom Report
NDP	Network Development Plan
NDR	Network Development Report

1. Introduction

1.1 About ENA

Energy Networks Association (ENA) represents the owners and operators of licences for the transmission and/or distribution of energy in the UK and Ireland. Our members control and maintain the critical national infrastructure that delivers these vital services into customers' homes and businesses.

1.2 About Open Networks

Britain's energy landscape is changing, and new smart technologies are changing the way we interact with the energy system. Our Open Networks project is transforming the way our energy networks operate. New smart technologies are challenging the traditional way we generate, consume and manage electricity, and the energy networks are making sure that these changes benefit everyone.

ENA's Open Networks Project is key to enabling the delivery of Net Zero by:

opening local flexibility markets to demand response, renewable energy and new low-carbon technology and removing barriers to participation
providing opportunities for these flexible resources to connect to our networks faster
opening data to allow these flexible resources to identify the best locations to invest
delivering efficiencies between the network companies to plan and operate secure efficient networks

1.3 Open Networks Work Stream 1B Product 5

1.3.1 Background

Network planning and development is essential for ensuring the electricity network infrastructure supports customers' needs and is especially important due to the expected challenges as usage of electricity increases due to decarbonisation. Electrification of the heat and transport sectors in the form of Heat Pumps (HP) and Electric Vehicles (EV), connection of distribution energy resources, and incorporation of flexibility services are some of the expected challenges.

DNOs publish network planning and development documents including Long Term Development Statements (LTDS) and Distribution Future Energy Scenarios (DFES). The aim of LTDS is to provide information on DNOs' existing network and availability of capacity in the short-term, while DFES provide long-term (until 2050) forecasts of future energy pathways in order to capture the envelope of uncertainties. This leaves a gap in information on DNOs' network development in the medium-term.

To address this gap, Ofgem has introduced a new standard licence condition (SLC25B) requiring DNOs to produce Network Development Plans (NDP) for a five-to-ten-year window. The NDP should include the DNOs' plans for reinforcements, the use of flexibility services, and network capacity reporting. The new Licence condition implements elements of the Electricity Directive (EU) 2019/944 which is part of the Clean Energy for all Europeans Package[1].

[1] https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en

1.3.2 Objectives

Open Networks is transforming energy networks into smart grids for the benefit of customers and stakeholders through a wide-ranging collaborative industry project involving electricity grid operators, BEIS, the energy regulator Ofgem and other interested parties.

The objective of Open Network's Work Stream WS1B is to optimise processes across the transmission and distribution boundary by considering key network operator activities, such as investment planning, operational planning and forecasting, from a whole electricity system perspective. The Open Network's Project Initiation Document (PID) outlines the scope and programme of WS1B Product 5[2].

WS1B P5's objective is to define the common high-level DNO end to end process for delivering the NDP licence requirements in the context of planning network investments and other reporting. We are building our previous work on capacity signposting and its development of a standardised Network Capacity Report. The work utilises WS1B Product 2's common understanding of forecasting scenarios to consider how future distribution network capacity is evaluated and reported.

The purpose of this report is to present the proposed Form of Statement (FoS) for the NDP.

Section three reviews the deliverables required from the Clean Energy Package, section four describes the methodology followed to develop the NDP FoS considering the context outlined in section three. Section five describes the NDP's dependencies and influences, section six defines our proposals for the NDP FoS, section seven looks at governance of the NDP, section eight looks at stakeholder feedback, section nine summarises implications for other publications including the LTDS review, and section ten concludes. Section eleven presents the Form of Statement in its entirety.

[2] https://www.energynetworks.org/assets/images/Resource%20library/ON20-PRJ-Phase%204%20PID%20Post-Consultation-v2%20(published).pdf

2. Executive Summary

In line with the 2015 Paris Agreement commitment to reduce greenhouse gas emissions, the EU Clean Energy Package has now been implemented in the legislation of England, Wales and Scotland. As a result, Ofgem require Distribution Network Operators (DNOs) under a new licence condition, namely SLC 25B, to publish a Network Development Plan (NDP) every two years to provide stakeholders with transparency on network constraints and needs for flexibility. Data and long-term forecasting are key enablers to facilitate the decarbonisation of the electrical grid, and with this in mind, the NDP has been created to present the 'best view' of planned asset based and flexible network developments over the five to ten-year period.

This is the third report published by WS1B P5 which sets out to analyse how the licence condition can be delivered to be of maximum use to readers and subsequently provide proposals for the NDP Form of Statement (FoS). The WS1B P5 working group has representation from all DNOs to ensure alignment and consistency with implementation.

Based upon our review of the licence requirement, it is proposed that the “NDP” comprises three standalone reports:

1) Network Development Report,
2) Network Headroom Report, and
3) NDP Methodology.

The Network Development Report part of the NDP will serve to provide 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. Its aim is to provide utility to stakeholders on major developments for the years 1-10 so they can plan and forecast accordingly, its scope is broken down by flexibility services and new infrastructure and defined as:

Flexibility services	New infrastructure
○ Magnitude; ○ Year of intervention, likely duration i.e. number of years in the future; ○ Location of the requirement; ○ Nature of requirement / flexibility product.	○ Timing and high-level scope of intervention; construction duration (start & finish); ○ Details of connectivity; ○ Asset quantities approx. circuit lengths, number of transformers etc. ○ Equipment ratings; ○ Approximate locations, where appropriate.

The main objective of the Network Headroom Report part of the NDP is to indicate where it is anticipated that there will be network capacity to accommodate future connections and where flexibility services may be required, it has been defined as follows:

Date range	Every year to be covered individually between 1-10 years.
	After the 10th year, this requirement moves to every five years up to 2050 or aligning with the final year of the DFES forecast.
Scenarios	DFES scenarios, plus a 'best view' scenario.
Network capacities and assessment methodology	Demand and generation headroom (available capacity) in MW per reported year per scenario.
	Headroom calculations are considerate of financially approved network developments in delivery or planned for delivery, including asset-based enhancements and the use of flexibility services. This may include updates in network developments in the timeframe 0-5 years which were not included in the latest LTDS (November). If included, this must be stated in the accompanying notes and updated in the next LTDS (end May).
	Headroom calculations are considerate of thermal loading and fault level constraints as a minimum.
Coverage	Capacity information to be provided for substations where the greatest voltage is greater than 20kV, normally BSP and primary substations down to and including the primary secondary voltage, typically HV (20kV, 11kV or 6.6kV).
Format and publication	The format of the Network Headroom Report part of the NDP is tabular in nature, presented in Microsoft Excel or similar spreadsheet format. Interactivity can be added to the workbook to improve visualisation of the data. Guidance shall be included to explain the scope of the data workbook, define each data element and give user instructions. A contents and version control page is included to ensure that users are able to easily access data, accurately reference the report and view approvals. It also states the dates and versions of critical data sources including the LTDS and DFES.
	Licensees shall endeavour to refresh the Network Headroom Report with the latest Licensee's data annually, including the years in between publishing the whole NDP (which shall be published by 1st May every two years).
Information sources	Parameters for the existing network underlying the headroom calculations shall be based on the latest LTDS and incorporate a view of financially approved and planned interventions.
	Existing and future network demand and generation shall be based on the licensee's latest LTDS and DFES forecasts for demand and generation at the substation.
	It is expected that the flexibility services incorporated in the NHR shall be in accordance with DNO Flexibility Procurement Statements and Reports or if not included in those reports, they must be stated in the accompanying notes. Publication of Flexibility Procurement Statements and Reports is a new Standard Licence Condition 31E, and reporting detail is yet to be finalised, but will likely include the location and magnitude of contracted and prospective flexibility services.

The Network Headroom Report part of the NDP is to be published yearly to maximise utilisation and align to the publication frequency of the LTDS, aligning to the previous November's full update of the LTDS. This will ensure a consistent set of data for capacity signposting is aligned annually.

Finally, the NDP Methodology serves to provide transparency for the calculations provided in the NDP. The NDP Methodology covers the end-to-end process which provides sufficient detail to allow stakeholders to understand sensitivities and extrapolate the NDP results.

Recommendations:

It is recommended that the governance of the NDP FoS is through the ENA to allow for more reactive updates to reflect stakeholder feedback and adjustments to meet their new requirements. Consideration should be given to making the NDP FoS a guidance document or instead defining the NDP FoS in an Engineering Recommendation, including it under the governance of the Distribution Code Review Panel by listing it as an Annex document.

As a review of the LTDS has recently commenced, it is recommended that the working group consider the LTDS current make-up and alignment with the NDP and whether any efficiencies can be obtained by moving aspects of the capacity reporting to the NDP, or by moving some elements of NDP into the LTDS with a combined form of statement. Either way, the co-ordinated purpose and content of the NDP and LTDS should be clarified and communicated to ensure that users have a clear understanding of what is found where.

It is recommended that the reporting of network capacity at distribution/transmission interface points is considered by DNOs, TOs and NGESO, to increase stakeholder utility by improving how distribution and transmission reports work together.

3. Background

3.1 Overview of CEP requirements and implementation

The Clean Energy Package (CEP) (EU Directive 2019/944[3]) comprises European legislation for a unified energy strategy for delivering the Paris agreement. This has now been implemented in UK law.

Article 32 of the Clean Energy Package mandates that distribution network operators publish a Network Development Plan (NDP) every two years to provide stakeholders with transparency on network constraints and needs for flexibility. The NDP is to present the 'best view' of planned asset based and flexible network developments over the five to ten-year period.

The scope of the NDP includes:

a) parts of the distribution system most suited to new connections;
b) where reinforcement of the Distribution System may be required
c) sufficient information for secure and efficient operation, coordination development and interoperability of interconnected systems;
d) a reasonable number of future scenarios;
e) non-frequency ancillary flexibility services requirements.

3.2 Standard Electricity Distribution Licence Condition

As part of the Clean Energy Package, Ofgem have introduced licence changes, namely SLC 25B which relates to the publication of a NDP. The licence condition comprises six parts (A to F), four of which relate to NDP content and two with regards the processes for preparing and publishing the NDP as shown in Figure 1. Parts A to D define the necessary scope and content of the NDP and are therefore directly relevant to the NDP FoS discussed in this report, whilst parts E and F relate to the processes for consultation, publication and submission of the NDP.

Affecting network companies with over 100,000 customers, the scope of the NDP requirements defined in parts A to D include:

- Production of an NDP by each DNO (with >100,000 customers) from mid-2022 and every 2 years thereafter.
- NDPs would cover the 5-10 year ahead period and would follow on from the LTDS that covers 0-5 years.
- NDPs would report the network development requirements for new generation and load and highlight areas suitable for new connections.
- NDPs would be a “best view” of development covering all voltages down to 11kV inclusive.
- NDPs would also highlight the expected requirements for distribution flexibility services.
- The NDP methodology, including underlying data and assumptions.

The processes defined in parts E and F require the licensee to consult with interested parties on the proposed NDP for a period of at least 28 days before formal publication. Non-confidential consultation responses are to be published, along with a summary of the responses and how they were considered.

From this the Authority may within 28 days of the licensee publishing its NDP, issue a direction to the licensee that the NDP requires further development. This includes direction to revise the NDP, consult with interested parties, re-submit by a specified date and republish under the same process as above.

