

Open Networks Project

Proposed DNO Standard Network Capacity Report

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WS1B P5

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1. Introduction

1.1 About ENA

Energy Networks Association (ENA) represents the owners and operators of licenses 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.

ENA's overriding goals are to promote UK and Ireland energy networks ensuring our networks are the safest, most reliable, most efficient and sustainable in the world. We influence decision-makers on issues that are important to our members. These include:

- Regulation and the wider representation in UK, Ireland and the rest of Europe
- Cost-efficient engineering services and related businesses for the benefit of members
- Safety, health and environment across the gas and electricity industries
- The development and deployment of smart technology
- Innovation strategy, reporting and collaboration in GB

As the voice of the energy networks sector, ENA acts as a strategic focus and channel of communication for the industry. We promote interests and good standing of the industry and provide a forum of discussion among company members.

1.2 Our members and associates

Membership of Energy Networks Association is open to all owners and operators of energy networks in the UK.

- ▶ Companies which operate smaller networks or are licence holders in the islands around the UK and Ireland can be associates of ENA too. This gives them access to the expertise and knowledge available through ENA.
- ▶ Companies and organisations with an interest in the UK transmission and distribution market are now able to directly benefit from the work of ENA through associate status.

1.2.1 ENA members



1.2.2 ENA associates

- [Chubu](#)
- [EEA](#)
- [Guernsey Electricity Ltd](#)
- [Heathrow Airport](#)
- [Jersey Electricity](#)
- [Manx Electricity Authority](#)
- [Network Rail](#)
- [TEPCO](#)

1.3 Open Networks Work Stream 1B Product 5

Open Networks is transforming our 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 P5¹.

WS1B Product 5 builds on the common understanding of forecasting scenarios produced through Product 2 to consider how distribution network capacity is evaluated and reported.

WS1B Product 5 aims to increase stakeholder utility by standardising how network companies evaluate available network capacity and signpost network capacity shortfalls. Inconsistency in present DNO evaluation methodologies and presentation of results is perceived to confuse stakeholders whom the industry looks to further engage with as part of facilitating a more decentralised, smarter and lower carbon electrical system in future. Uniformity in network capacity analysis and reporting will allow stakeholders to assimilate and act upon results more efficiently, thus enabling greater synergy to facilitate whole system planning.

WS1B P5 proposes a common approach of evaluating and reporting network capacity along with a standardised approach for publicising when and where network capacity is exceeded and where there may be a need for network intervention.

This report forms Product 5's second deliverable. Section 2 describes the methodology followed to develop the Standard Network Capacity Report considering the context outlined in section 3. Section 4 describes the proposed Standard Network Capacity Report with supporting justification and why alternative options were discounted. A plan for implementation is presented in section 5 with conclusions and next steps in section 6.

¹ [https://www.energynetworks.org/assets/images/Resource%20library/ON20-PRJ-Phase%204%20PID%20Post-Consultation-v2%20\(published\).pdf](https://www.energynetworks.org/assets/images/Resource%20library/ON20-PRJ-Phase%204%20PID%20Post-Consultation-v2%20(published).pdf)

2. Executive Summary

Data is crucial to the transformation to a low carbon, affordable, flexible and digital energy system. Further benefits to customers will be delivered through the expansion of network capacity information to signpost areas most suited to new connections and where there are network issues potentially benefitting from flexible services.

Aligned with a range of industry initiatives for improving data access, this second WS1B P5 report describes a proposed Standard Network Capacity Report that will be shared with stakeholders to articulate network needs. P5's scope and programme are outlined in the Open Network's Project Initiation Document (PID) ².

The proposed Standard Network Capacity Report will help industry participants by providing insights into future network headroom. This will enable connections to locate in the most advantageous areas, identify when and where issues occur and develop targeted mitigations.

The Standard Network Capacity Report has been developed by a team of network owner and operator experts. It builds on WS1B P2's standardised Distribution Future Energy Scenarios (DFES) which will deliver consistent forecasting of future network demand and generation. Together P2 and P5 are delivering uniformity in the first two steps in network investment decision making, helping to provide transparency in DNO processes.

The format of the Standard Network Capacity Report was developed through an analysis of existing network capacity reports and a survey completed by all DNOs. The content, evaluation methodologies and presentation of data have been developed to increase stakeholder benefits.

