LONG TERM DEVELOPMENT STATEMENT

FOR SCOTTISH HYDRO ELECTRIC POWER DISTRIBUTION PLC'S ELECTRICITY DISTRIBUTION SYSTEM

MAY 2023

Scottish & Southern Electricity Networks

SCOTTISH HYDRO ELECTRIC POWER DISTRIBUTION PLC
LONG TERM DEVELOPMENT STATEMENT

FOREWORD

Scottish Hydro Electric Power Distribution plc (SHEPD) is pleased to present this Long Term Development Statement (LTDS) for its electricity distribution network. It is produced by SHEPD in accordance with its Electricity Distribution Standard Licence Condition (SLC) 25. The statement covers the period 2021/22 to 2026/27.

The main purpose of the LTDS is to assist existing and prospective users of the electricity distribution network in assessing opportunities available for making new connections, or for additional use of the SHEPD distribution system.

The assets referred to in this document are in the ownership of Scottish Hydro Electric Power Distribution plc which delivers electricity to over 785,000 customers in Scotland.

Although all reasonable efforts have been made to ensure the accuracy of data, SHEPD does not accept any liability for the accuracy of the information contained herein and in particular neither SHEPD, nor its directors or employees, shall be under any liability for any errors.

CONTENTS

INTRODUCTORY SECTION

1 PURPOSE OF STATEMENT

This Long Term Development Statement (LTDS) is prepared in accordance with Standard Licence Condition 25.

The purpose of this statement is to:

- Provide sufficient information which will assist existing and prospective new users who are contemplating entering into distribution arrangements with the licensee, to identify and evaluate opportunities.
- Ensure the general availability of such information in the public domain.
- Inform users of distribution network development proposals.
- Provide users of the correct point of contact for specific enquiries.

Users of the distribution system should also be aware that the main document which governs development and operation of the distribution system is the Distribution Code. This code covers all material technical aspects relating to connections to and the operation and use of the distribution systems of the Licensee.

2 CONTENTS OF STATEMENT

This LTDS is in two parts.

- Part 1 gives an overview of document content and provides relevant contact details and sources of information.
- Part 2 contains detailed information of the system.

The statement contains a range of information associated with our 33 kV distribution system including the 11 kV busbar of 33/11 kV primary substations.

Information relating to 11 kV and LV systems may be available on request depending on area. A price list for the provision of this data is included in Appendix 1.

Part 2 of the statement gives:

- Detailed information on the guiding principles for planning the distribution system, company internal standards, design policies and network characteristics.
- Schematic and geographical plans showing the 33 kV system including location of 132/33 kV and 33/11 kV substations.
- Details of embedded generation.
- Planned network development proposals for which financial approvals have been given in Appendix 3. They provide a summary of the work to be carried out, timescale and area of the network impacted by each proposal. These exclude like for like replacement (as this does not change system capability) and system developments for new or existing users.

- Detailed information relating to:
  - Circuit Data, Table 1
  - Transformer Data, Table 2
  - Demand Data*, Table 3
  - Fault Level Data*, Table 4
  - Generation Data, Table 5
  - Connection Interest Table 6
  - Schematic Diagrams of the Distribution Network Single Line Diagrams

* Demand forecast methodology is formulated around a combination of important contributing factors impacting demand. Historic growth rates for each primary substation are calculated before being banded into four growth trends of Zero, Low, Medium, or High.

Individual future growth rates are based on the calculated historic trend and key drivers including committed connections, geographic economic factors derived from local authority development plans and demand forecast from large users with knowledge of major changes in connected load.

The key assumptions included in the demand forecast are as follows:

- Exponential growth is assumed and calculated using historic maximum demand readings over the past five years.
- Consistent running arrangement and system configurations are considered. Recorded substation peak demands are normalised to account for abnormal running arrangements or equipment faults to ensure the forecast is consistent to previous years running arrangement.
- Power export from distributed generators (DG) is removed, where possible, from recorded figures to give a true representation of underlying substation demand.
- Individual demand forecast submissions from large consumers are factored into forecasts
- Committed new loads and new connections are assumed to materialise in the manner predicted i.e., user timing and usage is assumed to occur as advised/requested by customer.
- Future Zero growth rates are assumed to have a forecast trend of 100% i.e., neither increasing nor decreasing.

* SHEPD will undertake further assessments to determine whether intervention is required where the calculated planning fault levels, identified in Table 4, exceed 95% of the circuit breaker fault level rating. The additional assessments undertaken by SHEPD include, but are not limited to, site specific protection settings analysis and circuit breaker trip testing.

If further assessments confirm that intervention is required SHEPD will determine the most economic, efficient and cost-effective solution to reduce the overall fault level. Possible mitigation works include, but are not limited to, opening the bus-section circuit breaker, reconfiguring the network, installing fast response automation, and extending circuit breaker trip times.

Details of the 132 kV system (regarded as transmission voltage in Scotland) are included in the Electricity Ten Year Statement, which is available on National Grid's Electricity System Operator website.
https://www.nationalgrideso.com/

3 CONTACT DETAILS

The LTDS is available free of charge by sending an email to:

system.planning.north@sse.com

or by making a request through the Scottish and Southern Electricity Networks website:

https://www.ssen.co.uk/our-services/tools-and-maps/long-term-development-statements-ltds/

For further information relating to LTDS, or to provide feedback:

System Planning North
Scottish Hydro Electric Power Distribution plc
Inveralmond House
200 Dunkeld Road
Perth
PH1 3AQ
E-mail: system.planning.north@sse.com

Enquiries relating to new load connections or changes to existing load connections should be addressed to:

Connections and Engineering
Customer Service Centre
Scottish and Southern Electricity Networks
Walton Park, Walton Road
Cosham, Portsmouth
PO6 1UJ
E-mail: connections@sse.com
Tel: 0800 0483516

Enquiries relating to connection of generators should be addressed to:

Major Connections Contracts (MCC)
Scottish and Southern Electricity Networks
Perth Training Centre
Ruthvenfield Way
Inveralmond Industrial Estate
Perth
PH1 3AF
E-mail: mcc@sse.com
Tel: 0345 0724319

Enquiries relating to connection of generators should review the options on the Scottish and Southern Electricity Networks website:

http://www.ssen.co.uk/GenerationConnectionsHome/

Enquiries relating to the provision of copies of the “Statement of methodology and charges for connection" should be addressed to:

Connections Policy Team
Scottish Hydro Electric Power Distribution plc
Inveralmond House
200 Dunkeld Road
Perth
PH1 3AQ
Email: connections.policy@sse.com

The Connection and Use of System charging statements can be viewed on our website. Our connection charging statements are revised from time to time and our Use of System charging statements are revised at least annually. Revised Use of System charges normally take effect from 1 April of each year. The latest documents can be viewed via the link below:

http://www.ssen.co.uk/Library/ChargingStatements/SHEPD/

4 OTHER INFORMATION SOURCES

Distributed Generation Connection Guide

The ENA produces connection guides to help users as an owner or developer of distributed generation to connect distributed generation to the UK’s electricity distribution networks.

The guides can be viewed by following the link below:

https://www.energynetworks.org/operating-the-networks/connecting-to-the-networks

Guaranteed Standards

In accordance with the Electricity (Standards of Performance) Regulations 2015, DNOs are obliged to meet guaranteed standards of performance set by OFGEM, the industry regulator.