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0944&from=EN

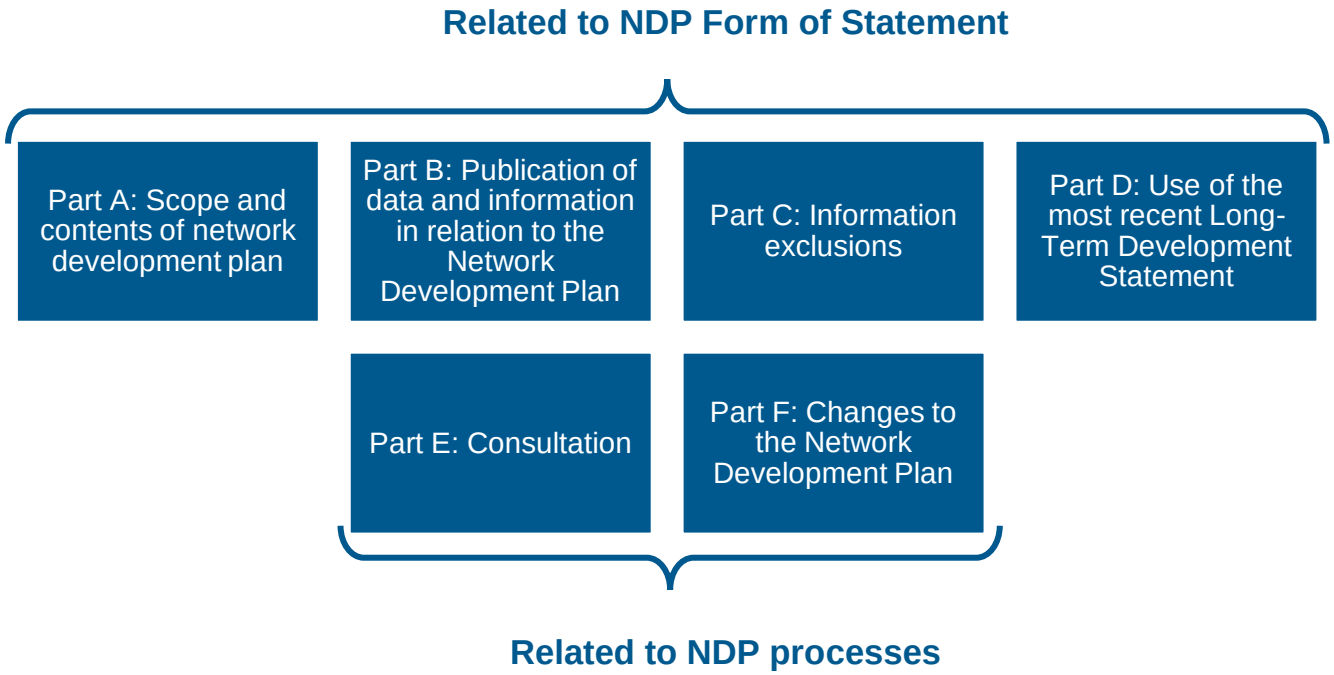


Figure 1: Standard Licence Condition (SLC) 25B overview

3.3 NDP in context of other existing network capacity reporting

DNOs already report on distribution network capacity to empower customers and stakeholders, some of whom need information on immediate connection applications, some who may be looking for opportunities to locate developments to provide network services and others looking at long-term plans for our region. Different network reports, as shown in Figure 2, have different purposes and therefore have a range of timeframes and content.

The NDP aims to provide value to customers by aligning against existing and evolving reports. It is critical that each form of capacity report has a distinct scope so that stakeholders know where to find information, but the reports must also complement each other with consistency across each DNO's suite of documents. Consistency of each form of report prepared by each DNOs is also necessary so that stakeholders can become familiar with a common approach, hence, this project is aiming to develop the NDP FoS so that an NDP from any DNO is recognisable and understood.

How reports work together has been considered when developing the NDP FoS to avoid both duplication between reports or gaps in the information provided to stakeholders. Learnings have been taken from Electricity North West's Regional Insights and WPD's Shaping Sub-transmission reports which are examples of the network capacity reports published on a discretionary basis prior to the requirement to develop NDPs.

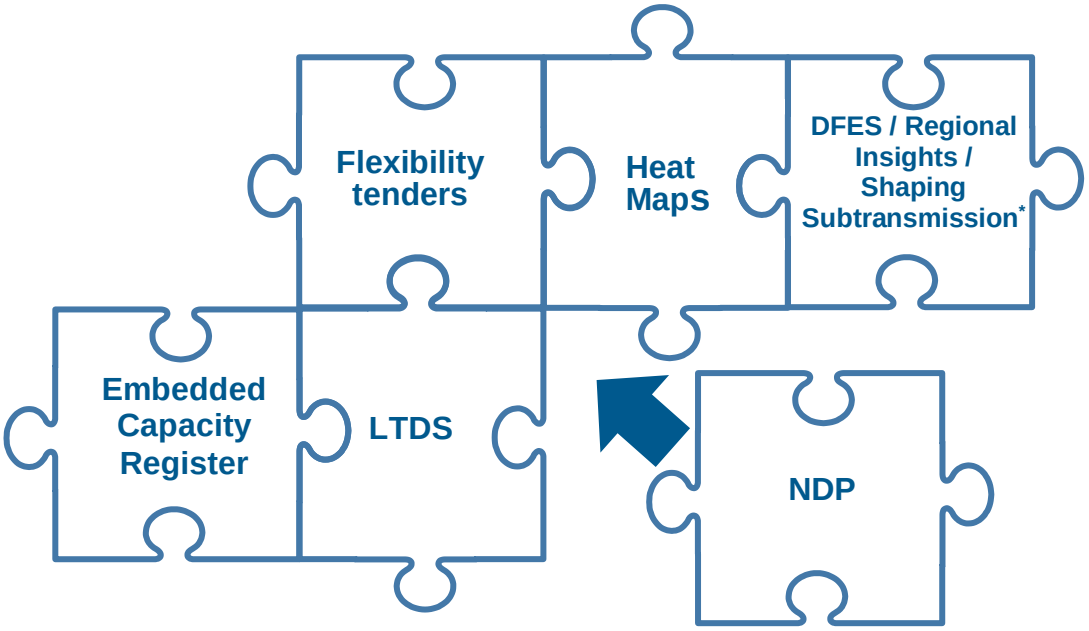


Figure 2: Distribution network data and capacity reports

*some DNOs only

4. Development Methodology

4.1 Step by step approach

Figure 3 shows the seven-step methodology for the development of the NDP FoS. This clearly defined process was adopted to ensure comprehensive assessments were undertaken to provide the necessary understanding and justification to shape the NDP for optimal utility.

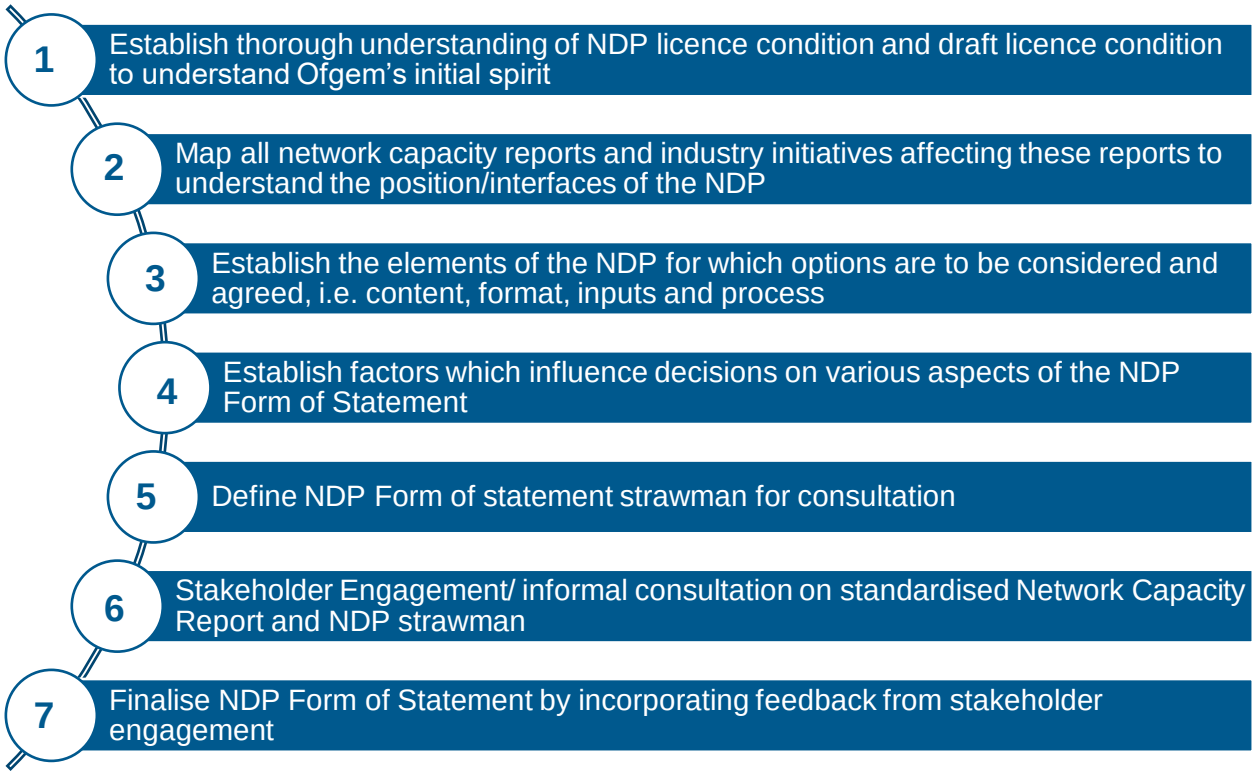


Figure 3: Step-by-step methodology for development of the NDP FoS

5. NDP FoS influences

The initial steps of the methodology for developing the NDP FoS were associated with understanding the landscape and requirements of the NDP to ensure that it complemented other network information sources and optimised stakeholder utility.

5.1 Licence condition requirements

Our first step in the methodology adopted to develop the NDP FoS was to thoroughly understand the NDP obligations through examination of the CEP and subsequent licence condition.

New standard licence conditions[4] incorporating the requirements of the Clean Energy Package came into force on 31st December 2020 following informal consultation on the proposed changes. Draft wording of the proposed modification was circulated for feedback via the ENA Electricity Regulation Group on 5th August 2020. This was following an Ofgem/BEIS led meeting introducing their CEP implementation plans to the ENA held on 30th June and after a wider workshop for DNOs hosted by BEIS on 13th August 2020 covering the draft licence conditions. The final NDP licence requirement differs from the draft. Original details on the nature of the NDP and what would be usefully included in the NDP were subsequently omitted from the new licence condition. However, Ofgem have indicated to the ENA that they expect NDPs to align with the spirit of the original drafting.

The content of the original drafting subsequently removed from the final Licence condition includes:

- Publication of a DFES with a reasonable number of scenarios;
- Obligation to use the scenarios for preparing the NDP;
- Model a high confidence forecast;
- Requirement to explain differences between each previous NDPs and observed conditions reported in subsequent LTDS from the third NDP publication.