The report is defined as follows:

Date range	To 2050
Reporting granularity	Every year for the first ten years and then every five years
Forecast scenarios	DFES scenarios and other scenarios used in network planning
Reported headroom	Demand and generation;
Network coverage	Distribution voltages down to the secondary of primary substations (typically 11kV)

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

Parameters underlying headroom calculations	Thermal loading, fault level and voltage where practical
Evaluation methodology	Detailed analysis for the short term where practical, and simple tabular comparisons for the longer term
Format and publication	Excel spreadsheet hosted on DNO website

Plans for the implementation of the Standard Network Capacity Report have been affected by;

- Long Term Development Statement review
- ED2 Sector Specific Methodology
- New licence condition requiring DNOs to publish Network Development Plans (NDPs) in accordance with the Clean Energy Package.

The Standard Network Capacity Report will be published in 2021 but will not become an enduring yearly report. The outputs and learnings from the standard network capacity report will be used to inform the development of the Network Development Plan.

WS1B’s next steps will be a stakeholder consultation on the proposed format of the NDP including the Standard Network Capacity Reports. Interactions between the LTDS, NDP and DFES shall be further considered to ensure efficient DNO processes

3. Development Methodology

The proposed Standard Network Capacity Report has been developed via an integrated methodology involving all UK DNOs facilitated by the Open Networks project. The working group comprised network owners and operator experts with thorough understanding of the end to end process from forecasting customer choices and the associated electrical needs, through analysis of network impact and identification of appropriate solutions. Their knowledge of wider industry initiatives and developments including increasing technology, digitalisation and flexibility has also informed the work.

The initial step was a fact-finding survey on how the capacity of GB electrical distribution networks is currently evaluated and shared with stakeholders as documented in the first P5 report³. The survey characterised network capacity reports and established a range of possibilities for the Standard Network Capacity Report.

The following questions about current practices and alternative approaches were used to inform how standardisation would be best achieved:-

- Why do we do it this way?
- Could we do it differently?
- What would be the benefits or disadvantages of doing it differently?
- Would it be appropriate to standardise on this way?

The preferred option for a Standard Network Capacity Report was developed by first looking for gaps in the current provisions. It was identified that most evaluations of network capacity were on the basis of a single scenario focussing on the short term, whilst only DFES informed reports examined the impact of multiple scenarios and the long term to 2050, as shown in Figure 1. The next step was to consider additional benefits to potential audiences, before defining parameters and how the report would be published.

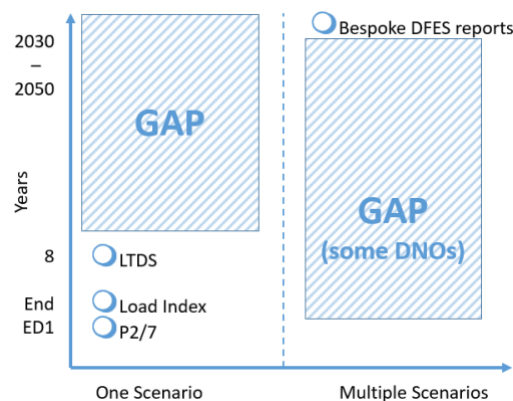


Figure 1: Gaps in current network capacity reporting

³ [https://www.energynetworks.org/assets/images/Resource%20library/ON20-WS1B-P5%20Final%20Report%20on%20Network%20Capacity%20Indications%20Survey%20\(PUBLISHED\).pdf](https://www.energynetworks.org/assets/images/Resource%20library/ON20-WS1B-P5%20Final%20Report%20on%20Network%20Capacity%20Indications%20Survey%20(PUBLISHED).pdf)

A strawman was used to debate the pros and cons of each potential option, explore DNO capabilities and stakeholder benefits to refine proposals and ultimately decide on the most appropriate reporting parameters and methodology. DNOs further checked the proposed Standard Network Capacity Report by checking the suitability and current implementation capability with a wider group within their organisations.

Wider perspectives and customer insights were gained by working with the Open Networks WS1B Steering and Stakeholder Groups.

At the Open Network Advisory Group Meeting held in July 2020, stakeholders confirmed that there was value in network capacity reporting for extended periods and multiple clearly defined scenarios. It was established that information on the assumptions within scenarios must be shared to inform developers of the sensitivities affecting flexibility needs in an area. This will facilitate assessment on whether the requirement is likely to endure or be displaced over time by reinforcement or other connections/disconnections/developments.