These guaranteed standards are laid out in three documents which can be viewed by following the below links:
The Guaranteed Standards:

- The Electricity (Connection Standards of Performance) Regulations 2015

http://www.legislation.gov.uk/uksi/2015/698/pdfs/uksi_20150698_en.pdf

Part 2 – Services and Standards for Metered Connections
Part 3 – Services and Standards for Unmetered Connections

- The Electricity (Standards of Performance) Regulations 2015

http://www.legislation.gov.uk/uksi/2015/699/pdfs/uksi_20150699_en.pdf

- The Electricity and Gas (Standards of Performance) (Suppliers) Regulations 2015

http://www.legislation.gov.uk/uksi/2015/1544/pdfs/uksi_20151544_en.pdf

Process to Request Additional Network Data

Enquiries relating to the provision of additional network data to that contained in the LTDS should be sent to:

system.planning.north@sse.com

SUMMARY INFORMATION

1 GUIDING PRINCIPLES FOR PLANNING THE DISTRIBUTION SYSTEM

The following standards are the guiding principles which underpin the policy for planning and designing the distribution network in Scottish Hydro Electric Power Distribution plc:

Licence Conditions

Distribution Code

Electricity Safety, Quality and Continuity Regulations

Environmental Standards

Company Internal Standards

2 STANDARDS

2.1 Licence Conditions

2.1.1 Pursuant to a licensing scheme made by the Secretary of State, under part II of Schedule 7 to the Utilities Act 2000, Scottish Hydro Electric Power Distribution plc has been granted a licence under section 6(1) (c) of the Electricity Act 1989 authorising it to distribute electricity for the purpose of giving a supply to any premises in the area specified in Schedule 1 of the Act.

2.1.2 Standard Licence Condition (SLC) 24 – Distribution System Planning and Quality of Supply sets out the requirement for licensees to plan and develop their distribution system to a certain standard. SHEPD meets this requirement by having an Ofgem approved planning standard (PO-PS-037 Distribution Planning – Standards of Voltage and Security of Supply) which sets out how security of supply will be met in its distribution services area.

In order to meet the above standard our policy is to plan networks at the most economic cost. To achieve this, we have taken two approaches:

For high volume works where point of connection is low voltage (230 and 400 V) or high voltage (11 kV) we have standard connection arrangements which ensure compliance with ER P2/7.

For lower volume, high cost developments, principally at 33 kV and above, we will tailor development to meet standards on an individual basis to optimise cost-benefit and customer requirements.

2.1.3 Under SLC 12 - Requirement to Offer Terms for Use of System and Connection, the licensee shall, on application, offer to enter into an agreement (Connection Agreement) for use of system.

Where the licensee makes an offer to enter into a connection agreement, the licensee shall, in making the offer, make detailed provision regarding:

The carrying out of the works required to connect the licensee's distribution system to any other system for distribution of electricity.

The carrying out of works in connection with the extension or reinforcement of licensee's distribution system rendered appropriate by reasons of making the connection.

Installation of such switchgear or other apparatus (if any) as may be required for the interruption of supply where the person seeking connection or modification of an existing connection does not require the provision of top-up or standby.

The charges to be paid in respect of services required. For the purpose of determining an appropriate proportion of the costs directly or indirectly incurred the licensee shall have regard to the benefit to be obtained or likely in the future to be obtained.

In determining the costs of connection of demand and generation, the licensee shall apply the charging principles set out in the annual charging statements including, where applicable, application of:

Cost apportionment of any necessary reinforcement for the Connection; and

Distributed Generation Incentives.

The statements which set out the basis of charges for "Use of System" and "Connection to the Distribution System" are entitled:

Scottish Hydro Electric Power Distribution plc's Use of System Charging Statement;

Statement of Methodology and Charges for Connection to Scottish Hydro Electric Power Distribution plc's Electricity Distribution System.

(all the above are amended as required)

All the above statements are available on our website www.ssen.co.uk or by sending an email to connections@ssen.co.uk.

Note: Some distribution connected generators will have impact on the transmission system (typically where the generator's authorised export capacity is either greater than 10 MW and / or is more than the declared summer minimum demand at the 33 kV busbar of the relevant 132/ 33 kV substation). Such generators may be liable for transmission use of system charges (TNUoS) from National Grid Electricity System Operator (NGESO). Prospective generators seeking a distribution connection should also consult NGESO under BETTA (British Electricity Trading and Transmission Arrangements), to assess the impact their generation project may have on the GB transmission system.

2.2 Distribution Code

Under SLC 20 of the Licence the licensee shall prepare and at all times have in force and shall implement and comply with the Distribution Code.

The Distribution Code covers all material technical aspects relating to connections to and the operation and use of the licensee's distribution system or the operation of electric lines and electrical plant connected to the licensee's distribution system.
It requires the licensee's distribution system to be designed so as to permit the development, maintenance and operation of an efficient, co-ordinated and economical system and to facilitate competition in the generation and supply of electricity.
The Distribution Code includes:

A distribution planning and connection code containing:

- Connection conditions specifying the technical, design and operational criteria to be complied with by any person connected or seeking connection to the licensee's distribution system; and
- Planning conditions specifying the technical and design criteria and procedures to be applied by the licensee in the planning and development of the licensee's distribution system and to be taken into account by persons connected or seeking connection with the licensee's distribution system in the planning and development of their own plant and system; and

A distribution operating code specifying the conditions under which the licensee shall operate the licensee's distribution system and under which persons shall operate their plant and/or distribution systems in relation to the licensee's distribution system, in so far as necessary to protect the security and quality of supply and safe operation of the licensee's distribution system under both normal and abnormal conditions.

It contains references to the following Electricity Supply Industry publications which provide guidance on planning and design criteria:

- **Engineering Recommendation G5/5**
  Planning levels for harmonic voltage distortion and the connection of harmonic sources and/or resonant plant to transmission systems and distribution networks in the United Kingdom.
- **Engineering Recommendation G12/4**
  Requirements for the application of protective multiple earthing to low voltage networks.
- **Engineering Recommendation P2/8**
  Security of Supply.
- **Engineering Recommendation P24**
  AC supplies to railway systems.
- **Engineering Recommendation P25**
  The short-circuit characteristics of single-phase and three-phase low voltage distribution networks.
- **Engineering Recommendation P28**
  Planning limits for voltage fluctuations and the connection of disturbing equipment to transmission systems and distribution networks in the United Kingdom.
- **Engineering Recommendation P29**
  Planning limits for voltage unbalance in the United Kingdom for 132kV and below.
- **Technical Specification 41-24**
  Guidance for the design, installation, testing and maintenance of main earthing systems in substations.
- **Engineering Recommendation S34**
  A guide for assessing the rise of earth potential at substation sites.
- **Engineering Recommendation G98**
  Requirements for the connection of Fully Type Tested Micro-generators (up to and including 16 A per phase) in parallel with public Low Voltage Distribution Networks.
- **Engineering Recommendation G99**
  Requirements for the connection of generating equipment in parallel with public distribution networks.

See Section 9 for enquiries relating to the Distribution Code.

2.3 Electricity Safety, Quality and Continuity Regulations

The Secretary of State issued The Electricity Safety, Quality and Continuity Regulations in 2002 in order to:

Ensure that the electricity supplies are regular and efficient.

Protect the public from dangers arising from distribution of electricity, use of electricity supplied or from installation, maintenance or use of any electricity line or electrical plant.

Eliminate or reduce the risks of personal injury or damage to property or interference with its use.