5.2 Coordination with other related DNO Reports

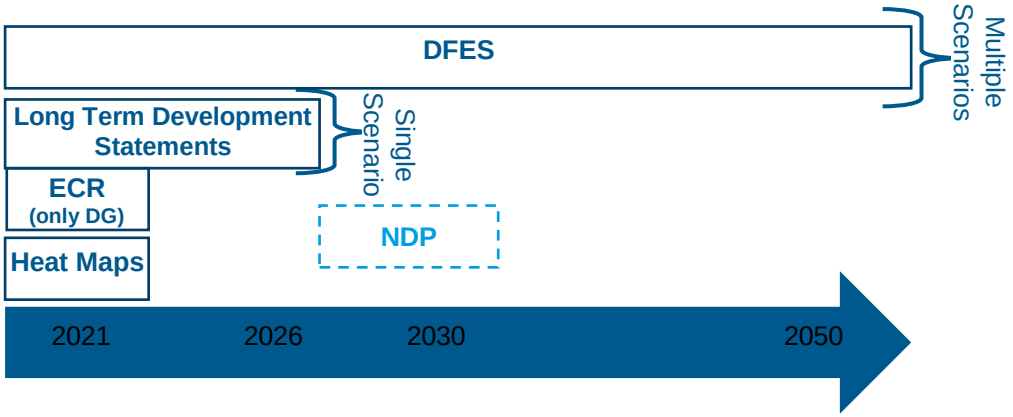


Figure 4: Timeline of existing network capacity, demand and generation reports (not to scale)

4 https://epr.ofgem.gov.uk/Content/Documents/Electricity%20Distribution%20Consolidated%20Standard%20Licence%20Conditions%20-%20Current%20Version.pdf

Our second step was to establish other DNO reports on and related to current and future network capacity, review their objectives and establish interfaces with the NDP to ensure the coordination of the NDP FoS as mentioned in section 3.3.

The NDP's timeline of 5-10 years is already defined in the licence condition, following on from the time period covered by the LTDS as shown in Figure 4. Consideration of other aspects of the existing network reports can inform the NDP FoS to provide consistency, for example the range of scenarios, area of network coverage and what parameters are included. The LTDS currently focusses on reporting demand from which users can infer network capacity for new loads, but it does not include generation volumes, so it is more complex for stakeholders to understand the capacity available for further generator connections.

LTDS requirements are expected to change as a result of Ofgem's review which commenced in summer 2021. This means that the NDP FoS should be agile and able to adjust to remain complementary to the LTDS.

5.3 Anticipated NDP use and value

To understand the impact of the NDP and how it will produce maximum impact, we undertook an assessment of the proposed audience and major stakeholders. Table 4 summarises how a range of stakeholders are expected to utilise the NDP and how this impacts the FoS.

Table 1: Stakeholder uses of NDP and what they mean for the FoS

Stakeholder	Utility(expected use and value)	What does this mean to the FoS?
Developers Property/Building, Generation, Industrial customers, Generation customers	- Understand future network constraints and plans for new capacity to signpost when and where connections will be most suitable (noting that indication of currently available capacity would not be by NDP but by other indications such as DNO heat maps)	- Developers need detailed information in accessible format - Likely not to be models, but some may be able to use them - Location of assets to be included - Flexible connection curtailment rates to be included - Dispatch rates to be included for flex services
Local Authorities (LA) / Government organisations	- Understand whether the electricity supply network will provide opportunities or will be a barrier to their advancement of their initiatives, especially decarbonisation or economic stimulus of typically larger areas and requiring greater capacities compared to individual customers	- Accessible format - They are interested in smaller capacities at lower voltages, EV connections, hubs etc - For local authority public sector software limitations (make it compatible with older versions of Excel) - With relation to new housing developments – headroom on EHV networks as affected by larger connections - Breakdown of where electrical infrastructure is within a LA
Interconnected electrical network operator e.g. IDNOs, TO and ESO	Understand future needs for considering alternative or whole system solutions Understand how constraints are proposed to be managed to understand impacts on their network to adjust their assessments accordingly Identify synergies in their development for efficient delivery (can work be scheduled at the same time or to avoid conflicts in scheduling and associated risk to security of supply	- Accurate evaluation of the capacity on any interconnected network is only possible with greater transparency of capacity on all networks - This means that transfer of models would be convenient
Other network operators • Transport • Gas network • Water network	Whole energy wider system analysis Policy optimisation Study the impact of electrification policy Co-ordinate or avoid overlap of works	- Same format from all DNOs will facilitate whole GB analysis - Accessible
Flexibility Service providers	Understanding network needs for existing/future service providers More notice of requirements and therefore time to prepare to participate	- Developers need detailed information in accessible format - Likely not to be models - NCR would be considered for strategic and longer-term decisions and the Flex

Stakeholder	Utility(expected use and value)	What does this mean to the FoS?
	Understanding the location, year of need, longevity and extent of the requirement	data details delivered via the Expressions of Interest. The flexibility opportunities will be sign posted in the NCR/NDP e.g. website.
Community Energy	- Inform connection opportunities and constraints	- Accessible format
Universities	- Provide resources and understanding for further analysis	- All assumptions and approaches to be well explained to support detailed evaluation and extrapolation of analysis and proposals.

6. NDP Form of Statement

6.1 Overview of the content

When reviewing the licence requirement for the NDP, its FoS has been broken into three standalone reports as shown in Figure 5, namely:

1) Network Development Report,
2) Network Headroom Report, and
3) NDP Methodology.

The rationale behind our proposals for the NDP FoS in these three reports are presented in this section. The full NDP FoS is presented in section eleven including a FoS appendix on the inclusion of customer specific information based on the same approach included in the LTDS FoS.

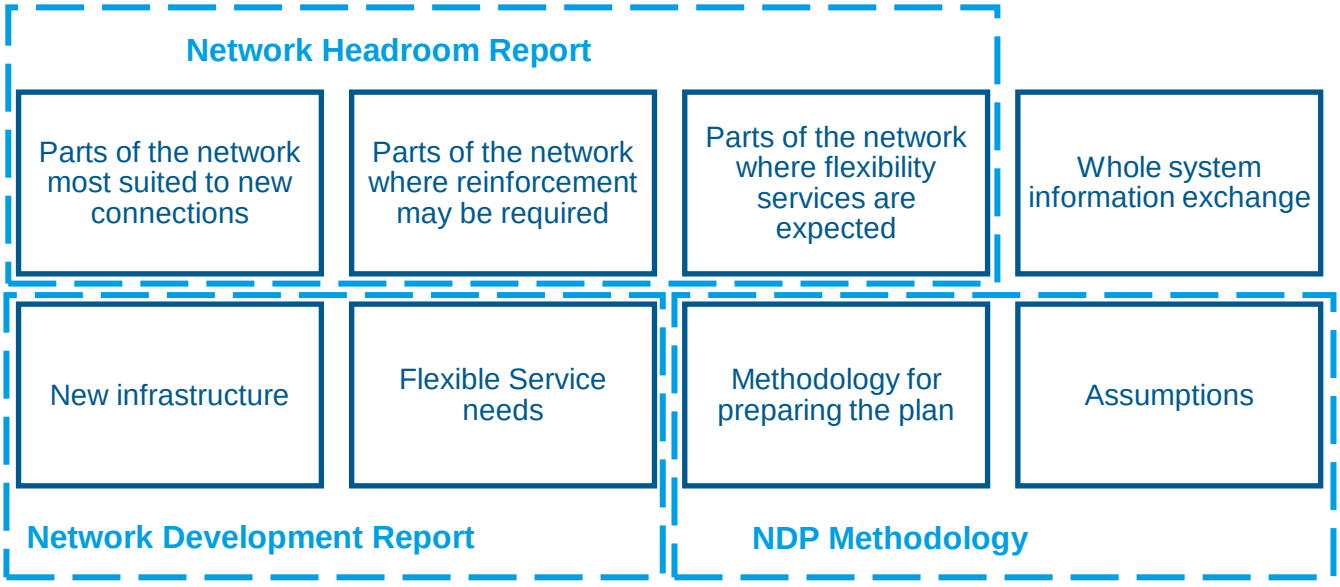


Figure 5: Parts of the NDP FoS

6.2 Network Headroom Report

The main objective of the Network Headroom Report 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. It is expected that other more up to date sources of information on current network loading, such as heat maps, will be signposted for users seeking information on immediate connections.

Open Networks WS1B P5 shaped a standardised Network Capacity Report in 2020 prior to awareness of the NDP requirements. However, the NDP encompasses reporting on network capacity and therefore P5's previous learning and outputs were useful in the development of the NDP FoS. All DNOs committed to the discretionary publication of a Network Capacity Report in 2021 with the objective of gathering stakeholder feedback to help refine the NDP FoS and on the understanding that it would be consumed within the NDP going forward.

The Network Headroom Report element of the NDP FoS has been developed building on the P5's previous standardised Network Capacity Report. The Network Capacity Report was published as a one-off document in August 2021, prior to May 2022 to allow stakeholders feedback on the information provided and its value in decision making.

This part of the NDP will provide significant value through the additional information to major stakeholders and provide forward visibility of network opportunities. The scope and format of the proposed Network Headroom Report part of the NDP is given in Table 2. *Note this is the final version of the table and includes updates and clarifications made following the publication of the August 2021 proposals.*Table 2: Network Headroom Report parameters

Scope of Network Headroom Report	Deliverable
Date range	Every year to be covered individually between 1-10 years
	After the 10th year, this requirement moves to every five years up to 2050 or aligning with the final year of the DFES forecast;
Scenarios	DFES scenarios, plus a 'best view' scenario;
Network capacities and assessment methodology	Demand and generation headroom (available capacity) in MW per reported year per scenario.
	Headroom calculations are considerate of financially approved network developments in delivery or planned for delivery, including asset-based enhancements and the use of flexibility services. This may include updates in network developments in the timeframe 0-5 years which were not included in the latest LTDS (November). If included, this must be stated in the accompanying notes and updated in the next LTDS (end May).
	Headroom calculations are considerate of thermal loading and fault level constraints as a minimum.
Coverage	Capacity information to be provided for substations where the greatest voltage is greater than 20kV, normally BSP and primary substations down to and including the primary secondary voltage, typically HV (20kV, 11kV or 6.6kV)
Format and publication	The format of the Network Headroom Report part of the NDP is tabular in nature, presented in Microsoft Excel or similar spreadsheet format. Interactivity can be added to the workbook to improve visualisation of the data.

	Guidance shall be included to explain the scope of the data workbook, define each data element and give user instructions.
	A contents and version control page is included to ensure that users are able to easily access data, accurately reference the report and view approvals. It also states the dates and versions of critical data sources including the LTDS and DFES.
	Licensees shall endeavour to refresh the Network Headroom Report with the latest Licensee's data annually, including the years in between publishing the whole NDP (which shall be published by 1st May every two years).
Information sources	Parameters for the existing network underlying the headroom calculations shall be based on the latest LTDS and incorporate a view of financially approved and planned interventions.
	Existing and future network demand and generation shall be based on the licensee's latest LTDS and DFES forecasts for demand and generation at the substation.
	It is expected that the flexibility services incorporated in the NHR shall be in accordance with DNO Flexibility Procurement Statements and Reports or if not included in those reports, they must be stated in the accompanying notes. Publication of Flexibility Procurement Statements and Reports is a new Standard Licence Condition 31E, and reporting detail is yet to be finalised, but will likely include the location and magnitude of contracted and prospective flexibility services.

A detailed explanation / justification for this approach is provided below:

6.2.1 Date Range

It is proposed that Network Headroom Report covers the date range to 2050, or aligning with the final year of the DFES forecast if that differs.. This date range goes beyond the 5-10 years of the mandated NDP date range as justified on the following basis:

Consideration to 2050 matches the DFES date range and so can reflect the uncertainty on long-term network impacts.

Customers' adoption of low carbon technologies and transition to active networks into the long term means that there will be value in reporting network capacity beyond the current position and the short-term future covered by most of the existing network capacity reports.

Reporting the network headroom within the NDP for just up to 10 years was considered but discounted because adopting 10 years would not go much further than the five years currently covered by the LTDS. Proven value is presently obtained from network capacity indications for the current year in heat maps and Embedded Capacity Registers, and LTDS and calls for flexibility services covering the short-term future. Other stakeholders, including Local Authorities and large developers, are interested in network capacity beyond ten years in the future.