4. Proposed Standard Network Capacity Report within context

The ENA Open Networks project was initiated in recognition that a co-ordinated response was required for decarbonisation and the transformation to active networks necessary for customers to adopt low carbon technologies economically and efficiently. Other initiatives are also reviewing industry needs for stakeholder information to ultimately achieve net-zero, including the work of other Open Networks products.

The Standard Network Capacity Report proposed by WS1B P5 interacts with several ongoing Ofgem initiatives, as shown in Figure 2, which have different timescales. Possible overlaps and influences of the implementation of the Clean Energy Package, Long Term Development Statement review and the ED2 Sector Specific Methodology are considered in the following subsections.

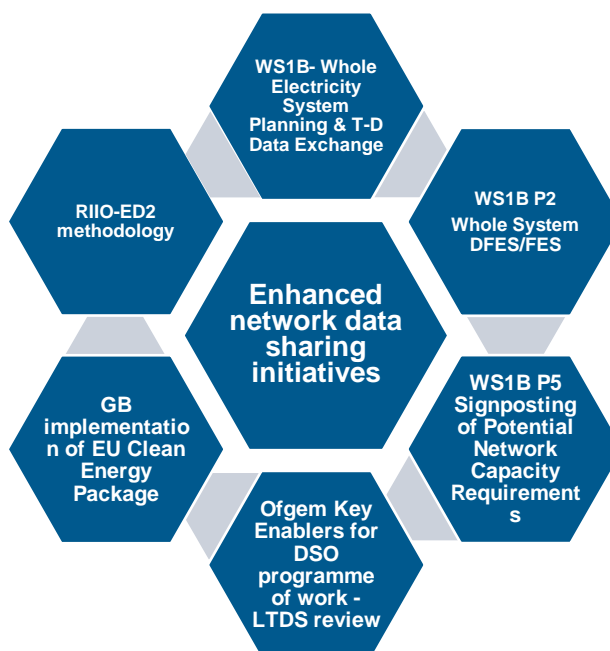


Figure 2: Network data sharing enhancement initiatives

4.1 Clean Energy Package

The Clean Energy Package (EU Directive 2019/944)⁴ comprises European legislation for a unified energy strategy for delivering the Paris agreement. This is now being implemented in GB law.

⁴ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0944&from=EN>

Legally entering into force by 31st December 2020, Ofgem are currently processing modifications to standard licence conditions for the implementation of the Clean Energy Package.

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.

Elements a and b are related to network capacity and overlap with P5's scope, so the development of P5's Standard Network Capacity Report has been cognisant of NDP requirements to ensure alignment.

Duplication of network capacity reporting is not desirable because it is inefficient and potentially confusing to customers. For this reason, it is not anticipated that the proposed Standard Network Capacity Report is published alongside any future NDP using the same analysis. Instead the Standard Network Capacity Report is seen as a trial to check processes, demonstrate capabilities and inform the development of the NDP template in co-ordination with the LTDS review.

NDP's required use of the most recent version of the LTDS and potentially a single scenario has been acknowledged by WS1B's P2 working group working on principles for distribution network forecasts. They will consider the development of a single scenario to produce a forecast to feed into P5's Standard Network Capacity Report and potentially subsequent NDP processes and reporting.

4.2 Long Term Development Statement, LTDS, Review

A recent letter⁵ from Ofgem outlines LTDS reforms informed by responses to their earlier consultation. It is reported that stakeholders welcomed changes to the LTDS as additional network data would facilitate DSO capabilities, thus also endorsing WS1B P5's proposal for a Standard Network Capacity Report. Ofgem will establish a working group to define the updates to the LTDS. The following are early indications of the content based on the outcomes from consultation;

⁵ <https://www.ofgem.gov.uk/publications-and-updates/next-steps-our-reforms-long-term-development-statement-ltlds-and-key-enablers-dso-programme-work>

- Sharing of network topology under a common and standardised model format
- Extension of the LTDS to the 11kV network
- Retention of the Excel format
- Requirement for heatmaps containing information for the five-year duration of the LTDS, including network headroom
- Geographical Information System (GIS) data to be downloadable

Ofgem's letter indicates that the LTDS changes will come into effect in Q2 2023 based on the need to modify Standard Licence Conditions with associated development and consultation phases.

