Electricity Distribution

nationalgrid

Company Directive

POLICY DIRECTIVE: DSO4/0

Distribution System Planning

Summary

This directive sets requirements for the planning of the electricity distribution system and its interfaces with other electricity systems.

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Approved by

Benjamin Godfrey

Director of Distribution System Operator

Date: **02/08/2023**

Target Staff Group	**Staff responsible for system planning, network design, flexibility services, connections, fault repairs, asset replacement, network rationalisation, diversions and third-party works.**
Impact of Change	**Blue: responsibility for some system planning activities have moved to the DSO, with obligations on the DNO to engage with the DSO.**
Planned Assurance checks	**The DSO's Forecasting and Capacity Manager shall monitor and review implementation in coordination with the managers of the target staff group. The directive shall be reviewed by the authors within one year of issue.**

IMPLEMENTATION PLAN

Introduction

This directive sets requirements for the planning of the electricity distribution system and its interfaces with other electricity systems.

Main Changes

This is a new directive that allocates responsibilities for distribution system planning tasks between the Distribution System Operator (DSO) and Distribution Network Operator (DNO).

Impact of Changes

Target Staff Group	**Staff responsible for system planning, network design, flexibility services, connections, fault repairs, asset replacement, network rationalisation, diversions and third-party works.**
Impact of Change	**Blue: responsibility for some system planning activities have moved to the DSO, with obligations on the DNO to engage with the DSO.**

Implementation Actions

The authors will host internal webinars with the opportunity to ask questions prior to the implementation date; these webinars will be recorded and made available on SharePoint. Managers of the target staff group shall ensure that their staff attend the webinars or watch the recordings.

The authors will also host workshops with network design and capital build leadership from the DNO.

Implementation Timetable

This directive shall be implemented on 18 September 2023.

The System Constraints and Network Solutions register (*SCaNS) will* be fully implemented in the coming months. Until such time as it is generally available, prospective users should contact the DSO via the points of contact in section 4.2.

REVISION HISTORY

DOCUMENT REVISION & REVIEW TABLE			
Issue	**Date**	**Comments**	**Author**
0	02/08/2023	Initial issue of POL:DSO4	Stephen Quinn and Oliver Spink

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1.0 INTRODUCTION

1.1 About the Distribution System Operator

National Grid Distribution System Operator (**the DSO**) is a directorate of National Grid Electricity Distribution. It was created to fulfil the roles of the Distribution System Operator identified by Ofgem in the DSO Incentive Governance Document (implemented via special condition 4.8 of the Electricity Distribution Licence).

The DSO comprises the following teams:

- **Network Modelling and Whole System**, responsible for:
    - The provision of network models, derived datasets, and network analysis tools; and
    - Whole System interfaces including the Statement of Works interface with the Electricity System Operator.
- **Forecasting and Capacity**, responsible for forecasting customer load and strategic planning of the primary and secondary distribution system.
- **Flexibility**, responsible for the commercial and operational aspects of using Flexibility Services to alleviate distribution system constraints.

More information about the DSO can be found at:

- https://sharepoint.westernpower.co.uk/sites/wpd/dso/public/SitePages/Distribution-System-Operator---DSO.aspx (internal only)
- https://www.nationalgrid.co.uk/dso (external)

1.2 Scope

One of the roles identified by Ofgem in the DSO Incentive Governance is to:

"Plan efficiently in the context of uncertainty, taking account of whole system outcomes, and promote planning data availability."

The purpose of this activity is to ensure that DNOs' system planning processes are clear, that high quality, data-driven decisions are made, and that DNOs provide stakeholders with relevant information to inform their own decision-making.

The DSO4 suite of directives sets requirements for planning the electricity distribution system in investment planning timescales. These include requirements for:

- The identification of electricity distribution system constraints; and
- The selection of solutions to resolve these constraints from options including:
    - Flexibility services in accordance with the DSO5 (*Flexibility & Markets*) and DSO6 (*Flexibility Service Specifications*) suites of directives;

- Network build and augmentation in accordance with the SD (*System Design*) suite of directives, including Load Management Schemes in accordance with the SD11 (*Requirements for Load Management Schemes*) suite of directives; and

- Changes to agreed operational practices such as running arrangements in accordance with the OC (*Operation and Control*) and DSO7 (*Distribution System Operations*) suites of directives.

Requirements for the management of electricity distribution system constraints in operational timescales will be set in the DSO7 (*Distribution System Operations*) suite of directives.

1.3 Glossary

Definitions for key terms can be found in Appendix A: Glossary.