Restricting the capacity reporting to 10 years was also considered inappropriate because developers of potential flexible services require visibility beyond this especially because their development and construction phases can take a number of years.

It should be noted that the Network Headroom Report is not intended to provide a customer about to submit a connection application with a latest indication of currently available capacity headroom to connect or to reflect the current status of connection offers, but to provide visibility of the distribution network's medium-term and longer-term capacity needs. It is expected that other more up to date sources of information on current network loading, capacity and headroom, such as heat maps, will be signposted for users seeking information on immediate connections.

This is because the forecasted levels of demand and generation already reflect prospective new connections and so the given headroom values may already factor in the capacity needed for the customer's application. For context, each DNO DFES forecast is a combination of:

- the pipeline of known accepted connection projects – in which accepted projects may be scaled by contribution factors reflecting the technology and scenario,
- forecast projects which have not yet been accepted for connection,
- insight regarding the past network loading and the aggregate demand and generation of existing and future customers.

As an example, from around 2023-2035, the further changes in the DFES generation scenarios predominantly reflect forecast connection projects which are not yet accepted for connection.

6.2.2 Reporting Granularity

It is proposed that the Network Headroom Report will be for every year for the first ten years, and every five years beyond that to the end of the date range. Five-year reports shall "snap" to the years ending in five or zero for simplicity and reflect the indicative nature of the report. The proposed years to be reported is justified on the following basis:

Reporting every year for the first ten and every five years thereafter matches the needs of different stakeholders.
Reporting network capacity for every year for only the first five years matching the current LTDS provision was discounted as it doesn't match with the NDP date range.
Reporting every year for more than ten years was discounted because analysis workload is greater and not justified by increased benefits.
Ten years matches the period that DNOs undertake detailed analysis to refine investment plans and roughly aligns with design and build timescales.
By factoring in the connection pipeline, forecasts have an element of assurance up to approximately ten years because this encompasses the typical build period of known projects in the pipeline and Embedded Capacity Register (formerly the System Wide Resource Register) reports on quoted and accepted connection offers.
Flexibility stakeholders are interested in detailed short-term requirements, so they target developments in the right places.
Timescale aligns with the DFES and reporting for each year matches the LTDS and other network capacity reports such as EREC P2/7.
Reporting for every five years after the first ten years matches the longer period and illustrates greater tolerance and divergence in DFES forecasts reflecting uncertainty in network needs.
Reporting every five years to the end of the date range provides flexibility providers with indications of the longevity of network needs.
The proposed simple approach is efficient when considering multiple scenarios.
Snapping to the years ending in five and zero shows the uncertainty in the results rather than appearing precise.
The reason for discounting reporting every year to 2050 was the larger volume of data leading to an unmanageable report. Also, future uncertainty means that there is no benefit from reporting for every year up to 2050.

6.2.3 Forecast scenarios

It is proposed that the Network Headroom Report will be based on the DFES scenarios, plus a 'best view' scenario. Inclusion of multiple scenarios goes beyond the requirements of the licence requirement and is justified on the basis of:

Reporting data for multiple DFES scenarios is beneficial because they are used in DNOs planning of network developments included in the NDP.
The DFES scenarios plus a best view scenario is appropriate because it matches the view from Ofgem that the NDP should be the DFES with purpose.

Some DNOs already identify a separate 'best view' scenario and this situation is likely to evolve following WS1B P2's work defining the methodology for creating such a scenario.
The requirement to use the most recent version of the LTDS when developing the NDP and potentially a single scenario as included in the initial drafting of the NDP Licence condition has been acknowledged by WS1B's P2 working group working on principles for distribution network forecasts. They are considering how a single 'best view' scenario is created for DNOs to produce consistent forecasts to feed into the network capacity reporting parts of their NDPs.

Although a single 'best view' scenario may avoid confusion in some stakeholder communities by simplifying the presentation to the highest certainty forecast, it shall be made clear that the 'best view' network development plan is also informed by other network factors including asset health and all other DFES scenarios that provide insights into the range of future uncertainties to avoid foreclosing development options. Forecasts with less certainty can help DNOs understand network requirements under more extreme conditions and so prepare the network for the next development stage.

6.2.4 Network coverage

It is proposed that the Network Headroom Report will include as a minimum the following components of distribution networks:

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

Exclude information on individual customers to comply with Licence condition 25B.6.
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.
Where distribution networks are run interconnected with other DNOs, assumptions on how the interconnected networks have been modelled should be included in the accompanying guidance document.
Network headroom reporting will focus on BSPs and primary substations for the following reasons:

Aligns with the Licence condition clause 25B.3 requirement to cover the "11kV network and above".
Data is most readily available for BSPs and primary substations although it is recognised that some DNOs may report on capacity of lower voltage networks if they already have data or if it becomes available in the future.
Range of network components matches published DFES forecasts.
Detailed reporting of LV network capacity was discounted because there is currently insufficient accurate visibility of LV distribution/secondary substation loading. DFES publications don't yet present LV distribution/secondary substation forecasts and it was judged that reporting down to this level could lead to an unmanageable report.
It was decided that DNOs should not report on GSP capacities in the NDP as true understanding of the capacity of the transmission-distribution interface requires assessments involving the transmission network owner and Electricity System Operator. Close collaboration on how the power system is operated, running arrangements and short-term asset ratings are required to study the distribution to transmission boundary, especially when considering combinations of arranged outages/faults for contingency analysis. Further consideration of how capacity could/should be reported across the transmission and distribution interface is required and needs input from the ESO, TOs and DNOs.

6.2.5 Capacity parameters

It is proposed that the Network Headroom Report shall include network capacity in terms of demand and generation headroom for the following reasons:

- Net zero requires new low carbon demand and generation technologies.
- Network investments are driven by demand and generation requirements.
- Meets the needs of different stakeholders who are interested in both generation and demand future connection capacity.

- Aligns with heat map reports.
- Reporting of demand or generation alone was disconnected because it would not meet stakeholder needs and for the converse of the reasons explained above.

Each DNO will clarify whether the given headroom values are for firm or flexible connections.

A positive value in the capacity headroom tables indicates that there is generally expected to be sufficient network capacity for the forecast demand or generation, either due to existing capacity or planned load transfer or planned reinforcement with high confidence of progression in the area. Each DNO's table will explain the extent to which capacity headroom reflects capacity in the last LTDS, or also approved network changes.

A negative value in the capacity headroom tables indicates that there is generally not expected to be sufficient network capacity for the forecast demand or generation as appropriate, and that the DNO would be expecting to seek flexibility services or develop reinforcement plans in this scenario and timeframe.

These headroom figures will support the 1-10 year plans for reinforcement and flexibility services in the NDP.

6.2.6 Assessment parameters

It is proposed that the Network Headroom Report will reflect thermal loading, fault level and voltage constraints if practical. Justification of this proposed approach includes:

The proposed Network Headroom Report is based on thermal and fault level parameters to adequately reflect significant constraints on demand and generation headroom respectively.

Consideration of fault level was included because it is a major constraint on generation connections. However, it is recognised that fault level indications must be accompanied with a clear description of the assumptions adopted in the assessment.

Consideration of voltage rise, and drop was not mandated because of the strong dependency on where connections occur in the network and because voltage issues can be managed for example by restricting a generator's power factor. It is preferable that short-term analysis is based on studies which assess voltage where possible. Where detailed analysis of short-term conditions has shown voltage issues, then the Network headroom Report may indicate capacity based on this constraint. Such reporting will highlight the issue to advertise, in advance of a formal flexible services tender, the potential for flexible solutions to alleviate voltage constraints.

6.2.7 Assessment methodology

It is proposed that the Network Headroom Report will be based on detailed (network modelling) analysis for the short term where practical, and simple tabular comparisons for the longer-term to 2050:

Capacity on distribution networks not only depends on local conditions, such as the rating of local assets, their configuration and local flexibility services, but also the capacity of interconnected networks. For example, the capacity of a primary substation to accommodate additional demand connections may depend upon the available capacity of the upstream circuits and BSP which supplies power to the primary substation. Another example is where capacity at a primary substation to accept additional generation depends on a restriction due to the fault level rating of equipment downstream of the primary substation.

The proposed methodology for reporting network headroom in the Network Headroom Report reflects constraints across the wider network where possible. This is likely to be achieved through power system studies, but they may not be practicable in all cases, for example when future forecast loading is such that power system analysis of the present network is numerically impossible.

Methodologies applied in the derivation of the NDP will be explained to ensure good understanding of the sensitivities of reported network capacity headroom or deficit. We recognise that it is important that stakeholders understand when the reported network capacity could be further limited by constraints on interconnected networks.

Network capacity assessments will consider appropriate interactions between forecast generation and demand capacities. For example, demand assessments of primary demand capacity may consider demand to be offset by export from forecast additional small LV embedded generation but may not consider export from forecast HV generation to account for this being realised in a single unit which could be out of service.

Similarly, generation capacity assessments may consider the corresponding forecast demand at the time of peak generation export, to reflect the counterbalancing effect of future EVs, heat pumps, new domestic/I&C connections.

Network capacity headroom reporting within the NDP will be based on detailed network analysis for the short-term because this greater level of detail is essential within planning to justify network investments and is justified as follows:

Simpler tabular comparisons of loading versus firm capacity was deemed to be acceptable for the long term to 2050 as detailed analysis is not warranted due to the uncertainty. Also, the conditions in some scenarios may be so extreme that power flow analysis may not converge.

Application of a tabular approach is not preferred for the first ten years as firm capacity can be an oversimplification not fully representative of complex networks.

6.2.8 Format and publication

It is proposed that the Network Headroom Report is presented in an Excel workbook format hosted on DNO webpages. This approach is justified on the following basis:

It is accessible to many users.

A tabular format facilitates presentation of headroom of multiple indications of how much additional demand and generation can be accommodated on the network. Table headings shall be as shown in Table 3, with the headroom values being given for each scenario and year covered by the report.

Table 3: Network Headroom Report headings

Substation Name	Voltage kV	BSP Group	GSP	Substation location	Demand Headroom MW	Generation Headroom MW

The relevance of the reported parameters shall be described along with the underlying methodologies and assumptions in the NDP Methodology document. Likely content shall include;

- Reference to the DFES document giving full descriptions of the background to the scenarios underlying the forecasts considered in the network capacity evaluations,
- Explanation of how headroom values have been calculated,
- Description of the studies employed to determine headroom values,
- Details of the network limitations considered in the evaluation, and
- What network interventions are included and when.

All nomenclature used in the Network Headroom Reporting shall be consistent with that used in the LTDS data tables.

Justification for presenting the Network Headroom Report in Excel report format incudes the following reasons:

- The tabular format is efficient and simply understood.
- Tabular formats are less likely to require IT investment and significant investment is not warranted until the enduring NDP requirements are finalised.
- Ofgem's have accepted retaining the Excel format for the LTDS in recent correspondence.
- A map-based reporting style was discounted at this stage because it would require specialist IT software and could be more difficult to interpret and use due to there being multiple layers.
- It is recognised that an Excel workbook and accompanying document have deficiencies when reporting future network capacity and developments respectively. Although use of the Common Information Model (CIM) standard would offer advantages through the inclusion of many different datasets, the system is not yet defined for the NDP use case, fully harmonised or widely used. However, CIM is expected to be adopted in the future after further development and when more stakeholders can take advantage of the benefits on offer.