The LTDS is one of the presently mandated reports available to stakeholders on network utilisation and capacity. Covering five years in the future, network capabilities are listed alongside current loading and fault levels to give an implicit indication of network headroom. Currently covering just one scenario, P5's Standard Network Capacity Report has looked to extend the content and utility of the LTDS in advance of Ofgem's planned reform.

Ofgem's aforementioned letter is seeking consistency in how DNOs plan network developments, aligning with the main driver of P5's Standard Network Capacity Report as proposed in this document. Objectives of P5's Standard Network Capacity Report closely match those of Ofgem's LTDS review which is looking to provide data to feed in to the NDP, and information for the evaluation of network opportunities.

The review is likely to overlap many aspects of the network capacity report proposed here feeding into the Network Development Plan template. Timing is one aspect that may be addressed and therefore change as the dependencies between the Future Energy Scenarios (FES), DFES, NDP and LTDS are considered along with the associated processes. These have been considered in the plan for the implementation of the Standard Network Capacity Report as laid out in section 5 of this document.

4.3 ED2 Sector Specific Methodology Consultation

Ofgem are currently consulting⁶ on the Sector Specific Methodology for the next electricity distribution price control (RIIO-ED2 SSMC) starting in April 2023. Section 7 Annex 2 of the consultation entitled "Keeping bills low for consumers" addresses load related expenditure including forecasted future demand, network impact and efficient solutions.

Ofgem propose that ED2 benchmarking is based on multiple scenarios from which DNOs would select their own "best view" but they have yet to indicate how scenarios are to be used to plan ED2 investments.

⁶ <https://www.ofgem.gov.uk/publications-and-updates/riio-ed2-sector-specific-methodology-consultation>

The SSMC describes the introduction of the pending new licence condition mandating publication of the NDP and goes on to detail a potential further licence condition requiring the publication of a consistently produced DFES and use of DFES data in the NDP.

Ofgem's SSMC acknowledges that information is not available for all parts of the distribution network and is expecting proposals for more monitoring. This agrees with P5's survey findings reflected in the proposed Standard Network Capacity Report.

On a general note, the SSMC states that processes should be in place for sharing network planning information, thus endorsing P5's short term ambitions to publish a Standard Network Capacity Report.

4.4 Further Influences on P5

Overall, our review of Ofgem initiatives has identified that further reporting of network capacity will be mandated or suggested in the future. This direction of travel confirms that P5's objective to produce a Standard Network Capacity aligns with Ofgem's intentions to increase data transparency to assist our customers. Early adoption of network capacity reporting will accelerate the perceived benefits of signposting where there is and is not sufficient network capacity.

Ofgem's intentions to oblige the publication of a more detailed LTDS and NDP indicates that customer values are sufficient to justify the associated expense of producing and hosting the data. On this basis, a detailed Cost Benefit Analysis of a Standard Network Capacity Report is not deemed to be necessary, but instead benefits are discussed qualitatively along with high level estimates of increases in production costs.

5. Standard Network Capacity Report

5.1 Objective

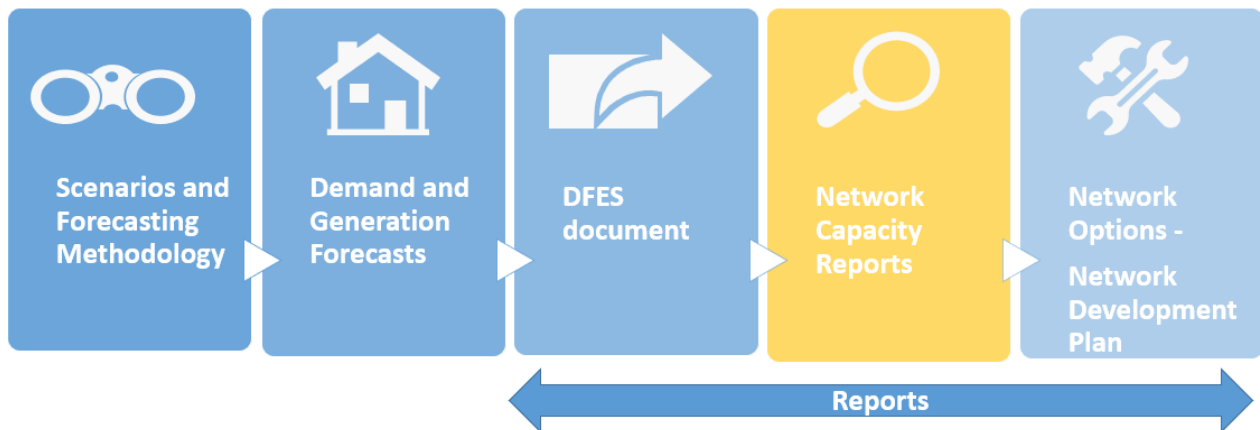


Figure 1: Network Capacity Report as part of the end to end process to decide network intervention investments