Regulation 27 gives permitted variations at all low voltage customers' terminals of +10% and -6% of the declared voltage of 230 V single phase or 400 V three phase. For 33 kV the permitted variations are between +6% and -6% of the declared voltage. It is therefore necessary to hold the system voltage within these ranges on all systems to which customers are connected, i.e. all low voltage systems, most 11 kV systems and some 33 kV systems.

2.4 Environmental Standards

Schedule 9 of the Electricity Act 1989 requires SHEPD to consider the effect of its work on the amenity and fisheries and to mitigate the effects where reasonable.

In planning, designing and operating the distribution system our policy is to pay due regard to environmental matters and, in particular, noise, visual amenity and pollution. We seek Planning Authority and Scottish Ministers' approval to build new lines. We also endeavour to meet the requirements of other bodies in protected areas such as National Scenic Areas. We will seek to avoid disturbance or detriment to such areas as far as reasonably practicable consistent with the economic and reliability impact on our distribution network and on customers' costs.

2.5 Company Internal Standards

In addition to meeting the above standards, SHEPD has internal standards to improve quality of supply and reduce duration of supply interruptions.

2.5.1 General

The targets for duration of supply interruption, customer minutes lost (CMLs) per customer per year, and number of customer interruptions (CIs) are agreed with Ofgem. These standards are in addition to the Guaranteed Standards set by Ofgem.

In planning, designing and operating the distribution system the systematic use of automation, mobile generation and targeted investment for refurbishment of the distribution system is designed to deliver these targets.

To meet the individual needs of customers, we will agree standards of connection whether in excess or lower than the appropriate levels as stated in the relevant network standard. In these cases, we will agree special commercial terms.

2.5.2 Capacity Planning

To ensure that the distribution system has adequate capacity to meet system demand, voltage and current flows are regularly monitored and adequacy of the network is checked. Capacity is benchmarked to estimated loads. Where there is a shortfall in network capacity we will seek appropriate solutions. These will usually involve network reinforcement but could involve alternative solutions.

2.5.3 System Voltage Control

The total full load volt drop for the transfer of power from the high voltage distribution system to the low voltage supply system is approximately 30%. Therefore, voltage correction must be applied in the appropriate places to comply with Regulation 27 of the Electricity Safety, Quality and Continuity Regulations 2002. This is carried out as follows:

At transmission voltages by National Grid:

- Control of reactive power flows. This includes switching in or out lightly loaded circuits, shunt capacitors and reactors, use of synchronous compensators, operation of "tap-stagger" and use of voltage above or below nominal.
- Auto or manually controlled on-load tapchangers on 275/132 kV transformers .
- Central control by despatch of reactive power from synchronous generators.
- Automatic voltage control on synchronous generators.

At distribution voltage levels by:

- Automatically controlled on-load tapchangers fitted to 132/33 kV and 33/11 kV transformers (some smaller < 1 MVA 33/11 kV transformers have off-load tap changers);
- Automatically controlled on-load tapchangers fitted to 33 kV, 11 kV and LV voltage regulators;
- Line drop compensation on some rural 11 kV systems;
- Automatic voltage control on embedded generators;
- Reactive compensation (fixed & variable tap shunt reactors, fixed shunt capacitors and DSTATCOMs);
- Off load tap changers fitted to 33 kV/LV and 11 kV/LV transformers.

3 DESIGN POLICIES

3.1 General

When planning and designing an electricity distribution system it is necessary to consider all alternative options to achieve an optimum solution based on technical and economic considerations.

The Company's distribution system has been standardised at 33 kV, 11 kV and 230/400 V (called LV).

3.2 132 and 33 kV System Design

33 kV networks from 132/33 kV substations normally run either radially or as open or closed rings. However, some networks run in parallel with those from other sources where technically acceptable and economically advantageous.

Additions to or reinforcements of these networks are considered individually and tailored to the existing network arrangements. The most economic investment is determined in line with any long term proposals and having regard to network complexity, operational requirements and flexibility.

Studies are completed to ensure acceptable voltage conditions, compliance with security of supply standards for first and second circuit outages and that circuit and plant ratings are not exceeded.

Additionally, for generation, studies are completed to identify any locations where increased fault currents exceed switchgear ratings. For larger sets, or where there is likely to be interaction with existing customers with large motor drives, steady state and transient stability studies are needed to:Ensure generation and the network remain stable following circuit switching or a network fault.

Check interaction with other nearby generation.

Predict any possible loss of synchronism and the corresponding need for additional protection to avoid damage to the generator or unacceptable voltage or power swings.

3.3 Supplies from 33/11 kV Substations

The maximum number of 11 kV circuits from a 33/11 kV substation is determined on the basis of network configuration and maximum utilisation e.g. for a substation with 2 x 12/24 MVA transformer capacity normal maximum number of 11 kV feeders would be 7.

Interconnecting feeders, where practical, would emanate from separate sections of busbar consistent with minimising initial switchgear requirements and allowing for future extensions.

Feeders will be controlled by automatic circuit breakers of 630 A nominal load rating. Many existing circuit breakers have nominal load rating of 400 A or less.

3.4 11 kV Network Configuration

The 11 kV network is normally configured to achieve maximum utilisation whilst maintaining security of supply standards at a minimum cost.

The 11 kV urban network is normally configured as a "loop-tee-loop" arrangement in an open "ring" formation. However, where an individual customer requires more or less security of supply standard, then the connection to that customer will be designed to meet specific needs.

The 11 kV rural network is normally configured as an open "ring" with pole mounted 11 kV/LV transformers directly connected. However, where group demand is below 1 MVA the network configuration may be radial feed with no backfeed facility.

Furthermore, there may be lengthy single phase and three phase spurs in particularly remote locations served by overhead line circuits.

3.5 Low Voltage Network Configuration

The feeding arrangement on the low voltage network is normally radial with no interconnection. There is existing interconnected LV network which operates as radial and is configured as "open" ring. The layout of distributors is optimised in relation to services to be supplied. Distributors are normally laid in footways.

4 NETWORK CHARACTERISTICS

4.1 Standard Plant and Equipment sizes

Various types of plant and equipment exist on the 33 kV and 11 kV systems. Typical details are given below.

4.1.1 33 kV System

- Voltage Regulators
  - Vector Group — Auto transformer
  - Voltage Ratio — 33/33 kV
  - Rating Between — 5 MVA and 32 MVA
  - Tapping Range — -18% to + 4%

- Primary Transformers
  Voltage Ratio 33/11 kV or 33/11.5kV (off load**)**
  - Vector Group: YY0
  - Rating: 1, 2.5, 4, 6.3 & 8 MVA ONAN 7.5/15, 10, 12/24, 15/30, 20/40 MVA CER
  - Tapping Ranges: -18% to +4% (on load) for 33/11kV or -15% to +11.67% (on load) for 33/11.5kV ONAN or -13.33% to +13.33% (on load) for 33/11.5kV CER
  - Rating: 0.1, 0.15, 0.2, 0.3, 0.5, 1.0, 1.5 MVA
  - Tapping Range: -5% to +5% (off-load).