Clarity on the requirements of the NDP is essential for consistency across the DNOs as there is room for interpretation on how the requirements of the CEP and Licence condition could be delivered. Previous work to define the format of the standardised Network Capacity Report has concluded that presentation of network

capacity in a tabular format is a simple way to signpost parts of the network which are suitable for new connections and provide the necessary justification for the NDP. Although tables work for the presentation of long-term network capacity for multiple scenarios, they may hide the complexity of network constraints. Therefore, it is recommended that a method of recognising these in the NDP be considered to ensure that stakeholders are not misled by reporting of simplistic network capacity headroom values.

Publication of DNO standardised Network Capacity Reports in 2021 has been used to check stakeholder opinion and inform the NDP template. Recognising that the focus of the NDP is up to 10 years and the DFES forecasts extend to 2050 at the moment, the utility of future network capacity predictions has been examined to inform the duration of the network capacity report accompanying the NDP. In addition to informing the scope of the NDP, production of the standardised Network Capacity Report in 2021 provided an opportunity to test the process for producing the data and share best practice to drive consistency in DNO approaches.

The Excel workbook will include a contents and version control page to ensure that users are able to easily access data, accurately reference the report and view approvals. It shall also state the dates and versions of critical data sources including the LTDS and DFES.

The workbook shall be accompanied by a short guidance document containing sufficient information to enable users to understand the scope of the information contained within the network capacity report. This will signpost the NDP Methodology and Network Development Report parts of the NDP, but not overlap. It may also explain how users can use any interactivity features included in the data workbook.

Licence clause 25B.1 (b) requires the NDP to be published every two years. As part of the recommendations from this report, it is proposed that the Network Headroom Report element of the NDP is refreshed annually to maintain consistency with the annual publication of the LTDS. As both the NDP and LTDS are to provide an outlook for actual plans and delivery, an annual publication helps ensure information provided to stakeholders is as consistent and accurate as possible.

6.2.9 Information sources

It is proposed that the network headroom values within the Network Headroom Report are evaluated based on data taken from the latest LTDS and DFES. This approach is justified on the following basis:

Use of the latest Long Term Development Statement is specified in Licence condition clause 25B.7. Publication of the NDP in May allows use of the latest DFES published in the previous December.

6.3 Network Development Reporting

Alongside network capacity headroom reporting, network development reporting within the Network Development Report element of the NDP will serve to provide 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 information is provided with the objective of providing users with foresight whether network plans may impact on theirs and signpost requirements for flexibility services so users can target developments.

The proposed scope of the Network Development Report is to provide a list of high-level plans for network interventions and flexible service requirements, specifically:

- For the years 1-10;
- Location of the intervention, covering whole network down to primary substation HV bars;
- Justification for the need for network developments, including the nature of any constraints and the created benefits;
- Development requirements for flexibility services and new infrastructure (see Table 4);
- Where a part of an interconnected network is expected to be constrained this may be highlighted as requiring further study to evaluate whole systems approaches, such as a Regional Development Plan;

- Where it resides on the delivery lifecycle (signposting, approved plan with secured financing, in delivery, planned for delivery etc.)

Table 4: Scope of the Network Development Report

Flexibility services	New infrastructure
○ Magnitude; ○ Year of intervention, likely duration i.e. number of years in the future; ○ Location of the requirement; ○ Nature of requirement / flexibility product.	○ Timing and high-level scope of intervention; construction duration (start & finish); ○ Details of connectivity; ○ Asset quantities approx. circuit lengths, number of transformers etc. ○ Equipment ratings; ○ Approximate locations, where appropriate.

Reporting of network developments shall be complementary to existing reporting of planned network interventions in LTDS and Embedded Capacity Registers (ECRs) by focussing on anticipatory network interventions in addition to planned interventions likely to be delivered in the period five to ten years in the future.

The LTDS includes a Network Development Proposals section providing the following details on network development proposals within five years of publication and for which finance has been secured:

- Work to be carried out
- Expected timescale
- Impact on the distribution network

The Network Development Report element of the NDP works well with this in that the focus is later, but it is likely that the NDP will reflect planned schemes in that they will be factored into the capacity underlying the assessments reported in the Network Headroom Report.

The ECR includes descriptions of planned network reinforcements required to connect customers of 1MW or more, along with their completion date. Both general and connections driven reinforcements are listed if a connection is contingent of completion of the work. Covering all voltages, the monthly update of the ECR is well suited to the shorter time required to complete reinforcement of lower voltage distribution networks and the frequency that reinforcements are needed to accommodate new connections. Longer time between updates would be less suitable because modifications to 11kV distribution networks are typically completed within months. The Network Development Report's focus on development plans for higher voltage networks and the biannual refresh is aligned with the years typically taken to design and construct 33kV and 132kV network reinforcements.

It is proposed that the format of the Network Development Report:

- Includes an introduction to the purpose of the NDP in accordance with Licence condition 25B;
- Includes accessible high-level descriptions of plans for network interventions and flexible service requirements;
- Has clear association of where the named schemes and services reside in terms of geography and network connectivity;
- Groups development proposals by grid supply point;
- Is likely to be in a pdf document format, possibly interactive, but always accessible to many parties;
- Uses nomenclature consistent with the LTDS data tables and schematics.

Alternatives will be reviewed with the ambition of future use of CIM;

The Network Development Report will be prepared every other year.

6.3.1 Future options

The use of a CIM model was proposed for future releases of the report but this would need to be on the basis of redacted data for private customers. As this technology has not been fully adopted by stakeholders, it is outside the scope of this current proposal.

6.4 NDP Methodology Reporting

In accordance with licence condition 25B.4, the NDP must provide transparency in how it provided its outcomes. Each DNO must:

Produce a methodology document to cover the end-to-end process
Provide sufficient detail to allow stakeholders understand sensitivities and extrapolate NDP results
The objective of the NDP is to be an integral part of DNO network planning and development, rather than simply being numbers produced for publication. Therefore, it is expected that the methodology used to prepare the data underlying the NDP shall be business as usual. Network assessment and planning practices shall be explained in sufficient detail to assist users understand developing plans by undertaking their own evaluations of the detailed information within the NDP Methodology.

It is proposed that the scope of the NDP Methodology to accompany the NDP includes:

Description of the end to end process shown in Figure 6.
Assumptions, for example those on the export from existing and accepted generation connections;
References to published data and network parameters;
DFES/"best view" forecast methodologies;
Network analysis and assessment methodologies;
Standard network design and operation of all voltage levels and the nature of alternative network interventions including typical equipment ratings.
The format will consist of the following:

Readily accessible data in a manner coordinated with other network operators;
Standalone document which is set up to not require significant updates each year.

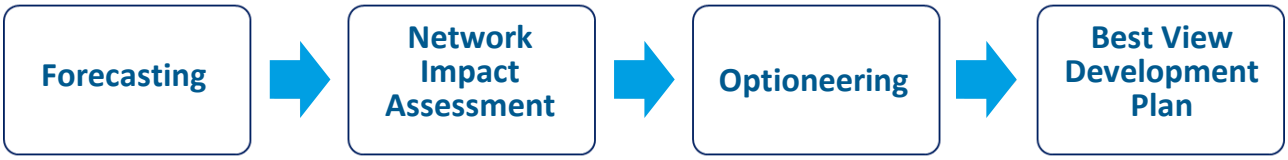


Figure 6: Network planning end-to-end process

6.4.1 Forecasting

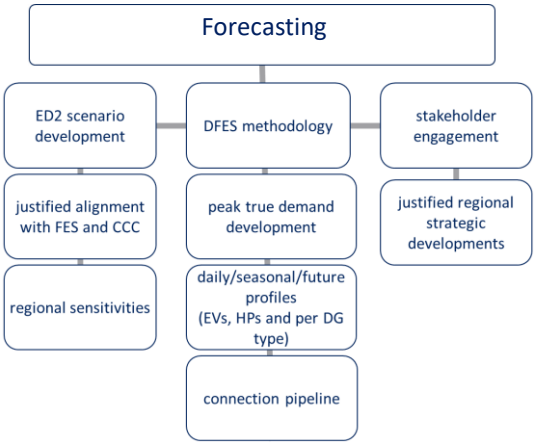


Figure 7: High-level components of forecasting methodology

The NDP Methodology will explain how DNO regional forecasts are developed and describe the building blocks that underlie the forecasting approach. The NDP Methodology document is expected to cover the high-level aspects of how forecasts are created as shown in Figure 7.

The NDP Methodology shall explain what parameters are forecast, the steps taken to create the forecasts and how they are informed, alongside descriptions of the adopted scenarios. It shall detail what differentiates a "best view" forecast from those which define the range of an uncertain future, in particular how policy, stakeholder engagement and local characteristics are considered.

Electrical demand forecasts are particularly important for informing network development plans and therefore it is also important that their creation is thoroughly explained. Daily and seasonal profiles for assumed electrical consumption and generation shall be detailed alongside the process of converting predicted volumes of new Low Carbon Technologies (LCTs) into additional electrical power flows. Description of the forecasting methodology shall also include how connection pipelines of accepted connection offers not yet connected or realised are included in forecasts.

Where appropriate, reference should be made to published DFES reports for efficient description of DFES methodologies.

6.4.2 Network Impact Assessment

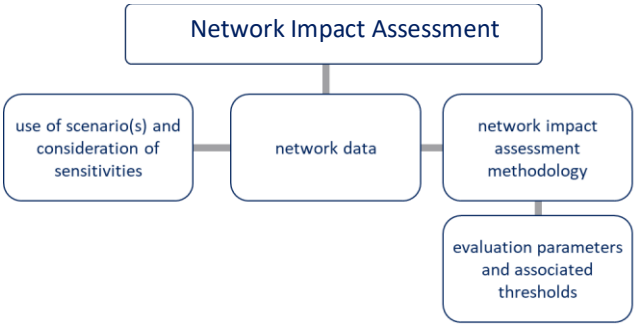


Figure 8: High-level components of network impact assessment processes

The NDP Methodology shall explain how forecasts are applied to understand whether the forecast electrical needs of customers can be accommodated within existing distribution networks. Figure 8 shows the high-level

components of network impact assessments that are expected to be covered in the NDP Methodology document.

The parameters evaluated during network analysis and pertinent network data which have a significant impact on assessment outputs shall be described at a high level, including reference to data publications where relevant, recognising the benefits of transparency. Use of monitored network parameters and smart meter data shall be explained alongside key assumptions used in the absence of measurements. Factors used to identify the need for network interventions shall be detailed along with the associated thresholds.

6.4.3 Optioneering

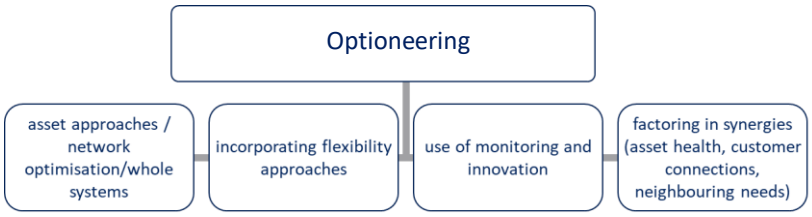


Figure 9: High-level components of optioneering processes

The overarching approach to network reinforcement should be described, drawing out how this manages the range of possible future demand scenarios and the associated network impacts. Figure 9 shows the high-level components of the optioneering process that are expected to be covered in the NDP Methodology document.

The process for identifying and assessing credible network reinforcement options to address fault level, voltage, power quality and thermal issues will be described. All solution types should be included for example, the use of flexible services to postpone upgrading equipment and the application of innovation and monitoring to provide data to inform subsequent more substantial intervention at an appropriate time to avoid asset stranding. This section of the NDP Methodology should include discussion of solutions benefits, timing and risks.