Evaluation of network capacity is an essential part of a robust process for developing efficient and economic network interventions as shown in Figure 1. The objective of the Standard Network Capacity Report is to be an integral part of this process, rather than simply being numbers produced for publication.

By being a DNO tool, industry stakeholders will benefit from the more transparent identification of network capacity shortfalls with assurance that the same results are informing network investment plans. A standard approach will allow stakeholders to use data from different DNO areas. Developers were identified as an obvious audience as information on network needs to inform where they should target their developments. Other audiences of the proposed Standard Network Capacity Report were identified as follows;

- Demand and generation customers connecting beyond the short-term future
- Regional Stakeholders including Local Authorities looking to understand infrastructure needs to support long term decarbonisation
- Innovators wanting to understand network issues to be resolved

5.2 Overview

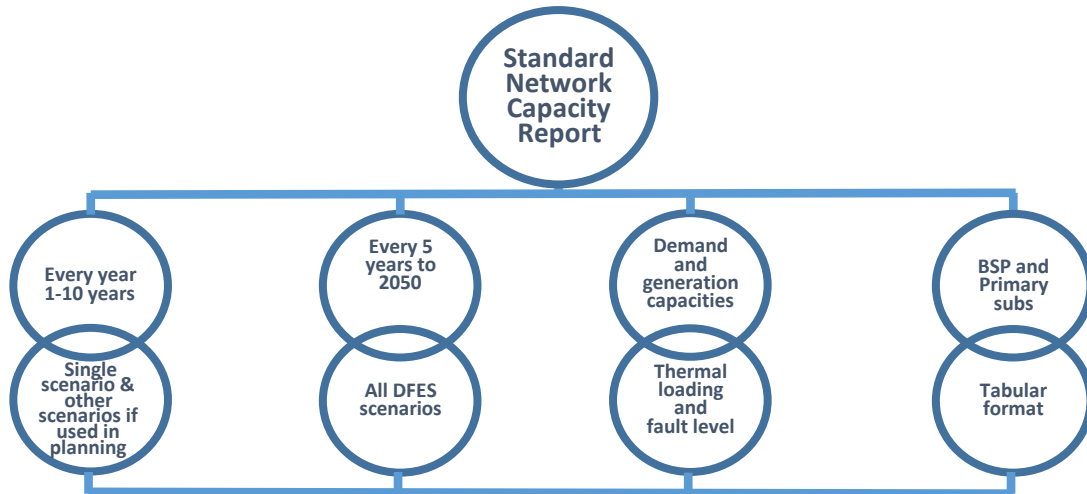


Figure 2: Standard Network Capacity parameters

Characteristics of the proposed Standard Network Capacity Report are summarised in Figure 2. The proposed report focusses on future network capacity headroom, stopping short of identifying what network action is required for example traditional reinforcement, ANM and flexible services. These aspects will ultimately be included in the NDP, supplementing the network capacity reporting component that will build on the Standard Network Capacity Report proposed here.

Details of the proposed Standard Network Capacity Report are presented in subsequent subsections. The extent of the standardisation of the reports produced by different DNOs is explained, as there may be some differences despite standardisation being desirable. The methodologies DNOs use to calculate network capacity and headroom are examples of potential differences. Accuracy and confidence in analysis varies depending on how a DNO models their network, their view on risk, the extent of network monitoring and how data is cleansed.

5.3 Date Range

Network capacity will be given in the Standard Network Capacity Report for:-

- **a date range to 2050**, or the end of the third decade in the future covering a period 21 to 30 years in the future.

5.3.1 Justification of adopted date range

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.

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

5.3.2 Discounted date range options

Consideration of a short-term date range in the Standard Network Capacity Report was discounted because this is already evaluated in other publications. Proven value is presently obtained from network capacity indications for the current year in heat maps and Embedded Capacity Registers, and LTDSs and calls for flexibility services covering the short-term future.