  Voltage Ratio 33 kV/LV (433V) (off load**)**
  - Vector Group: DYn11
  - Rating: 200, 500, 800, 1000, 1500 kVA (ground mounted)
  - Tapping Range: -5% to +5% (off load)

  Voltage Ratio 33 kV/LV (250 or 500V) (off load)
  - Rating: 16, 25, 50, 100 kVA (pole mounted)
  - Tapping Range: -5% to +5% (off load)

  Switchgear
  - Current Rating 400, 800, 1200, 1600, 2000, 2200, 2500 A
  - Fault rating 8.7, 13.1, 17.5, 25, 31.5 kA

4.1.2 11 kV System

- Voltage Regulators
  - Vector Group — Auto transformer
  - Voltage Ratio — 11/11 kV
  - Rating Between — 1 MVA and 8 MVA
  - Tapping Range — -18% to + 4%

- Transformers
  - Vector Group: — DYn11
  - Voltage Ratio: — 11 kV/LV (433 V)

Ground Mounted

- Rating: 315, 500, 800, 1000, 1500 kVA
- Tapping Range -5% to 5% (off load).

Pole Mounted

- Rating 50, 100, 200 kVA
- Tapping Range -5% to 5% (off load).
- Transformers
- Voltage Ratio 11 kV/LV (250 or 500 V)
- Rating 16, 25, 50, 100 kVA (pole mounted)
- Tapping Range -5% to 5% (off load).

- Switchgear
  - Current Rating 400, 630, 800, 1250, 2000 A
  - Fault rating 13.1 or 18.4 kA - some pole mounted switchgear may be rated below 13.1 kA.

4.1.4 Telecontrol

Normally all 33 kV or higher voltage switchgear is equipped with telecontrol. Use of telecontrol at 11 kV is considered according to the situation and location.

4.1.5 Batteries

SHEPD will normally provide its own battery systems where required for distribution sub stations. However, shared use is considered if appropriate.

4.2 Power Quality

4.2.1 Harmonics

Engineering Recommendation G5/5 sets the planning levels for harmonic voltage distortion to be used for the connection of non linear equipment. These levels should not normally be exceeded when considering the connection of non linear loads and generating plant to the distribution networks under the Distribution Code. The table below gives a summary of Total Harmonic Distortion (THD) planning levels at supply system point of common coupling (PCC) nominal operating voltage:

Nominal Voltage (V) kV	THD Limit
$V \leq 0.4$	5%
$0.4 < V \leq 25$	4.5%
$25 < V \leq 66$	3.7%
$66 < V \leq 230$	3%
$V > 230$	3%

The assessment procedure for non-linear equipment follows three stages:

Stage 1 facilitates the connection of harmonic sources to LV supply systems.

Stage 2 facilitates the connection of harmonic sources to all supply systems operating at a voltage of greater than LV and less than 33 kV, including any harmonic source that is too large for consideration under Stage 1, or that cannot meet the emission limits of Stage 1. Measurement of the background harmonic level may be required, before a simplified assessment is made of the predicted harmonic voltage level at the PCC that may result from the connection of the new harmonic source.

Stage 3 applies to the connection of the harmonic sources that are not found to be acceptable under Stage 2 assessment or which fall outside the scope of Stages 1 & 2, excluding Stage 2 assessments with an LV PCC. It also applies to any harmonic sources that have a nominal PCC voltage greater than or equal to 33kV and to the assessment of relevant plant where the connection is made at system voltages of 33kV or higher.

The objective is to balance the degree of detail with degree of risk that the connection of the particular equipment will result on the supply system.

4.2.2 Voltage Fluctuations

Engineering Recommendation P28 sets the planning limits of voltage fluctuations caused by industrial, commercial and domestic equipment. Allowable limits vary with the interval between fluctuations and are based on the likelihood of customer complaints. Normally acceptable values are 3% and below.

4.2.3 Unbalance

Engineering Recommendation P29 sets the limits of voltage unbalance on networks up to 132 kV. Normally acceptable values are 2% and below.

4.2.4 Investigations

There are no areas in SHEPD where harmonic levels, voltage fluctuations or unbalance are known to be an issue. However, we will investigate and take measurements in response to customer requests. If found to be unacceptable we will seek an appropriate solution.

4.3 Method of Earthing

4.3.1 Primary substations

The methods currently employed to earth the neutral of High Voltage networks at primary (33/11kV) substations are:

Direct Earthing

The only impedance between the transformer lower voltage winding star point (neutral) and earth consists of the earthing conductor and the resistance between the earth mat and earth.

Resistance Earthing

Use is made of an earthing resistor between the transformer lower voltage winding star point (neutral) and earth to limit the earth fault current.

Matching Transformer

In some instances, where generation is connected to the transformer low voltage winding, the neutral is earthed by a single phase transformer with secondary load resistor to restrict fault current to low values.

Earthing Transformers

In instances where the transformer lower voltage winding is delta connected a neutral point is derived artificially by inclusion of an earthing transformer. This neutral point is then appropriately earthed.

In addition to the above Arc Suppression (Peterson) coils are also used in some cases. Furthermore, there are occasions where transformer high voltage winding is earthed (or provided with a selectable earth switch). This is where there is islanded generation or where there are subsea cables (for protection against overvoltage during faults).

4.3.3 Distribution Substations

Earthing is provided for HV metal work, LV neutral and extraneous metal work not associated with the power system e.g. fences etc.

Where the overall resistance to earth does not exceed 1 ohm the HV metal work, LV neutral earth and fence metal work (within 2 metres of HV metal work) are combined together. Where the overall resistance to earth exceeds 1 ohm HV metal work earth, LV neutral and fence metal work earths are kept separate and resistance to earth of each separate earth electrode must not exceed 40 ohms.

4.3.4 Low Voltage System

The method applied to earth the LV system of most new networks and many existing networks is Protective Multiple Earthing (PME). This refers to the use of the supply neutral conductor of the LV network to provide earthing facilities for customers.

There is also use of Continuous Earth Wire, Separate Neutral and Earth and Protective Neutral Bonding systems.

The general requirements that must be fulfilled are:

The supply neutral conductor will be connected to an earth electrode at or near the transformer star point.

The supply neutral conductor will not contain a fusible cutout, circuit breaker or switch.

The value of the transformer neutral earth electrode will not exceed 40 ohms.

The overall resistance to earth of the supply neutral conductor will not exceed 20 ohms.

In addition to the neutral earth at or near the transformer star point, the supply neutral conductor will be connected to other points either to earth electrodes or supply neutral conductor of another distributing main.

4.4 Protection Systems

4.4.1 General

Protection equipment is used to recognise, locate and initiate removal of a fault or abnormal condition from the power system, normally by operation of a switching device. Circuit breakers and relays are normally used at higher voltages, but fuses are employed where relays are not economically justified.

To avoid unnecessary damage to plant and equipment and to minimise disconnection of healthy plant, it is essential that the protection systems employed on the distribution system are reliable, selective, fast and sensitive.

4.4.2 LV Feeders

In most cases low voltage feeders are protected by fuses. These provide short circuit protection to the main feeder and connected services. The fuses are rated to provide discrimination with HV protection.

4.4.3 11 kV/LV Transformers (Ground Mounted)

Ground mounted 11 kV / LV transformers are normally protected by HV fuse switches. The fuses provide protection for faults on the HV cable to the transformer, faults within the transformer and faults on the LV connections.

4.4.4 11 kV/LV Transformers (Pole Mounted)

Pole mounted 11 kV / LV transformers receive protection from either feeder circuit breaker, pole mounted auto reclosers / sectionalisers or pole mounted HV fuses.

4.4.5 11 kV Feeders

11 kV feeders are normally protected by circuit breakers with the following protections and typical clearance times:

Predominantly underground circuits:

- IDMT overcurrent and earth fault protection - up to 1 s, but possibly up to 3 s depending on fault type and location.