1.4 Variations

Where any difficulty is encountered with the application of this directive, the authors shall be notified, who will consider whether to recommend a variation to the responsible executive manager of the DSO suite.

2.0 EXTERNAL OBLIGATIONS

The electricity distribution system shall be planned in compliance with the applicable requirements of:

1. NGED's Electricity Distribution Licence;

2. The Electricity Act;

3. The Distribution Code;

4. The Electricity at Work Regulations; and

5. The Electricity Safety, Quality and Continuity Regulations.

Note: the intention of this directive and its subordinate Standard Techniques is to provide a route to compliance with these obligations.

3.0 CUSTOMER RELATIONSHIP MANAGEMENT

Customers are critical to all system planning and network design activities. Early engagement with a broad range of stakeholders allows strategic investment to be directed where it is most required. Good customer relationship management is key to compliance with our external obligations.

The system planning function of the Distribution System Operator has been established to direct strategic investment on the distribution system. This ensures that future load projections for all customers are accounted for when sizing network capacity requirements; these would not necessarily be accounted for solely through requests for new, augmented or modified connections.

The Forecasting and Capacity team of the DSO shall engage with stakeholders including local authorities to ensure that the plans and ambitions of all customers are considered in the DSO's scenarios and forecasts. Relevant requirements will be set in the DSO2 (*Load Projections and Profiles*) suite of directives.

Customer relationship management is also required where an enquiry is received by NGED in accordance with Electricity Distribution Licence Condition 12 (Requirement to offer terms for Use of System and connection). In these instances:

1. The staff within the DNO assigned to the enquiry shall remain responsible for engagement with customers; and

2. The DSO shall support the DNO by providing technical information and, where appropriate, attending customer meetings.

4.0 SYSTEM PLANNING PROCESS

Note: Distribution System Planning is performed in response to several triggers including General Load Growth, New Connections, Fault Repairs, Asset Replacement, Network Rationalisation, Diversions, and Transmission Works. Responsibility for distribution System Planning sits variously with the DSO and DNO depending upon the trigger and the nature of any constraint.

Where reinforcement is proposed by the DSO, it shall be referred to the DNO who shall perform detailed network design. The DNO's detailed network design shall include estimated costs and timescales to permit cost-benefit analysis by the DSO.

Note: In some cases (particularly where multiple constraints and triggers interact) it is necessary for system planning to be referred to the DSO by the DNO.
Where proposed works in response to a system planning trigger are referred to the DSO by the DNO, the DSO shall make an assessment and either:

1. Perform the system planning; or

2. Refer the proposed works back to the DNO for system planning. The DSO may set conditions or requirements on the proposed works for strategic system planning purposes.

The decision is dependent on the planning trigger as outlined below, and how the system planning trigger interacts with other distribution system constraints.

4.1 System Planning Triggers

4.1.1 General Load Growth

Note: System planning in response to projected load growth is intended to make capacity available in anticipation of need. This should minimise delays on customers.

The response to projected or actual load growth shall be planned by the DSO, except where the constraint is one of:

1. Fault level, in which case reinforcement shall be planned by the DNO; and
2. Secondary mains or switchgear, in which case it shall be planned by the DNO.

Note: Responsibility for these types of constraint will transfer to the DSO in a future revision to this directive.

Where a scheme proposed by the DNO would reduce distribution system capability or impact a constraint on the System Constraints and Network Solutions register (*SCaNS*), the DNO shall refer it to the DSO for review.

The DNO may refer proposals to the DSO where the DNO believes that general load growth will trigger a constraint.

The responsibilities allocated in this subsection apply to System Planning of both:

1. The Distribution System; and

2. The interface between the Distribution System and the Transmission System, including the submission of any necessary Modification Application or Connection Application.

4.1.2 New Connections

Note: Customer requests for new or augmented connections sometimes trigger reinforcement to provide the requested capacity. While a Minimum Scheme can be determined for each connection enquiry, it can be more efficient to coordinate reinforcement to provide the requested capacity for multiple connections.

Sole-use assets shall be planned by the DNO.

The DNO shall plan any reinforcement works that are necessary for the Minimum Scheme, and shall make connection offers on that basis. The DNO shall not plan Enhanced Schemes.

Note: In instances where a customer requests an connection in excess of the DNO determined Minimum Scheme (as outlined in Common Connection Charging Methodology 1.11), this does not constitute an Enhanced Scheme (as outlined in Common Connection Charging Methodology 1.4).