Consideration of only the short term in the Standard Network Capacity Report was considered inappropriate as flexible service developments and construction of asset-based network solutions can take a number of years extending beyond the short term.

5.4 Reporting Granularity

Network capacity will be given in the Standard Network Capacity Report:-

- **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.

5.4.1 Justification of adopted reported years

Reporting every year for the first ten and every five years thereafter matches the needs of different stakeholders.

Reporting every year for the first ten years is adopted for the Standard Network Capacity Report for the following reasons:-

- Ten years matches the period that DNOs undertake detailed analysis to refine investment plans
- Ten years roughly aligns with design and build timescales

- Ten years encompasses the connection pipeline and Embedded Capacity Register (formerly the System Wide Resource Register) reports on quoted and accepted connection offers when network forecasts are more assured
- Flexibility stakeholders are interested in detailed short-term requirements, so they target developments in the right places
- Timescale aligns with the NDP, and reporting for each year matches the LTDS and other network capacity reports such as P2/7

Reporting every five years after the first ten is adopted for the Standard Network Capacity Report for the following reasons:-

- Reporting for every five years matches the longer period and illustrates greater tolerance and divergence in DFES forecasts reflecting uncertainty in network needs
- Flexibility stakeholders are interested in longevity of network needs
- Simple approach is efficient when considering multiple scenarios

Snapping to the years ending in five and zero will further show the uncertainty in the results rather than appearing precise.

5.4.2 Discounted reporting granularity options

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. Whilst reporting every year for more than ten years was discounted because analysis workload is greater and not justified by increased benefits.

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.

5.5 Forecast scenarios

Network capacity will be given in the Standard Network Capacity Report based on:-

- **At least one scenario for the first ten years, or multiple scenarios if assessed for network planning, and**
- **All DFES scenarios from 10 years in the future up to 2050**

5.5.1 Justification of adopted forecast scenarios

The Standard Network Capacity Report may be presented for one or multiple scenarios for the first ten years for the following reasons:-

- One scenario matches the approach taken in current LTDS, Week 24 and Load Index reporting. Where the Standard Network Capacity Report is based on the forecast corresponding to one scenario it will be based on the scenario reflected in the Week 24 submission and LTDS for consistency. This aligns with the draft licence condition which stipulates that the NDP is prepared using the most recent version of the Long Term Development Statement.
- Forecast power demands and associated network impacts corresponding to multiple scenarios tend to be more closely grouped for the first ten years as they are more dominated by planned connections.
- Therefore, one scenario can be a reasonable proxy for all scenarios in this timeframe.
- Fewer scenarios may be simpler and easier for stakeholders interested in effects on their connections to assimilate.
- Complex analysis of network impacts is required to justify network investment, so inclusion of more scenarios will be more time consuming, especially without automated study methodologies.
- The option for reporting on multiple scenarios is included as some DNOs run automated studies to inform their network investment plans and therefore can create the necessary results efficiently.

Reporting long-term network capacity for multiple scenarios has been adopted to reflect uncertainty in future network needs. Network impacts due to DFES forecast ranges of uptake and power requirements are important due to the direct implications on customers and DNO investments. Consideration of multiple scenarios exposes differences in the extent of, and when network constraints are triggered under the range of assumptions.

5.5.2 Discounted forecast scenario options

Multiple scenarios for everybody to evaluate network capacity for the first ten years was discounted because not all DNOs were immediately equipped to undertake the necessary analysis efficiently. One scenario aligns with the current requirements of other reports covering at least part of this time period and was judged to be sufficient basis for informing network decisions.

5.6 Capacity parameters

The Standard Network Capacity Report shall report network capacity in terms of:-

- **Demand,** and
- **Generation**

5.6.1 Justification of adopted capacity parameters

The Standard Network Capacity Report includes demand and generation headroom for the following reasons:-

- Net zero requires new low carbon demand and generation
- Network investments are driven by demand and generation requirements
- Meets the needs of different stakeholders who are interested in both generation and demand connection capacity
- Aligns with heat map reports

5.6.2 Discounted capacity parameter options

Reporting of demand or generation alone was disconnected because it would not meet stakeholder needs and for the converse of the reasons explained above.