6.4.4 Best View Development Plan

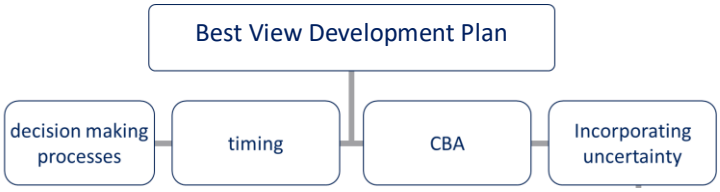


Figure 10: High-level elements of network development planning process

Alternative options for what solutions to apply to our network are assessed and compared to decide the most appropriate solution and what is included in the “best view” network development plan. The NDP Methodology shall cover the high-level components of this network development planning process as shown in Figure 10.

It will be explained how the “best view” and other scenarios are used together in the development of robust network development plans. This shall include how consideration of the “best view” forecast and other scenarios are used to ensure that options for responding to an uncertain future are not foreclosed but avoiding stranded assets and investing too early. Approaches for the development of optimal development plans considering synergies with other load and non-load network needs will be explained. This description should include how plans are created to avoid inefficient disruptive piecemeal development.

7. NDP FoS Governance

Governance of the NDP FoS is required to ensure consistency in future DNO reports. This is particularly important during a period of evolution of how networks are operated including customer participation. The NDP FoS should be enhanced and modified going forward to reflect stakeholder feedback and adjusted to meet their new requirements. Other enhancements could come through the incorporation of new DNO data, such as data for lower voltage networks, and new capabilities, such as the use of CIM for sharing future network configurations in model format.

The expectation that the NDP FoS needs to change over time means that the associated governance must permit this flexibility to quickly deliver benefits from advancements in DNO capabilities, incorporate further stakeholder needs and make changes incorporating learnings from the stakeholder engagement required by Standard Licence condition 25B. The governance needs to allow the NDP FoS to be agile and should not involve lengthy change processes.

Ofgem are responsible for the LTDS FoS through its association with Standard Licence condition (SLC) 25. Consequently, there is a formal and lengthy process for updating the LTDS FoS. Such a governance process may be a barrier to the agile development of the NDP FoS and therefore is not ideally suited.

Governance through the ENA is a preferable alternative because it would allow changes to be made more quickly whilst involving all DNOs through a working group. Consideration should be given to defining the NDP FoS in an Engineering Recommendation, including it under the governance of the Distribution Code Review Panel by listing it in an Annex or instead making it an ENA guidance document which continues to be owned and kept under reviewed as an Open Networks project product.

8. Stakeholder Engagement and Feedback

Our proposals for the NDP FoS were developed through the WS1B P5 working group involving all DNOs and representatives from the ESO and TOs, with all parties helping to shape the proposal to maximise stakeholder value and to ensure deliverability.

Further review and feedback has also been sought from a range of stakeholders. The NDP FoS has been shared with the Open Networks Steering Group and Advisory Group, along with engaging with wider stakeholders as shown in Figure 11.

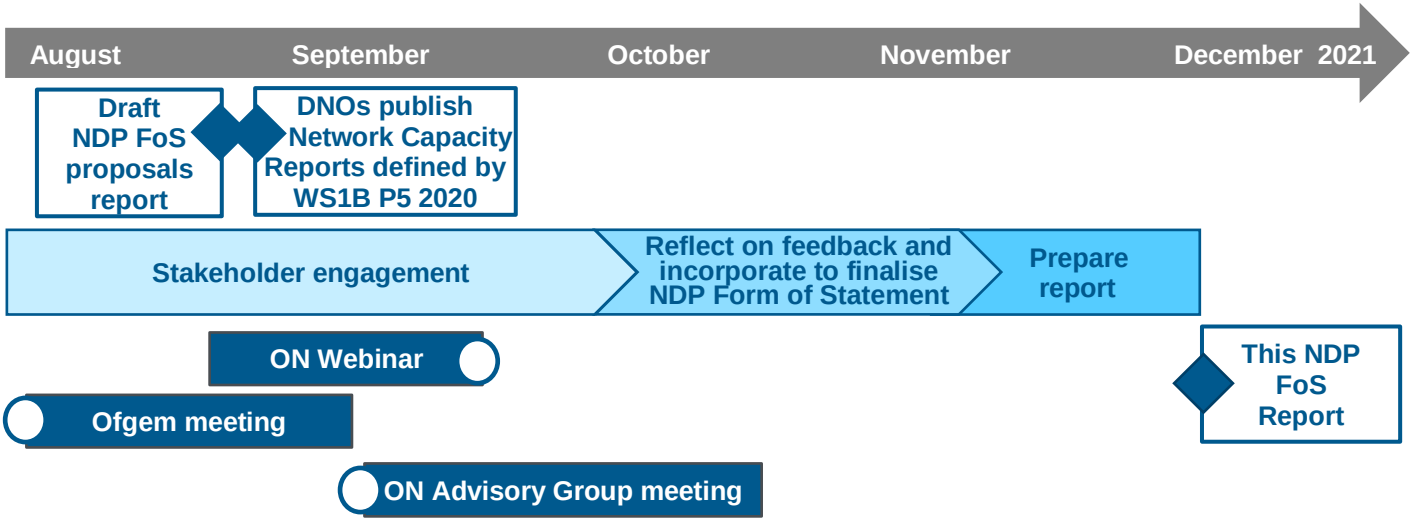


Figure 11: WS1B P5 stakeholder engagement programme

All DNOs published their Network Capacity Report by the end of August 2021 in accordance with the commitment made last year through WS1B P5. Engagement around these publications was used as an opportunity to seek feedback on the proposals for the NDP FoS.

In addition to this, a number of activities were undertaken in parallel to maximise stakeholder benefit and allow for feedback on the development of the NDP FoS:

- The proposed NDP FoS was presented to the Open Networks Advisory Group and ON WS1B committee.
- A webinar was hosted through the ENA in September 2021, signposting the 'Proposals for the Form of Statement of Network Development Plans' report and highlighting each DNO's respective Network Headroom Report
- A Microsoft form was sent to all attendees detailing questions relevant to the FoS to allow for stakeholder feedback

To ensure that the feedback received was constructive and relevant, the following questions were asked to stakeholders based on the Network Headroom Report (NHR), Network Development Report (NDR) and NDP Methodology elements of the NDP. A summary of the feedback based on these questions is provided in Table 5.

Table 5: Stakeholder feedback questions

Number	Question	Summary of feedback received

1	NHR: Is there value in of reporting network capacity to 2050?	Reporting network capacity to 2050 is valuable if all network investments and methodology are transparent.
2	NHR: Are there advantages in reporting network capacity for multiple scenarios?	Yes, if they come with corresponding stated assumptions on the network investment needed and the inputs on which those investment decisions and costs were based.
3	NHR: Is it useful to update the NHR annually in accordance with the DFES?	Yes, an annual update is useful or corresponds with other published reports
4	NHR: Is there enough clarity and awareness of how the various capacity reporting work together?	More clarity is required in terms of the nature of the constraint and the affected asset. HV feeder headroom would be useful.
5	NHR: What are your views on an Excel format and the future implementation in CIM?	This is the right format at present due to the universal nature of the application.
6	NDR: Does the proposed reporting of larger scale interventions (primary and above) meet your requirements for long-term visibility of network and development planning?	A high-level overview of larger scale interventions is appropriate but local benefits come from understanding constraints at the HV feeder level.
7	NDR: Is it clear how this part of the NDP fits in with embedded capacity register/LTDS/flexibility service tenders etc?	The methodology document will need transparency on where the figures have come from and how the respective reports fit together.
8	NDR: Does it provide adequate instruction/detail of proposed interventions?	Yes, this detail is adequate
9	NDP Methodology: What do you want out of the proposed Methodology part of the NDP?	How a DNO's understanding of network data and customer behaviour are being applied in the methodology and how these influence network plans.
10	NDP Methodology: Can variances in DNO approaches due to software and data availability be accommodated if well explained in the methodology?	Not yet clear, once the NDP's have been published the delta maybe understood.
11	Do you see any further opportunities for the detailed scope of the NDP?	The scope of the NDP should be reviewed with Stakeholders during years 1 and 2 so reactive updates can be applied.

The overall feedback from stakeholders was positive around what the NDP is trying to achieve and provide in terms of stakeholder value. Stakeholders view that a key part of success for the NDP is the quality of the NDP Methodology and how it informs stakeholders of the decision-making process and what has been considered. Standardisation in approach between DNOs was welcomed/ Visibility further downstream of the lowest voltage at primary substations was also mentioned and a commitment has been given to review this in further iterations of the NDP FoS in the future.

9. Feed forward

9.1 Learnings relevant to the LTDS review

Ofgem and the associated working group are currently reviewing the LTDS. Their objective is to update the LTDS by addressing the interoperability of network data to improve the sharing of planning data and so provide stakeholders with greater understanding of opportunities on the network.

The introduction of the NDP and update of the LTDS provide an opportunity to bring together sharing of network capacity information to optimise stakeholder utility and deliver efficiencies in their reporting. The expected LTDS updates have much synergy with the NDP objectives and therefore it is important to consider the way that the LTDS and NDP work together. Duplication and potential contradictions in reporting network capacity must be avoided to prevent confusing stakeholders.

The development of the NDP FoS has identified how the NDP overlaps and dovetails with the scope of the LTDS content based on the current FoS as shown in Figure 12. Consideration of where there are matches highlights potential for simplifying reports, avoiding repetition, merging reports and layering information. The development of the NDP FoS has considered the LTDS to ensure coordination, however, the LTDS review can consider further holistic network capacity reporting.

The five to ten-year network development reporting within the NDP clearly follows on from the nought to five-year period covered by the LTDS. Also, both require identification of network capacity, so there is overlap because we are proposing that the NDP FoS covers the whole period for consistency. The network parameters detailed in the LTDS are key to understanding the network capacity reporting within the LTDS and therefore it is critical that the NDP is matched to the latest LTDS as required by the new licence condition. It may be appropriate to merge some aspects of the LTDS and NDP to provide users with one comprehensive source of information. Despite overlapping the LTDS, the proposed NDP FoS goes beyond the requirements of the licence condition, for example by giving network capacity values from year 1 to up to 2050, so that users don't have to access two sources of information.

DNOs are currently required to publish their LTDS by the end of November and partial updates are provided in May each year. Whereas, the NDP Licence condition requires its publication before 1 May every two years from 2022. Availability of a complete year of network data covering the period of winter maximum sets the natural heartbeat to annual DFES forecasting and the subsequent network analysis utilising these forecasts as shown in Figure 13. The NDP fits with this timeline because the future network capacity reporting element requires the latest DFES forecasts and enough time must be allowed for the mandated engagement. Future network development reporting is built on network assessments which also require consideration of forecasted demand and generation levels even though network planning is an ongoing process due to the continuous nature of customer connections and new asset health information.

The publication timescales of network capacity reports should be co-ordinated to allow for the efficient flow of data from the FES, through the DFES and utilisation in the NDP and LTDS network capacity reports. The LTDS network data changes less quickly and therefore the month that it is reported each year is less critical. In future, the 1st May NDP and 31st May LTDS partial update timelines could be aligned in a single publication, subject to the outcome of the LTDS review

The mismatch between the requirement to update the LTDS every year and the NDP every second year is addressed in our proposed NDP FoS by suggesting that the network capacity (headroom) reporting part of the NDP is updated annually.