Predominantly overhead line circuits:

- Instantaneous high set overcurrent - 150 ms.
- IDMT overcurrent and earth fault - up to 1 s, but possibly up to 3 s depending on fault type and location.
- Time delayed sensitive earth fault - 7 s.
- Auto-reclosing as para. 4.6

Additional pole mounted auto reclosers are strategically located on the overhead network to limit the number of supply interruptions to customers for transient and permanent faults.

4.4.6 33/11 kV Transformers

33/11 kV transformers typically have the following protection and clearance times:

High set overcurrent, instantaneous earth fault and restricted earth fault – 150 ms.

3 stage standby earth fault - 1.4 s, 2.1 s and 2.9 s.

IDMT overcurrent and earth fault - up to 3 s.

Neutral voltage displacement protection - 3 – 10 s.

Buchholz and winding / oil temperature relays.

Intertripping or fault throwing switch if needed to trip remote circuit breaker – 300 ms or operating time of remote protection.

4.4.7 33 kV Feeders and Transformer Feeders

33 kV feeders are normally protected by circuit breakers fitted with protection dependent upon feeder type (overhead or underground cable). Typical protection provided (and clearance time) is a selection from:

Unit protection - 150 ms.

Distance protection - 150 ms zone 1, 500 ms zone 2, 1.3 s zone 3.

IDMT overcurrent and earth fault - up to 3s.

Auto-reclosing as para. 4.6 for predominately overhead circuits.

Additional protection is needed if remote transformers are connected, typically:

High set overcurrent - 150 ms.

Instantaneous earth fault - 150 ms.

Intertripping over pilot cable or fault throwing switch.

4.5 Network Automation

In order to minimise customer minutes lost and customer interruptions due to outages, where economically viable, opportunity is taken to automate the 11 kV distribution system by installing in line circuit breakers or actuators.

Circuits are generally prioritised for automation based on customer numbers and fault history.

4.6 Auto Reclosers

The majority of faults on overhead lines are of transient nature (e.g. insulator flash over) generally caused by wind borne materials. These faults are normally cleared by opening of the source circuit breaker or pole mounted recloser and do not recur when reclosed. Auto-reclosing is therefore applied to most predominantly overhead circuits.

Typical or preferred settings, where relays permit, are:

11 kV source circuit breaker:

- Trip 1 - Instantaneous high set overcurrent or time delayed overcurrent or earth fault or sensitive earth fault.
- 10 s dead time.
- Trip 2 - Instantaneous high set overcurrent or time delayed overcurrent or earth fault or sensitive earth fault.
- 10 s dead time (or lock-out if sensitive earth fault).
- Trip 3 - Time delayed overcurrent or earth fault.
- Trip 4 - Time delayed overcurrent and earth fault to lock-out.
- Reclaim time 5 s.

11 kV pole-mounted circuit breakers:

- Settings to co-ordinate with the above.
- Final dead time 140 s.

33 kV circuit:

- Single shot.
- 10-15 s dead time.
- 15 s reclaim time.

4.7 Operating Voltages

4.7.1 General

The company's distribution system operates at nominal voltages such as 33 kV, 11 kV and 230/400 V. Voltage control is applied at various voltage levels to ensure that statutory levels are maintained at customers' supply terminals as below.

4.7.2 Voltage Control of of 11 kV and LV system

Automatic control of the 11 kV source voltage is obtained by the on-load tapchanger on the 33/11 kV transformers. The interval between taps is typically 1.25%, 1.43 or 1.67%.

Line drop compensation is applied to some rural 33/11 kV transformer tapchanger control schemes to arrange automatic increase in the 11 kV source voltage with increase in demand. Typical settings are 1.05 p.u. at full load and 0.985 p.u. at no load. The 11 kV system is typically designed to accommodate 6% volt drop.

The low voltage system is typically designed so that the aggregate volt drop in the low voltage distributor and service does not exceed 7% with normally less than 2% in the service.

4.7.3 Voltage Control of 33 kV System

Where appropriate the voltage at the 33 kV source is set to the highest permissible value, typically 1.03 p.u., in order to permit maximum design volt drop in the 33 kV system. It is also chosen to ensure that the required 11 kV and LV busbar voltages at both nearby and remote substations can be achieved.

4.8 Generation Connection Policy

The principal duty placed on the authority is to protect the interest of consumers having regard to the need to secure that all reasonable demands for electricity are met. This duty is devolved to the licensee to develop the distribution systems in an economical manner whilst maintaining defined planning standards. The implications are that whereas demand for electricity must be met year round, generators will not always be able to simultaneously generate at their authorised capacity (generation is dispatched by the Transmission Operator) since the supply and demand for electricity must be balanced at all times. However, distribution connected generation is self dispatched and therefore networks have to provide firm access. Therefore, it is necessary that before any offer for connection is made, detailed network analysis is carried out to ascertain the impact of generation so that the quality of supply to connected consumers is not compromised.

Generators connected to the LV, 11 kV or 33 kV distribution system must comply with the general principles specified in Engineering Recommendation G98 or ER G99 as applicable. Where appropriate, the requirements of the Distribution Code and Grid Code must be met.

It is a requirement that Neutral Voltage Displacement will be fitted to all generators where the size of the generator or group of generators on the same connection point exceeds 200kVA. This is to ensure that the risks of back-energising the 11kV network from an LV generator is small.

Please also see section 4.10 - Network Constraints and Opportunities.

4.9 Load Management Areas

IDue to the extent of SHEPD's unique geographic area, historic network and sparsely populated areas, there are several primary substations that are currently exempt from ER P2/7. This is because the solution to reinforce the network to meet ER P2 would not be co-ordinated, efficient and/or economic. These areas of the distribution network are governed by SHEPD's approved alternative planning standard.

The customer base at these sites is mainly domestic and the heating load is controlled by time switched regimes; these are managed to contain demands within circuit capability and to optimise utilisation.

4.10 Network Constraints and Opportunities

In accordance with its licence, SHEPD develops an efficient, coordinated and economical distribution system. However, our island networks present some additional challenges.

The distribution network in Shetland is not currently connected to any mainland distribution or transmission system. Supplies are provided from local generation using the 33 kV, 11 kV and LV systems.

The distribution system in Orkney is connected via 33 kV subsea circuits to the mainland distribution system. Security for the local distribution system is also currently provided by SHEPD owned local generation.

The distribution system supplying the Outer Hebrides is connected via 33 kV subsea cable and the security of supply is currently provided by SHEPD owned local generation.
Therefore, any application for large connection (demand or generation) in the above areas require careful evaluation so that voltage profile to customers, switchgear and plant fault level rating, subsea cable rating and stability of the system are not compromised.

SHEPD is committed to working with all parties looking to connect to its network to identify and deliver the best possible connection package for optimum benefit.

In particular, the continued growth in generation connecting at distribution voltages is driving ongoing improvements in how SHEPD seeks to provide information and assistance to customers wishing to connect to its network.

It is essential that prospective generation developers work with SHEPD to ensure correctly located and well-matched generation is incorporated into its network to the mutual benefit of both customers and the network.

Key areas that need to be discussed and monitored are the impacts of the generation on the network and the impacts of the network on the generation.

The addition of generation to the network impacts the system fault levels, which in turn can lead to network reinforcement works or other smarter solutions being necessary to support the connection. The power flows experienced by the modified network, if not accurately analysed, monitored and controlled, could cause system overload, over and under voltage, system frequency variations and reduce system power factors. All of these are undesirable on the distribution network.