5.7 Network coverage

The Standard Network Capacity Report shall detail network capacity for a minimum of the following components of distribution networks⁷:-

- **Bulk Supply Points, BSPs (typically 132/33kV or 132/66kV) , and**
- **Primary substations (typically 33/11kV or 33/6.6kV)**

In Scotland, 132/33kV substations are known Grid Supply Points, GSPs, rather than BSPs, due to the lower transmission/distribution boundary and would therefore be excluded from the Standard Network Capacity Report.

Distribution networks evolve to accommodate customer needs, providing additional capacity to accommodate additional connections. Confidence that development plans will be materialised increases with time; they start as an idea, designs change and will not be confirmed until much later, such as when financial approval is granted within the DNO. Planned reinforcement/network interventions shall be reflected in the analysis behind the Standard Network Capacity Report, matching how they are reflected in the LTDS. It is unlikely that network interventions will be planned to provide the necessary network capacity covering all scenarios into the long-term future. It should be expected that negative headroom, indicating that forecasts exceed network limits, will be reported. The magnitude of such negative numbers is a sign of the capacity deficit which would need to be mitigated should the forecast level of demand and generation be realised.

⁷ In Scotland, the distribution network operates at 33kV and below.

5.7.1 Justification of adopted network coverage

The Standard Network Capacity focusses on BSPs and Primary substations for the following reasons:-

- Data is most readily available for BSPs and Primaries 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.

5.7.2 Discounted network coverage options

Detailed reporting of LV network capacity was discounted because there is 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 Grid Supply Point capacities in the initial Standard Network Capacity Report as true understanding of the capacity of the transmission-distribution interface requires assessments involving the transmission network operator 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 is reported cross the transmission and distribution interface is required and needs input from the ESO, TOs and DNOs.

5.8 Network parameters

The Standard Network Capacity Report shall report network capacity reflective of:-

- **Thermal loading,**
- **Fault level** and
- **Voltage if practical**

5.8.1 Justification of adopted network coverage parameters

The proposed Standard Network Capacity Report is based on thermal and fault level parameters to adequately reflect 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.

5.8.2 Discounted network parameter options

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 Standard Network Capacity 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.

5.9 Evaluation Methodology

The Standard Network Capacity Report shall report network capacity based on:-

- **Detailed 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 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 Standard Network Capacity 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 Standard Network Capacity Report 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, HPs, new domestic/I&C connections.

5.9.1 Justification of adopted evaluation methodology

The proposed Standard Network Capacity Report 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.

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.

5.9.2 Discounted evaluation methodology options

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.

5.10 Report format and publication

The Standard Network Capacity Report shall be presented in an Excel workbook format hosted on DNO webpages.

Headroom shall be presented to give explicit indications of how much additional demand and generation can be accommodated on the network. Table headings shall be as shown in Table 1, with the headroom values being given for each scenario and year covered by the report.

Table 1: Headroom report headings

Substation Name	Voltage kV	BSP Group	GSP	Substation location	Demand Headroom MW	Generation Headroom MW
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The tabular report shall be accompanied by a document which shall describe the relevance of the reported parameters and describe the underlying methodologies and assumptions. 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.

The Standard Network Capacity Report shall be hosted on the DNO webpage in a standalone report for this first publication, accepting that network capacity reporting may be subsequently consumed within the NDP or another network capacity report depending on the outcome of the LTDS review.

5.10.1 Justification of adopted report format

Excel format has been adopted for 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 requirements of licence conditions are finalised
- Ofgem's latest LTDS review letter endorses Excel format

5.10.2 Discounted report format options

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.

6 Implementation Plan

The implementation plan for the Standard Network Capacity Report has considered the requirement of the new standard licence condition to publish the first NDPs by January in the financial year commencing 1 April 2022, anticipated to be May 2022.

It is not appropriate to commit to publishing an independent Standard Network Capacity Report on an enduring basis because the NDP must include network capacity data to signpost network constraints and justify investment plans. For this reason, the implementation of the Standard Network Capacity Report is being considered as a trial to inform the creation of the NDP standard form to be further developed in the Open Networks 2021 programme. This subsequent piece of work shall build on the proposed Standard Network Capacity Report to consider how capacity constraints are consistently resolved leading to transparent mitigation and investment plans.

DNOs have agreed to aim to publish a Standard Network Capacity Report by the end of July 2021.