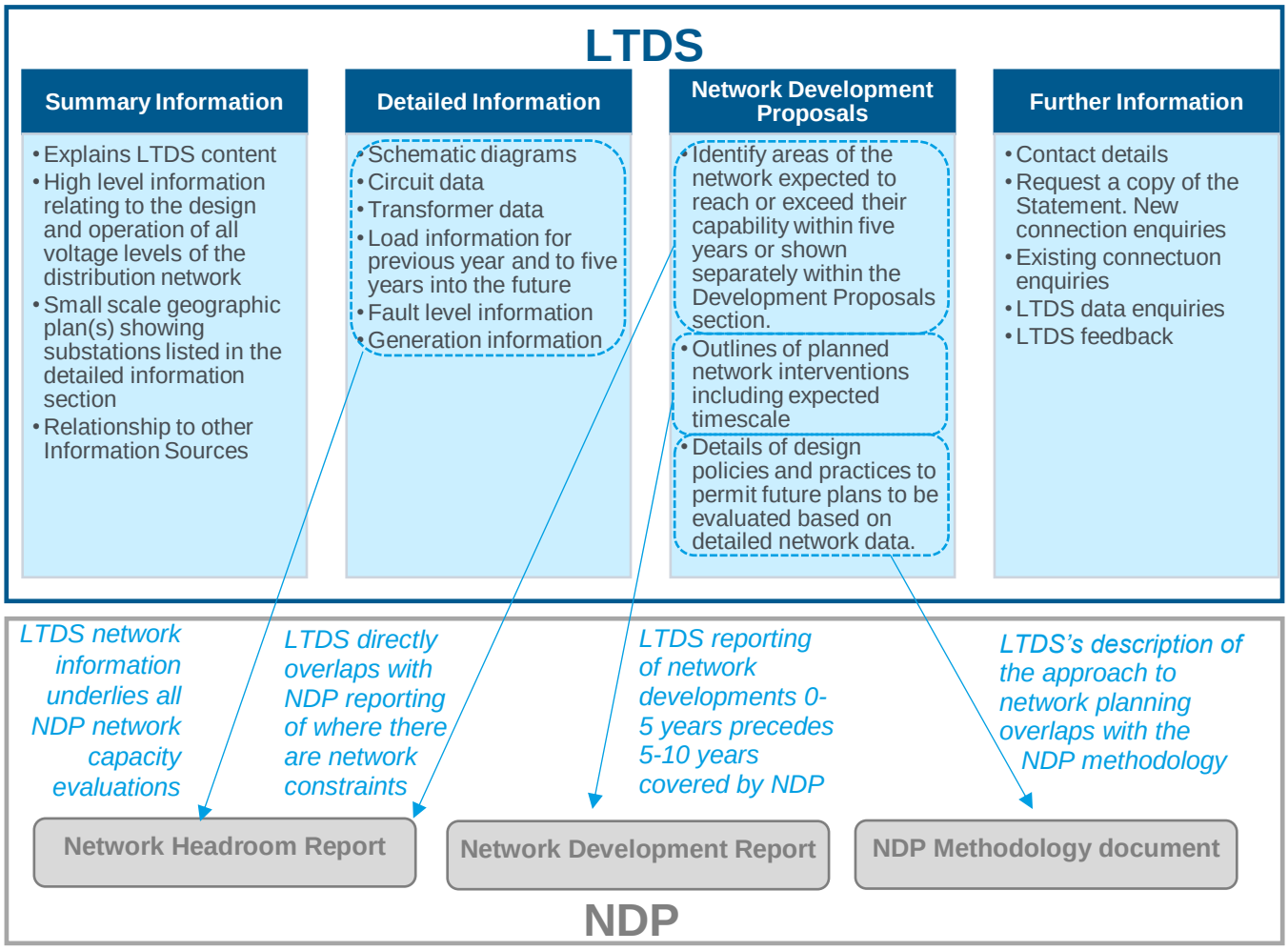


Figure 12: LTDS content based on current FoS and relationship with NDP

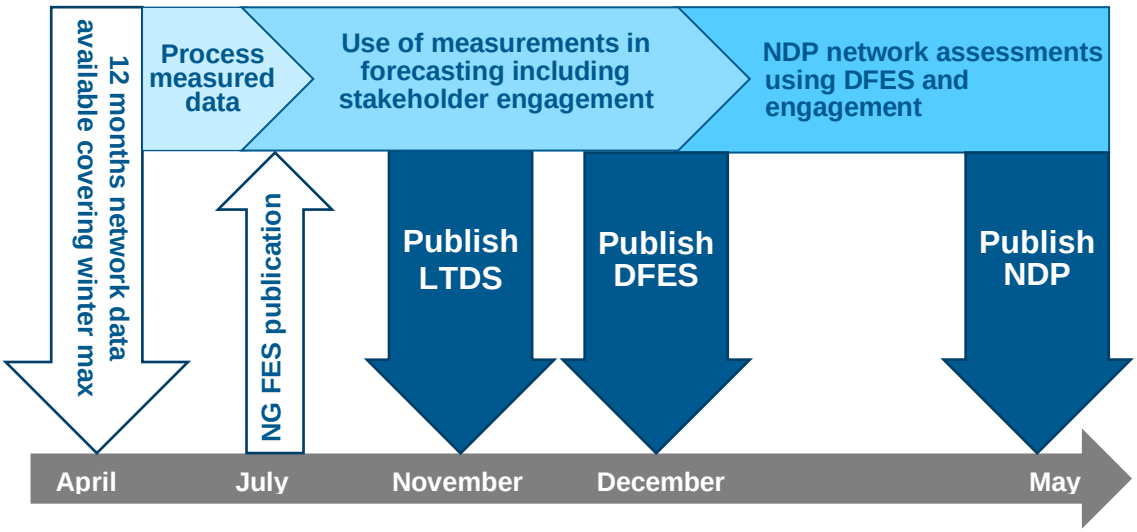


Figure 13: LTDS, DFES and NDP timeline.

9.2 Distribution network capacity in relation to existing transmission network capacity reports

National Grid ESO (with input from the TOs) publish a range of reports (as shown in Figure 14) to give a view of future requirements and the capability of the GB transmission network as well as recommendations on network development that should 'Proceed' during the coming year. There are similarities between the scope of the DNO and the National Grid ESO documents, but also differences in detail such as the timelines and the information they include.

Capacity to connect onto distribution networks can be affected by the availability of capacity on the transmission network. To understand the risks and opportunities of their projects, connecting customers need to understand the interaction between capacity on distribution and transmission networks because it can potentially be more expensive and take longer to resolve transmission constraints. For example, a customer would benefit from early indications if a potential connection to a distribution network would depend on replacement of transformers at the transmission interface which could take several years to complete.

Interaction with current/future transmission network reporting has been considered in the development of the NDP FoS.

Future capacity at transmission interfaces is excluded from the proposed NDP FoS because the NDPs will be DNO documents and DNOs are not able to judge the capacity at the interface points owned and operated by TOs and NGESO respectively. This mainly applies to the future demand capacity because many DNOs are including indications of the generation headroom currently available at transmission interface points as managed through the trial exchange of data with NGESO known as the Appendix G process. The CUSC Workgroup Meeting (CMP298) "Updating the Statement of Works Process to Facilitate Aggregated Assessment" raised by National Grid ESO aims to incorporate the Appendix G process in the CUSC. One objective of the modification is to provide indications of realistic levels of available capacity rather than Appendix G's blocks of capacity which do not provide users with information as to what limits apply after this.

Figure 14: National Grid ESO data and capacity reports/information sources

*NOA Pathfinder projects are currently used to investigate solutions for specific network issues out with the standard NOA process, and therefore can also provide an indication of the capacity for the part of the transmission network under investigation.

The Future Energy Scenarios (FES), The Electricity Ten Year Statement (ETYS) and Network Options Assessment (NOA) reports all relate to transmission network planning processes. The ETYS identifies transmission network constraints based on power flow results based on FES forecasts, whilst the NOA presents Cost Benefit Analysis outcomes which justify network development decisions. However, they do not include current/future transmission network headroom or available network capacity for new connections at individual transmission sites. A transmission headroom report would fill the gap and stakeholders would have a more

complete picture of the capacity available on distribution networks. Some TOs already publish voluntary reports on network capacity showing areas of available headroom on their network. However, consistency in reporting for all transmission networks would help stakeholders further.

There are processes for DNOs to commission bespoke assessments of transmission capacity to accommodate specific connections, but these take time and are subject to application fees. Readily available information in the form of heat maps, planning limits and forecast future headroom values, like the proposed NDP, could give customers a useful immediate indication. Headroom/capacity reporting could either be brought into an existing report or a new document created, if this is to be published by the ESO. Alternatively, each TO could publish their own network capacity and network development report.

It is recommended that reporting of network capacity at interface points is reviewed to provide consistency between DNOs and TOs/NGESO to increase stakeholder utility by improving how distribution and transmission reports work together. There is value in understanding where the interactions and touch points should exist between the transmission and distribution planning processes to ensure a continued focus on delivering whole system solutions where it is in consumers' interests to do so.

10. Conclusions

WS1B P5 have followed a step-by-step methodology to develop proposals for a the NDP FoS, beginning with assessing stakeholder needs.

The proposed FoS for the NDP that DNOs are required to publish from May 2022 in accordance with Licence condition 25B has been broken into three standalone documents, namely:

Network Headroom Report;
Network Development Report; and
NDP Methodology.
Its purpose is to provide stakeholders with relevant information about the network to understand where there is capacity and where reinforcement and/or flexibility is required. The scope and format for each part has been assessed in how best to deliver information to stakeholders.

It is proposed that Network Headroom Report will be based on the DFES scenarios as a minimum, plus a best view scenario as appropriate. Reporting future network capacity for multiple scenarios rather than one is proposed to help capture higher levels of uncertainties. Demand and generation headroom shall be reported every year for the first ten years, and from ten years in the future up to 2050 in five-year intervals. A spreadsheet format is proposed to ensure that the information can be accessed by most users.

The proposed Network Development Report contains descriptions of aspects of plans including stage of approval, where work is intended to be carried out, when interventions are expected, scope of the work and the benefits to be delivered. A pdf document format is proposed to again provide access to most parties.

Both the Network Headroom Report and Network Development Report will be supported by a NDP Methodology document. It is proposed that it shall describe the end to end process which DNOs have used to first assess network capacity and then identify appropriate network development plans. It shall identify data sources and assumptions employed alongside planning practices to assist a user to assess potential future development of the distribution network.

11. Form of Network Development Plan

This form of statement relates to the Network Development Plan (the "NDP") published in accordance with standard distribution licence condition 25B.

The "NDP" comprises three standalone reports:

1) Network Development Report,
2) Network Headroom Report, and
3) NDP Methodology.

All parts are published free of charge on the Licensee's website without the need for registration of user details. Together the parts provide comprehensive information on future distribution networks with sufficient background to understand the scope of the information and how it was prepared, thus allowing further analysis.

Content of the NDP

Network Development Report

The Network Development Report section of the NDP describes parts of the network requiring intervention in the next five to ten years, in particular upcoming flexible services to be employed and options for new infrastructure. For context, it may need to recap the developments up to five years ahead as described in the last Long Term Development Statement (November), or highlight changes in capacity or developments about to be published in the update to Long Term Development Statement (May).

The Network Development Report section includes an introduction to the purpose of the NDP in accordance with Standard Licence Condition 25B.