The DSO and DNO shall meet periodically to review the aggregate impact of schemes triggered by all system planning triggers. The DSO may amend or replace reinforcement schemes that could be optimised by strategic system planning. Examples could include planning an Enhanced Scheme to resolve constraints associated with multiple connections or the use of flexibility services. The DNO shall make any subsequent variations to customer offers such as variations to timescales and costs.

The responsibilities allocated in this subsection apply to System Planning of both:

1. The Distribution System; and

2. The interface between the Distribution System and the Transmission System, including the submission of any necessary Modification Application or Connection Application, but excluding the Statement of Works process, which shall be the responsibility of the DSO.

4.1.3 Fault Repair, Asset Replacement, Network Rationalisation and Diversions

Note: the ongoing proactive and reactive renewal of the network can present opportunities to optimise system planning by coordination with load-related planning such as general load growth and new connections.

The DNO shall proceed with fault repairs without reference to the DSO where they are necessary for reasons of safety or in order to restore supplies to customers.

Asset replacement, network rationalisation, diversions, non-urgent fault repairs, and similar works shall be planned by the DNO, except in instances where the proposed works would:

1. Remove circuits or reduce distribution system capability;

2. Increase distribution system capability beyond that which would result from replacement with a like-for-like asset or by a modern equivalent; or

3. Affect a constraint which is listed on the System Constraints and Network Solutions register (*SCaNS*) and forecast to be triggered within 10 years.

In these cases the proposed works shall be referred to the DSO.

The DSO and DNO shall meet periodically to review the aggregate impact of schemes triggered by all system planning triggers. The DSO may amend or replace schemes that could be optimised by strategic system planning. An example is bringing forward reinforcement to avoid creating stranded assets at asset replacement.

The responsibilities allocated in this subsection apply to System Planning of both:

1. The Distribution System; and

2. The interface between the Distribution System and the Transmission System, including the submission of any necessary Modification Application or Connection Application.

4.1.4 Distribution Impact of Transmission Works

Note: Transmission connections and reinforcement can have significant technical impacts on the distribution system and/or result in substantial diversions of distribution system assets.

The distribution system impact of transmission works including new connections shall be assessed by the DSO. Where a resulting distribution constraint is identified, the response shall be assessed by the DSO. Where the DNO receives a request for Third-Party Works or Distribution Impact Assessment, it shall be referred to the DSO.

4.2 DSO Points of Contact

Formal points of contact in the DSO for system planning matters are set below. Informal queries may also be raised for discussion on the Mattermost messaging platform at https://mattermost.westernpower.co.uk:8065/dso-dno .

4.2.1 Secondary System Planning

Secondary system planning referrals and queries shall be sent to the Secondary System Planning team in the DSO, who can be contacted on nged.secondarysystemplan@nationalgrid.co.uk .

4.2.2 Primary System Planning

Primary system planning referrals and queries shall be sent to the Forecasting and Capacity team in the DSO, who can be contacted on nged.primarysystemplan@nationalgrid.co.uk .

4.3 System Planning Registers

The DSO's Forecasting and Capacity Manager shall establish and maintain a System Constraints and Network Solutions register (*SCaNS)*, recording:

1. All of the constraints projected to occur across the distribution system in the next 10 years, and

2. Solutions which have been identified to alleviate a constraint outlined. Proposals can cover network build solutions, use of flexibility services or operational mitigation.

The Forecasting and Capacity Manager may delegate the secondary distribution system components of this register to the Secondary System Planning Manager.

*Note: The System Constraints and Network Solutions register (*SCaNS) *will be fully implemented in the coming months; until such time as they are generally available prospective users should contact the DSO via the points of contact in section 4.2.*

The set of schemes assessed in each *Distribution Network Options Assessment (DNOA)* shall be derived from this register. The *Distribution Network Options Assessment* undertakes a cost benefit analysis between network build and alternative solutions (such as flexibility services) to an identified constraint.

The DSO's Forecasting and Capacity Manager shall be notified of any distribution system constraint which arises or becomes known.

This register shall be cross-referenced to:

1. Projections maintained by the DSO's Forecasting and Capacity Manager in accordance with the DSO2 (*Load Projections and Profiles*) suite; and

2. The DNO's records of:

    a. Connection enquiries,

    b. third-party works,

    c. diversion enquiries, and

    d. Asset replacement requirements.

    Which shall include details of any associated reinforcement or other modification to existing network planned by the DNO.

5.0 TECHNICAL REQUIREMENTS

Detailed technical requirements for distribution system planning are set below and in this directive's subordinate Standard Techniques.

5.1 Planning for Operability

The electricity distribution system shall be planned in such a way as to facilitate its subsequent operation in accordance with the DSO7 (*Distribution System Operations)* suite of directives.