This date is considered to have multiple advantages:

- i. It allows sufficient time for consideration and development of the form of the NDP which may affect the context of the Standard Network Capacity Report.
- ii. It allows for further input on stakeholder benefits as part of the work on the NDP form of statement.
- iii. It may align with engagement and consultation on the combined aspects of the form of the NDP.

Specific stakeholder consultation on the data within the Standard Network Capacity Report is not planned for this first issue, although consultation will subsequently be part of the validation of the NDP.

The DNO webpages hosting the Standard Network Capacity Report shall be linked from the ENA Open Networks webpage with clear indication of how they fit within the ongoing Open Networks project.

7 Feed-forward

Much useful learning has arisen from producing the proposal for the Standard Network Capacity Report through this Open Network’s product, which has utilised inputs from network owner and operator experts. It can inform efficient next steps, so key points are captured in this section to feed forward into the development of the NDP template and LTDS review.

The introduction of the NDP is an opportunity to bring together network capacity assessments to optimise stakeholder utility and deliver efficiencies in their reporting.

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. Work to define the format of the Standard 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 Standard Network Capacity Reports in 2021 should be 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 should be 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 Standard Network Capacity Report in 2021 will be an opportunity to test the process for producing the data and share best practice to drive consistency in DNO approaches.

Table 2: Comparison of P5’s standard report with the scope of the proposed LTDS and NDP arising from the CEP licence condition.

Parameter	P5 Standard Network Capacity Report	Potential future extended LTDS	NDP
Year	+30years	0-5	5-10
Scenarios	Multiple	Not specified	Not specified. Original draft mentioned a single scenario and also a reasonable number of future scenarios
Network Range	BSPs and primary substations	Down to primary substation secondary (11kV) busbars	11kV network and above, permitting the exclusion of secondary transformers and all pole mounted transformers

Capacity parameters	Network headroom for demand and generation	Network headroom	Commentary on network locations most suited to new connections and where reinforcement is likely to be required
Format	Excel table	Excel table	Consistent approach to be defined
Publication Month	July	Currently November	Expected to be May

Co-ordination is required between the LTDS review and NDP development to avoid duplication and potential contradictions in reporting network capacity to avoid confusing stakeholders. P5's Standard Network Capacity Report overlaps with the scope of the proposed LTDS and CEP requirements as shown in **Error! Reference source not found.** Consideration of where there are matches highlights potential for simplifying reports, avoiding repetition, merging reports and layering information. Such approaches may be considered within the NDP development and LTDS review to create holistic network capacity reporting. 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.

8 Conclusions

The form of a Standard Network Capacity Report has been developed building on the learning arising from a survey on how network capacity is currently evaluated and reported.

The report is defined as follows:

Date range	To 2050
Reporting granularity	Every year for the first ten years and then every five years
Forecast scenarios	DFES scenarios and other scenarios used in network planning
Reported headroom	/deficit
Network coverage	Distribution voltages down to the secondary of primary substations (typically 11kV)
Parameters underlying headroom calculations	Thermal loading, fault level and voltage where practical
Evaluation methodology	Detailed analysis for the short term where practical, and simple tabular comparisons for the longer term
Format and publication	Excel spreadsheet hosted on DNO website

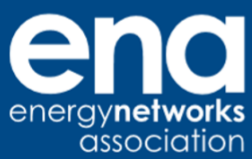
The original expectations for the implementation of the proposed Standard Network Capacity Report have been revised due to the recent clarity on the Clean Energy Package implementation, the scope of the Long Term Development Statement review and the ED2 Sector Specific Methodology. DNOs have committed to publication in 2021 as a trial to inform the development of the form of the NDP statement.

8.1 Next Steps

Endorsement from DNOs has been received on the proposed Standard Network Capacity Report. Commitments to publish the proposed report have been given in terms of the report publication date, format and the context as a trial to feed into the development of the form of the NDP statement.

The next steps shall be to present this report as documentation of P5's outputs to the Open Networks Steering Group for approval.

The report shall also be shared with Ofgem to seek comments on the proposal in terms of alignment with expectations for the NDP so that early feedback can be fed into the Open Networks work on the form of the NDP statement.



Energy Networks Association

4 More London Riverside

London SE1 2AU

t. +44 (0)20 7706 5100

w. energynetworks.org

 [@EnergyNetworks](https://twitter.com/EnergyNetworks)

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Registered office: 4 More London Riverside, London, SE1 2AU