Networks may have to be redesigned in order to best adapt to the generation connection requirement. This will add both cost and time to the connection project and should be considered and remembered when submitting any such connection enquiry or request.

Importantly, connection of well-sited and adaptable generation could provide network support and reduce network losses. The development must supplement SHEPD's responsibility to deliver a safe, secure and reliable network.

When considering connecting new load or generation to the network, it must be thoroughly planned and designed to meet the requirements set out in the Distribution Code, and in line with the information contained within this LTDS document.

The following short guide may assist users who wish to complete initial investigations and assessments of proposed connections to SHEPD's network."

Key Milestones in the initial connection investigation process.

Fill out a generation connection form, available from the ENA Website and submit this to SSEN: https://www.energynetworks.org/operating-the-networks/connecting-to-the-networks

This will commence dialog with the company in relation to the connection request. Identify your new Connection, Generation or Load.

- Decide on the capacity and type of generation to connect; Wind, Solar, Hydro, combined Heat and Power systems, Bio-mass or other.

- Unless a specific location is required, select an area on the LTDS geographic map or select a sub station local to the desired connection area.

- Using the information available in the LTDS investigate that the selected Substation's capacity, demand, forecast demand and fault level could support the new connection.

- Collect technical data from LTDS and perform self study.

- Carry out study to access the impact of new generation on the existing network parameters including;

    - Fault level contribution of connecting new generator?
    - Clean or dirty load giving rise to System harmonics?
    - Impedance of the unit, how will this alter fault level?
    - What is the effect under 1st circuit outage conditions?

Connection charges will vary with the location and size of the proposed connection. At the point of connection request or enquiry, costings will be advised in line with the SSEPD Statement of Methodology and Charges for Connection to SSEPD's Electricity Distribution System.
http://www.ssen.co.uk/Library/ChargingStatements/SHEPD/

Applications for connection of generation are evaluated on an individual basis. Information on generation connections and applications can be found in Table 5 and Table 6 of this statement's data section which summarises larger embedded generation installations in SHEPD's area.

4.11 Transmission Constraints

Transmission capacity studies indicate that one of the main bottlenecks, termed the North-South constraint, for transferring power across the transmission system is between Kintore (near Aberdeen) and Tealing (near Dundee). This is due to high concentration of generation in the north and west. In general, new generation developments are difficult to locate without incurring significant expenditure on transmission reinforcement unless the new generation replaces existing generation.

In addition to the above there are other main import/export limitations in the south- west (Sloy-Inveraray), north-west (North of Beauly) and north-east (Beauly- Blackhillock).

Further information on constraints on the transmission system can be obtained in the Electricity Ten Year Statement, which is available on National Grid's Electricity System Operator website.
https://www.nationalgrideso.com/

SSEPD produce a Generation Availability map, which provides an indication of the networks capability to connect a large-scale development to a major substation.

The map can be viewed by following the link below:
https://www.ssen.co.uk/generationavailability/

5 GEOGRAPHIC AND SCHEMATIC PLANS

The following are included in this LTDS:

Schematic plans for the 33 kV system showing the electrical connectivity of the system.

Geographic map of the Network area.

Maps of 33 kV, 11 kV and LV systems for particular areas may be available on request depending on area. A price list for these is included in Appendix 1.

The distribution system of SHEPD interconnects with:

- The transmission system of Scottish Hydro Electric Transmission Ltd at the 132/33 kV substations shown in the schematic diagrams shown in the Electricity Ten Year Statement, which is available on National Grid's Electricity System Operator website. https://www.nationalgrideso.com/
- SP Energy Network's distribution systems at Strathleven & Abernethy 132/33 kV substations.

SP Energy Networks can be contacted via their website at:

http://www.spenergynetworks.co.uk/
The Distribution Code specifies the process for managing network development at interface point with users, which includes other Network Operators. It also describes the interface with the National Electricity Transmission System and SHEPD.

6 SOURCES OF NETWORK AND CHARGING INFORMATION

Charging Information is saved at:
https://www.ssen.co.uk/Library/ChargingStatements/SHEPD/

Competition in connections information is located at:
https://www.ssen.co.uk/Connections/UsefulDocuments/

Select "Competition in Connections" from the filter list.

7 DETAILED INFORMATION

7.1 OVERVIEW OF THE SYSTEM

The following table shows the volume of SHEPD's distribution network.

Voltage			Volume
33 kV	Overhead Line	km	5351
	Cable	km	2174
	Transformers	33/11 kV and 33 kV /LV	2785
11 kV	Overhead Line	km	20841
	Cable	km	5746
	Transformers	11 kV/LV ground and pole mounted	53707
Low Voltage	Overhead Line	km	3808
	Cable	km	11535

7.2 Network Data

The following data are included in this LTDS.

7.2.1 Circuit Data

The electrical parameters for 33 kV circuits are shown in Table 1. All 33 kV circuits emanating from a grid substation are shown in a group. The circuit rating information relates to the main item i.e., cable or overhead line and is based on the smallest cross section. Cyclic ratings are given where appropriate. In practice other items such as current transformers, protection equipment and isolators may restrict the circuit rating. The information is intended to illustrate the basic circuit capability. The vast majority of circuits operate at their construction voltage.

7.2.2 Transformer Data

33/11 kV transformer data is shown in Table 2. A site-specific analysis can be carried out to ascertain the reverse power capability of each transformer.

7.2.3 Demand Data

The maximum demand recorded at the substation is shown in MW and power factor in Table 3. The forecast demand is normally based on the historical growth trend plus any large known development. Firm capacity for multiple transformer sites relates to the remaining capacity under n-1 (largest unit loss), although higher loads can often be supplied by using load transfers or mobile or local generation. For single transformer sites the demand will normally be secured by use of interconnection, mobile generation or combination of both.

The minimum load scaling factor is the ratio of minimum to maximum demand.

Appendix 2 shows typical substation load profiles.

7.2.4 Fault Level Data

Calculated three phase fault level data under normal running arrangements at 33 kV and 11 kV nodes is shown in Table 4. There are some nodes which require a detailed network investigation before data is published. Normally there will be more than one circuit breaker at a substation site; the make and break ratings shown relate to the lowest rated circuit breaker. At most sites, not all circuit breakers would be subject to the fault currents given.

Fault currents given include contributions from all transmission and distribution networks and generation included in our study model. Making values include contributions from induction motors as set out in Engineering Recommendation G74.

The two fault currents published in this document are Peak Make and RMS Break. The Peak Make value has been calculated at a time of 10ms and includes both the AC and DC component of the fault current. The symmetrical RMS Break has been calculated at 60ms and includes the AC component of the fault current only. The associated X/R ratio is published and can be used to calculate the DC component of the fault. The asymmetrical RMS Break current is not published due to this value being dependent on site-specific components and settings.

Any fault levels calculated to within 95% of the circuit breaker rating at any given site will be highlighted before being assessed in further detail. Following the outcome of an additional study, steps to reduce fault level or reinforcement of switchgear may be proposed by SHEPD.

7.2.5 Connected Generation

A list of generation connected to SHEPD's distribution network is shown in Table 5. Standby and peak lopping generations are excluded from the table.

7.2.6 Interest in a connection

A high level summary of interest in demand and generation connections is shown in Table 6. 1MVA is the minimum installed capacity included in this table.