High level plans for network interventions and flexible service requirements of 132kV networks to the lower voltage of primary substation, are to be described including;

- Justification for the need for network developments, including the nature of any constraints and the benefits provided by interventions;
- Where each development resides on the delivery lifecycle (signposting, approved plan with secured financing, in delivery, planned for delivery etc.);
- Where a part of an interconnected network is expected to be constrained, this may be highlighted as requiring further study to evaluate whole systems approaches, such as a Regional Development Plan;
- Necessary details of the best view requirements for flexibility services and new infrastructure developments are tabulated below.

Flexibility services	**New infrastructure**
• Magnitude • Expected timescale • Voltage • Location of the requirement • Nature of requirement / flexibility product type, for example post or pre-fault • Nature of the service, for example demand-side response, energy efficiency, or other alternative to asset-based reinforcement	• Expected timescale • Details of connectivity including voltage • Asset quantities approx. circuit lengths, number of transformers etc • Equipment ratings • Approximate geographical locations and options for possible circuit routes

Network Development plans shall be grouped by Grid Supply Point and use nomenclature consistent with the LTDS data tables and schematics. The Network Development section is published in a format suitable for use by other parties, typically Adobe PDF format, possibly with interactivity to improve user access.

Network Headroom Report

The Network Headroom Report part of the NDP indicates where it is anticipated that there will be network capacity to accommodate future connections and where flexibility services may be required. Presented in tabular form, it is defined as follows:

Date range	Every year to be covered individually between 1-10 years.
	After the 10th year, this requirement moves to every five years up to 2050 or aligning with the final year of the DFES forecast.
Scenarios	DFES scenarios, plus a 'best view' scenario.
Network capacities and assessment methodology	Demand and generation headroom (available capacity) in MW per reported year per scenario.
	Headroom calculations are considerate of financially approved network developments in delivery or planned for delivery, including asset-based enhancements and the use of flexibility services. This may include updates in network developments in the timeframe 0-5 years which were not included in the latest LTDS (November). If included, this must be stated in the accompanying notes and updated in the next LTDS (end May).
	Headroom calculations are considerate of thermal loading and fault level constraints as a minimum.
Coverage	Capacity information is provided for substations where the greatest voltage is greater than 20kV. This is normally BSP and primary substations down to and including the primary secondary voltage, typically HV (20kV, 11kV or 6.6kV).
Format and publication	The format of the Network Headroom Report part of the NDP is tabular in nature, presented in Microsoft Excel or similar spreadsheet format. Interactivity can be added to the workbook to improve visualisation of the data. Guidance shall be included to explain the scope of the data workbook, define each data element and give user instructions. A contents and version control page is included to ensure that users are able to easily access data, accurately reference the report and view approvals. It also states the dates and versions of critical data sources including the LTDS and DFES.
	Licensees shall endeavour to refresh the Network Headroom Report with the latest Licensee's data annually, including the years in between publishing the whole NDP (which shall be published by 1st May every two years).
Information sources	Parameters for the existing network underlying the headroom calculations shall be based on the latest LTDS and incorporate a view of financially approved and planned interventions.
	Existing and future network demand and generation shall be based on the licensee's latest LTDS and DFES forecasts for demand and generation at the substation.

	It is expected that the flexibility services incorporated in the NHR shall be in accordance with DNO Flexibility Procurement Statements and Reports or if not included in those reports, they must be stated in the accompanying notes. Publication of Flexibility Procurement Statements and Reports is a new Standard Licence Condition 31E, and reporting detail is yet to be finalised, but will likely include the location and magnitude of contracted and prospective flexibility services.

The format of the Network Headroom Report is to be consistent with the table below for each scenario and year covered by the report.

Substation Name	Voltage kV	BSP Group	GSP	Substation location	Demand Headroom MW	Generation Headroom MW

NDP Methodology

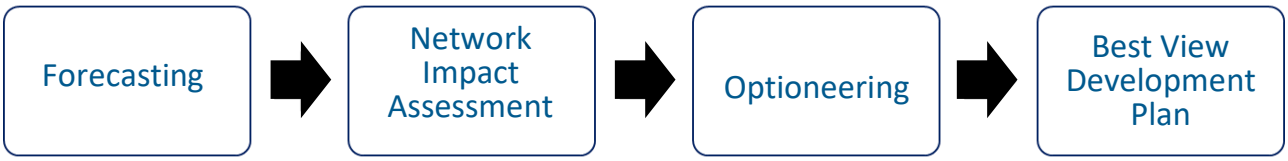
The NDP Methodology explains how the headroom in the Network Headroom Report was calculated and how network requirements in the Network Development Report are decided. It describes the business-as-usual end-to-end processes underlying the NDP as an integral part of DNO network planning and truly reflective of best view developments. Sufficient detail is provided to allow stakeholders to understand sensitivities and extrapolate the NDP results. This includes details of the assumptions made by the licensee in preparing the NDP.

The NDP Methodology is a standalone document which may not require significant update at each publication. It will be in a format suitable for use by other parties, typically Adobe PDF format.

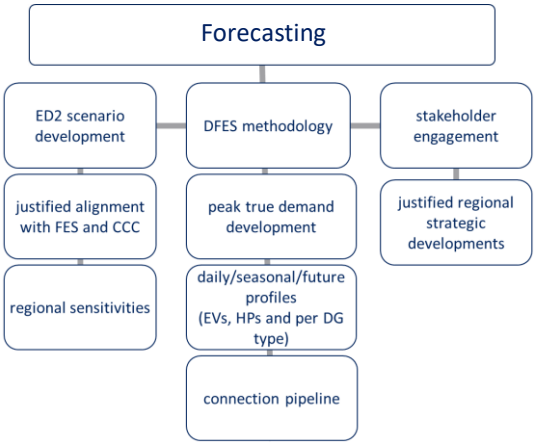
At a high level, the scope of the NDP Methodology includes:

- Relevance of the reported parameters;
- Description of the end to end process shown below;
- References to published data and network parameters;
- Assumptions, for example those on the export from existing and accepted generation connections;

Network planning end-to-end process:



Forecasting

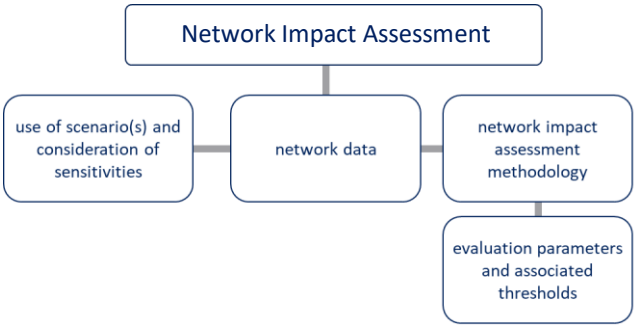


The NDP methodology explains how DNO regional forecasts are developed and describes the building blocks that underlie the forecasting approach covering the high-level aspects of how forecasts are created as shown above. Specifically this includes; what parameters are forecast, the steps taken to create the forecasts and how they are informed, alongside descriptions of the adopted scenarios. It details what differentiates a “best view” forecast from those which define the range of an uncertain future, in particular how policy, stakeholder engagement and local characteristics are considered.

Daily and seasonal profiles for assumed electrical consumption and generation are detailed alongside the process of converting predicted volumes of new Low Carbon Technologies (LCTs) into additional electrical power flows. Description of the forecasting methodology also includes how connection pipelines of accepted connection offers not yet connected or realised are included in forecasts.

References to published DFES reports may be made for the efficient description of DFES methodologies.

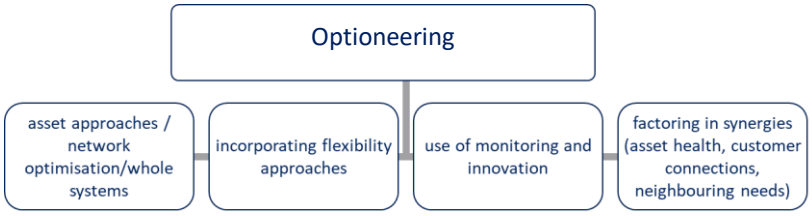
Network Impact Assessment



The NDP Methodology explains how forecasts are applied to understand whether the forecast electrical needs of customers can be accommodated within existing distribution networks. The high-level components of network impact assessments shown above are expected to be covered.

The parameters evaluated during network analysis and pertinent network data which have a significant impact on assessment outputs are described at a high level, including reference to data publications where relevant. Use of monitored network parameters and smart meter data is explained alongside key assumptions used in the absence of measurements. Network limitations used to identify the need for interventions are detailed along with the associated thresholds.

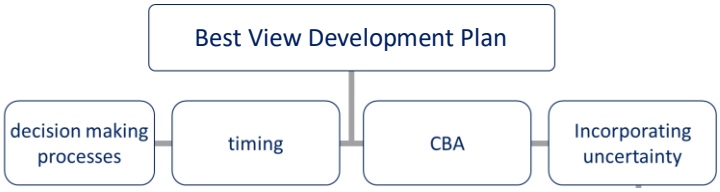
Optioneering



The overarching approach to network reinforcement is described based on the high-level components of the optioneering process as shown above, drawing out how this manages the range of possible future demand scenarios and the associated network impacts.

The process for identifying and assessing credible network reinforcement options to address fault level, voltage, power quality and thermal issues is described. All solution types are included for example, the use of flexible services to postpone upgrading equipment and the application of innovation and monitoring to provide data to inform subsequent more substantial intervention at an appropriate time to avoid asset stranding. This section of the methodology includes discussion of solutions benefits, timing and risks.

Best View Development Plan



The NDP Methodology covers the high-level components of how best view development plans are created as shown above. It explains how alternative network solutions are assessed and compared to decide the “best view” network development plan.

It explains how the “best view” and other scenarios are used together in the development of robust network development plans. This includes how consideration of the “best view” forecast and other scenarios are used to ensure that options for responding to an uncertain future are not foreclosed but avoiding stranded assets and investing too early. Approaches for the development of optimal development plans considering synergies with other load and non-load network to avoid inefficient disruptive piecemeal development are explained.

Standard network design and operation of all voltage levels including typical equipment ratings are detailed.

APPENDIX 1 – PROCESS FOR ASSESSING TREATMENT OF CUSTOMER SPECIFIC INFORMATION

The following process should be adopted for information that the licensee considers to fall into the categories referred to in standard licence condition paragraph 25B.6;

- "seriously and prejudicially affect the commercial interests of the licensee or any third party"
- "breach of standard condition 42 (independence of the distribution business and restricted use of confidential information)"

Q1. Does the information need to be disclosed by the licensee to fulfil the obligations under SLC 25 of the distribution licence? **YES** Not in breach of Section 105 of the Utilities Act 2000 or SLC 39 of the distribution licence **NO** Omit the information from the Statement
Q2. Does the information relate to an individual (i.e. not to a company)? **NO** Data Protection Act does not apply **YES** Licensee must be satisfied that disclosure of the information complies with the Data Protection Act
Q3. Does the customer object to disclosure of the information? **YES** **NO** Include the information in the statement
Q4. Can the customer's objection be resolved by the licensee presenting the information in a different format in the Statement? **NO** **YES** Include the information in the Statement in that format
Q5. Would the customer accept that the information would be made available following a specific request from a user of the Statement? **NO** **YES** Reference information in the Statement and provide it to any user who specifically requests it
Q6. Refer matter for determination by the Authority under paragraph SLC 25B.6 of the distribution licence providing details of the specific issue and discussions between licensee and customer. In considering its decision, the Authority may choose to contact the customer directly.

Note:
Where such information may be involved, it is essential that this process is started early enough to enable any issues to be resolved without causing a delay to the publication of the Statement.

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