Note: Compliance with system planning standards does not automatically result in an efficient, co-ordinated and economical system of electricity distribution. It is necessary to consider operational practicalities in pursuit of these aims.

5.2 Constraint Management

All constraints shall be managed by following these steps:

1. **Detect** the constraint.
2. **Calculate** how to resolve or mitigate the constraint.
3. **Instruct** the resolution or mitigation.
4. **Actuate** the resolution or mitigation.
5. **Record** the constraint and how it was resolved or mitigated.

These steps are equally applicable in operational and investment planning timescales.

APPENDIX A: GLOSSARY

Key definitions are tabulated below. These definitions are taken from the DSO Glossary, which is available internally at https://sharepoint.westernpower.co.uk/sites/wpd/dso/public/Lists/DSO%20Glossary .

Term	Definition
Constraint	Distribution constraint means any limit on the ability of the licensee's Distribution System, or any part of it, to transmit the power supplied onto the licensee's Distribution System to the location where the demand for that power is situated, such limit arising as a result of any one or more of: (a) the need to not exceed the thermal rating of any asset forming part of the licensee's Distribution System; (b) the need to maintain voltages on the licensee's Distribution System; and (c) the need to maintain the transient and dynamic stability of electricity plant, equipment and systems directly or indirectly connected to the licensee's Distribution System and used by the licensee to operate the licensee's electricity distribution system in accordance with the Act, this licence, or any other requirement of law;
Forecast	A prediction of future events that, in the balance of probabilities, National Grid Electricity Distribution believes will occur.
Network Design	The activities associated with design of the electricity network in response to a System Planning trigger. The scope includes: • Cost estimates; • Physical location of assets, including obtaining consents where applicable; • Ability to deliver a network build solution; • Power system protection requirements; and • Earthing and power quality requirements.
Primary Distribution	The parts of the distribution system including and upstream of the switchgear on the lower voltage side of each Primary Substation.
Projection	The time-series of future changes to a parameter in a given Scenario or Forecast.
Reinforcement	...assets installed that add capacity (network or fault level) to the existing shared use Distribution System.
Scenario	A hypothesis of future events that would or could occur given certain political, economic, social, technological and environmental conditions.
Secondary Distribution	The parts of the distribution system including and downstream of the switchgear on the lower voltage side of each Primary Substation.
System Constraints and Network Solutions Register (SCaNS)	A register maintained by the DSO Forecasting & Capacity team of the following: 1. All of the constraints projected to occur across the distribution system in the next 10 years, and 2. Solutions which have been identified to alleviate a constraint outlined. Proposals can cover network build solutions, use of flexibility services or operational mitigation. The register covers both Primary Distribution and Secondary Distribution systems. The Distribution Network Options Assessment will be derived from this register.

Term	Definition
System Frequency Integrity	The ability of the GB system to operate within acceptable frequency-related technical limits under both Intact Network and outage conditions.

System Planning	This comprises:
	• The identification of electricity distribution system constraints; and
	• The selection of solutions to resolve these constraints from options including:
	  ○ Flexibility services,
	  ○ Network build and augmentation, and
	  ○ Changes to agreed operational practices.

Third Party Works	In relation to a particular User those works, defined as such in its Construction Agreement; being works undertaken on assets belonging to someone other than a Relevant Transmission Licensee or the User where such works are required by The Company to enable it to provide the connection to and/or use of the National Electricity Transmission System by the User or required as a consequence of connection to and/or use of the National Electricity Transmission System by the User

APPENDIX B SUPERSEDED DOCUMENTATION

This is a new document and no document is superseded by its issue.

APPENDIX C RECORD OF COMMENT DURING CONSULTATION

Comments – POL: DSO4/0

APPENDIX D BIBLIOGRAPHY

Related requirements are set in:

- Subordinate Standard Techniques in the DSO4 suite of directives;
- The DSO2 (*Load Projections and Profiles*) suite of directives;
- The DSO5 (*Flexibility & Markets*) suite of directives;
- The DSO6 (*Flexibility Service Specifications*) suite of directives;
- The DSO7 (*Distribution System Operations*) suites of directives;
- The SD (*System Design*) suite of directives;
- The OC (*Operation and Control*) suite of directives; and
- Documents listed in section 2.0.

APPENDIX E KEYWORDS

Distribution System Planning, Network Design, Reinforcement, Load Growth, Connections, Fault Repair, Asset Replacement, Network Rationalisation, Diversion, Third-Party Works, Distribution Impact Assessment, System Constraints and Network Solutions register, SCaNS.