7.3 Other Information

Additional information is available on request:

Circuits	e.g. zero sequence impedance.
Transformers	e.g. zero sequence reactance, earthing details, hot sites.
Demand	e.g. limitation on firm capacity, demand duration profiles.
Fault Level	e.g. contributions to fault current at each node, decremented break fault currents, details of limitations and indicative cost to relieve.

A price list for provision of such additional information is included in Appendix 1; contact details are in Part 1 Section 4.

8 NETWORK DEVELOPMENT PROPOSALS

Appendix 3 lists financially approved distribution system reinforcement proposals. These schemes are either under construction or are in the design stage.

9 FURTHER INFORMATION

9.1 Distribution Code

See: www.dcode.org.uk

9.2 Electricity Ten Year Statement

See: https://www.nationalgrideso.com/

9.3 Engineering Recommendations

Copies of National Engineering Recommendations and Technical Specifications are available from:

Energy Networks Association
6th Floor
Dean Bradley House
52 Horseferry Road
London
SW1P 2AF

Tel: 020 7706 5100

Email: info@energynetworks.org

or

www.energynetworks.org

APPENDIX 1

NETWORK INFORMATION PRICE LIST

SHEPD will be able to provide additional and/or site-specific network information on request. The price list given below is for general data which is normally available but will require time and effort to collect.

For some site-specific enquiries, and for those items that are not included in the list below, it may be necessary to carry out network analysis, site checks and in some cases shut down of the network to obtain information. A quotation will be provided to the customer before work is undertaken.

Network Data

a)	**Reliability Data**	
	Typical reliability data for 33 or 11 kV and LV system	£25 per voltage
	Specific circuit reliability data	£100 per circuit
b)	**Demand Data**	
	Specific demand (maximum and minimum) data - normal running for 33 and 11 kV circuits	£100 per circuit
c)	**Impedance Data**	
	Specific 11 kV circuit impedance data	£50 per circuit
	Specific 33 kV circuit data additional to LTDS standard data	£50 per circuit
d)	**Plant Data**	
	Rating, fault levels rating and protection details without site visit. (Where site visit is required, price will be provided on request)	£100 per site

Any request for the above information should be sent in writing (see Part 1 Section 4 for contact details) including areas of interest showing details of the substation group and the substation or busbar node names and the information required. Under normal situations return of information will be within 15 working days.

Geographic Mapping Information

Maps and network plans are available on request from SHEPD's Mapping Services department.

Mapping Services can offer access to our GIS mapping system information via the internet. This would allow repeated access at user's convenience. Requests for this service should be made directly to Mapping Services via email: mapping.services@sse.com

This service may be subject to access and is provided free.

One set of specific 33 kV system map with OS background	£50 per printed set
One set of specific 33 kV schematic diagrams	£50 per printed set
One set of specific 11 kV system map with OS background	£50 per printed set
One set of specific 11 kV schematic diagram	Price on request

"One set of specific system mapping" Is defined as a 2km area centred as requested by the customer. This can be produced in either paper format or as a digital shape file or PDF.

In some cases, it will be necessary to obtain information from manufacturers or suppliers. SHEPD will use its best endeavours to obtain this but will not be held responsible for non- provision or delayed provision of such information. Any additional cost to provide such information will be advised.

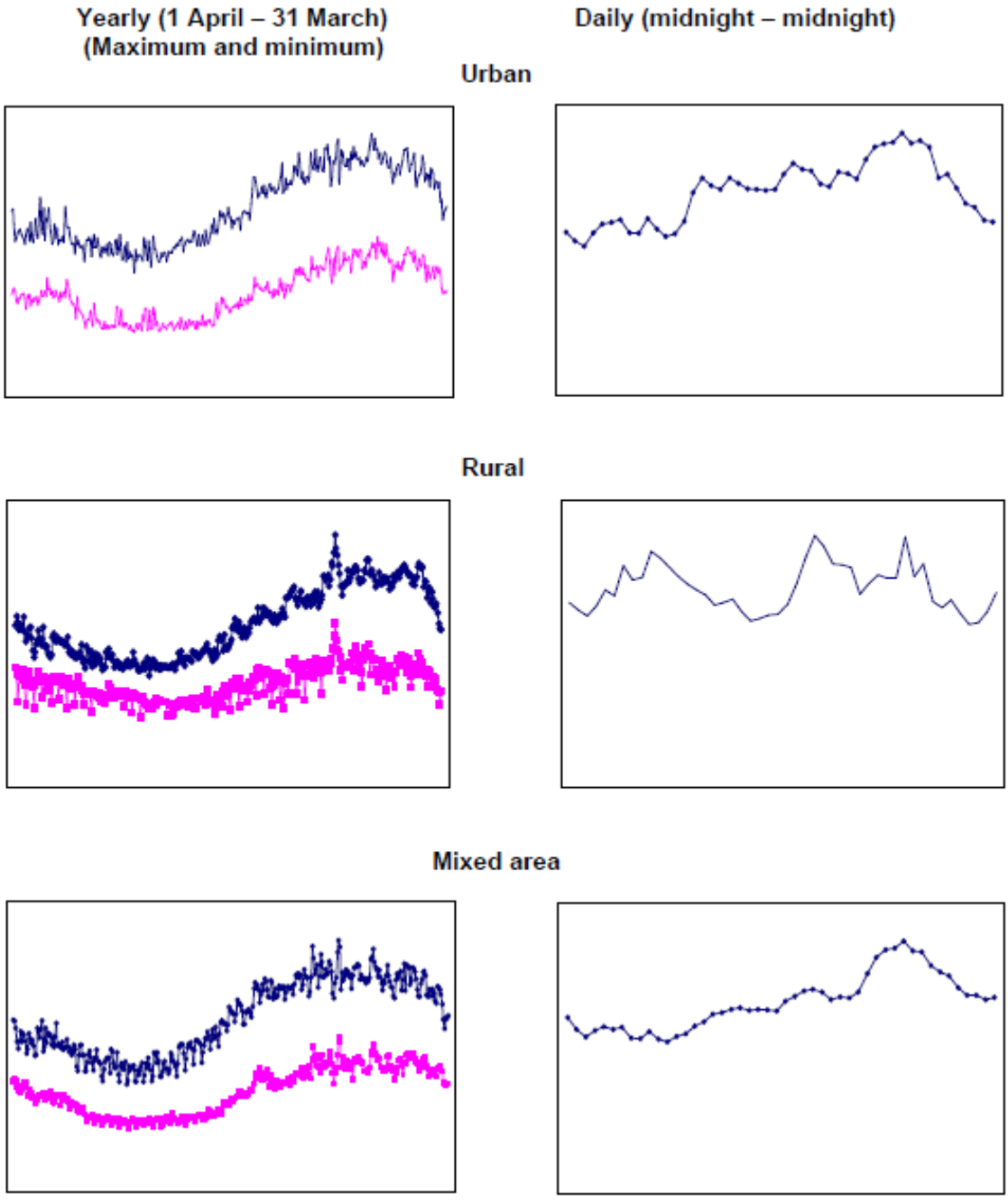
Any request for the above information should be sent in writing accompanied with a cheque payable to Scottish Hydro Electric Power Distribution plc to:

System Planning North
Scottish Hydro Electric Power Distribution plc
Inveralmond House
200 Dunkeld Road Perth
PH1 3AQ
E-mail: system.planning.north@sse.com

All prices are subject to VAT at current rates

APPENDIX 2

TYPICAL 33/11 KV SUBSTATION LOAD PROFILES



APPENDIX 3

NETWORK DEVELOPMENT PROPOSALS

GSP	Name	Estimated Completion	Impact on Distribution Network Capability	Changes from Nov 2022 Statement
Carradale	Carradale - Arran North Submarine Cable Replacement	Completed	Subsea cable replacement	Completed
Taynuilt	Mull - Coll Submarine Cable Replacement	Completed	Subsea cable replacement	Completed
Redmoss	Kincorth 11kV Board Replacement	Completed	Ageing plant replaced with telecontrol. Increase in make and break fault ratings	Completed
Persley	Haudagain T1 & T2 replacement	Completed	Upgrade to 12/24 transformers and 11kV Board replacement, plus 11kV network reconfiguration	Completed
Lyndhurst	West Kirkton 11kV switchboard Replacement	Completed	Increase in make and break fault ratings Nodes: 84214	Completed
Fort William	Corran Narrows North Subsea Cable	Completed	Subsea Removed, replaced with uprated land cable	Completed
Craigiebuckler	Craigton T1+T2+11kV board replacement	Jun-23	10MVA Transformers replaced with 7.5/15MVA. Aging11kV s/board replaced with new, with telecontrol (+ noise complaint)	No Change
Persley	St Machar 11kV Board Replacement	Jul-23	Ageing plant replaced with telecontrol. Increase in make and break fault ratings	Estimated completion changed from May-23
Strichen	Boddam 11kV Cable Reinforcement	Aug-23	Increase in circuit capacity	Estimated completion changed from Mar-23
Dyce	Circuit Reinforcement Dyce North	Sep-23	Increase in circuit capacity Nodes: 82419 - 82404, 82420 - 82405	Estimated completion changed from Mar-23
St Fergus	St Fergus Gas 11kV Board Replacement	Sep-23	Increase in make and break fault ratings Nodes: 21350	No Change

Craigiebuckler	Craigiebuckler 11kV Board Replacement	Sep-23	Ageing plant replaced with telecontrol. Increase in make and break fault ratings	Estimated completion changed from Jun-23
Gremista	Gremista 33kV outdoor c/b replaced with indoor switchroom	Oct-23	Ageing plant replacement; increase in make and break fault ratings	No Change
Persley	Persley-Bridge of Don No1 & 2 33kV FFC replacement	Oct-23	Replace 33kV fluid filled cable with Al cables: change in cable capacity	Estimated completion changed from Aug-23
Thurso South	Mainland Orkney - Hoy Centre SSEPD_34 33kV Submarine Cable Replacement	Oct-23	Subsea Replacement + Increase in Capacity Nodes: 86139 & 86170	No Change
Thurso South	Mainland Orkney - Hoy North SSEPD_21 33kV Submarine Cable Replacement	Oct-23	Subsea cable replacement Nodes: 86101 & 86128	No Change
Taynuilt	Kinloch Isle of Mull (NoSR)	Oct-23	North of Scotland Resilience (NoSR) Increase in network security	Estimated completion changed from Mar-23
Fort William	Glenfinnan-Lochailort 33kV Reinforcement	Nov-23	Increase in circuit capacity Nodes: 82990 - 82915	Estimated completion changed from Mar-23
NEW	Finstown GSP Integration	Nov-23	Facilitate renewable generation	Estimated completion changed from Mar-23
Port Ann	Primary Reinforcement - Inverneil	Nov-23	Increase in transformer capacity Nodes: 82236 & 82237	Estimated completion changed from Mar-23
Port Ann	Primary Reinforcement - Glendaruel	Nov-23	Increase in transformer capacity Nodes: 84903 & 84907	Estimated completion changed from Mar-23
Dyce	Balmedie P2 Compliance	Dec-23	Increase in network security	Estimated completion changed from Mar-23
Abernethy	Milnathort 11kV switchboard Replacement	Feb-24	Increase in make and break fault ratings Nodes: 80037	Estimated completion changed from Mar-23
Grudie Bridge	Drumrunie Transformer Reinforcement	Mar-24	Increase in transformer capacity Nodes: 83331 - 83332	No Change
Lairg	Tressady Transformer Reinforcement	Mar-24	Increase in transformer capacity Nodes: 83904 - 83905	No Change

Longman Drive	Longman Drive Substation	Mar-24	Increase in Transformer capacity	No Change
Grudie Bridge	Inverbroom Transformer Reinforcement	Mar-24	Increase in transformer capacity Nodes: 83320- 83321	No Change
Dounreay	Dounreay 33kV Circuit Reinforcement	Mar-24	Fault level reinforcement	No Change
NEW	Rothienorman GSP Integration	Mar-24	Facilitate renewable generation/ DGEN reconfiguration to free up capacity at Keith & Kintore	No Change
Scorradale	Submarine Cable Replacement - Shapinsay/Mainland	Mar-24	Subsea cable replacement Nodes: 86121	Project deferred into ED2 price control period
Tummel	Tummel Bridge 33kV Cable Reinforcement	Mar-24	Facilitate renewable generation	No Change
Abernethy	Errol 11kV switchboard Replacement	Mar-24	Increase in make and break fault ratings Nodes: 80013	No Change
Bridge of Dun	Logie Pert 11kV switchboard Replacement	Mar-24	Increase in make and break fault ratings Nodes: 80604	No Change
Milton of Craigie	Longhaugh 33/11kV transformer Replacement	Mar-24	Increase in capacity Nodes: 84301 - 84304 & 84302 - 84304	No Change
Milton of Craigie	Longhaugh 11kV switchboard Replacement	Mar-24	Increase in make and break fault ratingsNodes: 84304	No Change
Taynuilt	Taynuilt - Tullich 33kV Circuit Reinforcement	Mar-24	Increase in transformer capacity Nodes: 3L5: 19730-85917-85966 -85913; 6L5: 19730-85941-85964-85913	No Change
Port Ann	Machrie T2 and 11kV switchboard Replacement	Mar-24	Additional 2.5MVA Tx to match existing unit and new indoor 11kV switchboard (25kV Break & 62.5kA Make)	No Change
Inverness	Inverness 33/11kV Transformer Replacement	Jun-24	Increase in transformer capacity Nodes: 83523	No Change
Arbroath	Charles Avenue 11kV Switchboard Replacement	Mar-25	Increase in make and break fault ratings Nodes: 80218	No Change
Arbroath	Hume Street 11kV Switchboard Replacement	Mar-25	Increase in make and break fault ratings Nodes: 80222	No Change

Woodhill	Queens Lane North 11kV Board Replacement	Mar-25	Ageing plant replaced with telecontrol. Increase in make and break fault ratings	No Change
Elgin	Primary Reinforcement - Elgin	Mar-25	Increase in transformer capacity Nodes: 82513 & 82502	No Change
Gremista	Scalloway - Setter Sandwick - Sumburgh Reinforcement	Mar-25	Increase in network security Nodes: 89972 & 89981	No Change
Braco West	Crieff 11kV switchboard Replacement	Mar-25	Increase in make and break fault ratings Nodes: 80509	No Change
Port Ann	Crinan 11kV switchboard Replacement	Mar-25	Increase in make and break fault ratings Nodes: 84915	No Change
Port Ann	Islay (NoSR)	Mar-25	North of Scotland Resilience (NoSR) Increase in network security	Estimated completion changed from Mar-23
Keith	Rothes 11kV & 33kV Switchgear Replacement	Mar-25	Increase in make and break fault ratings Nodes: 83608, 83609 & 83605	Estimated completion changed from Mar-24

There have been no cancelled/decommissioned assets since the Nov 2022 statement.