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Acronym Guide

DNO	Distribution Network Operator	ICP	Independent Connections Provider
ENA	Energy Networks Association	IDNO	Independent Distribution Network Operator
EREC	Engineering Recommendation	NHH	Non-Half Hourly (meter)
FITs	Feed in Tariffs		
HH	Half Hourly (meter)		

Note that this document covers the process for connecting generation to the distribution networks in Great Britain. Northern Ireland has different connection arrangements, for example different versions of Engineering Recommendations G83/G98 and G59/G99 are in use. For more information, refer to the Northern Ireland Electricity website: www.nie.co.uk

Note: Many of the terms used in this guide are defined in the Glossary.

Introduction

Who is this Guide for?

This Guide is intended to help you, as a developer or the prospective owner of any form of **Distributed Generation**, to connect your generating unit to one of GB's electricity distribution networks. It may also be useful for installers or manufacturers of distributed generation equipment.

DNOs treat storage as both demand and generation, and need to be aware of storage because of the potential impact on their networks.

This “summary” guide is written for the developers of Distributed Generation or storage projects which are covered by **Engineering Recommendation (EREC) G83/G98**. This covers projects that are:

- Projects with a capacity of **16A per phase or less** (if there are multiple generation or storage units connected at the same premises, then 16A is the maximum combined capacity per phase); and
- Projects connected at **low voltage** (230V single phase, or 400V three phase); and
- Technology which is **type tested** under the requirements of EREC **G83/G98**.

This guide is best suited for those developers who are connecting Distributed Generation or storage in more than one property within a ‘close geographic region’. This is typically defined as an area which is fed by the same part of the distribution network. A general rule of thumb is that if your installations are within 500 meters of each other, then they are likely to be within a close geographic region. Your DNO will be able to clarify this for you.

If you are developing Distributed Generation within a single property, or if your project is outside of the scope of EREC **G83/G98**, then there are alternative Guides that are more suited to your project, available on the Energy Networks Association website.

What is the aim of the Guide?

This is a ‘summary’ form of a much more detailed guide, available on the Energy Networks Association (ENA) website. The purpose of this summary guide is to act as a **simplified ‘route map’** of the processes for getting a generation project connected to the distribution network.

You should be aware that the process of getting connected described in this guide is **only part of the process** of developing your distributed generation. For example, this guide does not cover:

- Designing, installing and operating the generation units themselves;
- Planning and financing the project; and
- Resolving local planning issues.

The format of the Guide

This Guide has been written and formatted with you, the reader, in mind. We have tried to make this Guide as clear and easy to read as we can, bearing in mind that some of the issues discussed are technical and complex. In particular:

- Any acronyms and terms which may be unfamiliar are explained in the glossary.
- Text is **emboldened** for emphasis.
- Where necessary the Guide distinguishes between the arrangements that apply in Scotland and those which apply in England and Wales. This is indicated with a Scottish flag.
- There is a pointer on where to find more information at the end of the guide.



Because the topics covered here are technical and complex, it is necessary to refer to such concepts as voltage and power. Where possible, terms that may be unfamiliar have been defined.

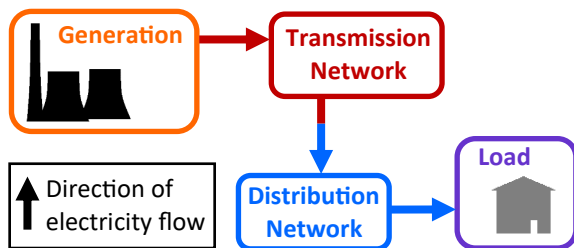
Governance of the Guide

This Guide is a Distribution Code Review Panel (DCRP) document. The DCRP will update the Guide periodically.

A: Background-The GB Power Sector

Traditional power system

In the traditional power system, electricity generally flows in one direction; from large power stations (mostly coal, gas and nuclear), into the transmission system, through to distribution systems and delivered to loads (such as homes, businesses and factories).



Changing power system

An increasing number of small electricity generating units are being developed, often connected to distribution networks. This is known as Distributed Generation, and can bring advantages such as low carbon energy sources and reduced transmission and distribution system costs.

However, it can result in the electricity flows in the network being less predictable and dynamic. As this is not what the network was designed to deal with, this can cause issues around network control and protection.

Important terms

Transmission Network / Transmission System: Transports electricity over long distances across the country. Electricity is transported at a high voltage to reduce losses. Transmission voltages are 275kV or 400kV. In Scotland, 132kV is also used.

Distribution Network / Distribution System: Transports electricity from the Transmission System (and from Distributed Generation) to loads like homes and businesses. The voltage is reduced to the correct supply voltage for the loads. Distribution voltages are 132kV and lower in England and Wales, and less than 132kV in Scotland. Most domestic customers are supplied at 230V.

Key organisations

National Grid Electricity Transmission (NGET): The System Operator for Great Britain, and also the Transmission Owner for England and Wales.

The Transmission Owner for northern Scotland is Scottish Hydro Electric Transmission Plc, and for southern Scotland, SP Transmission Plc.

Distribution Network Operator (DNO): Owns and maintains public electricity distribution networks. There are six DNOs in Great Britain.

Note: You may be connected to an Independent DNO's (IDNO) network or a private network rather than the DNO's network. In this Guide when we refer to DNOs, this also applies to IDNOs.

Suppliers: Buy electricity in bulk from generators, and then sell to consumers. They are responsible for providing bills and customer services, and arranging metering and meter reading. Electricity supply is a competitive market so you can choose and change your electricity supplier.

Ellexon: The Balancing Settlement Code company for Great Britain.

Ofgem (Office of Gas and Electricity Markets): The regulator of the power system in Great Britain.

B. The Role of Distributed Generation

What is driving Distributed Generation?

Environmental concerns—The increased concern over the damage that Greenhouse Gases may be doing to our environment. Distributed Generation technologies are often renewable or low carbon means of generating electricity.

Government policy—The Department for Business, Energy and Industrial Strategy (BEIS) is developing policy to ensure that in the UK energy supplies are secure, low carbon, and fuelled from a diverse mix of energy supplies. This includes supporting Distributed Generation.

Security of Supply—The need for secure and reliable sources of energy, both now and into the future.

Technological innovation

Technology is developing all the time, and there are more generating technologies and network techniques available now than there were when the national grid was being developed.

To incentivise innovation in energy networks, Ofgem runs two mechanisms: the **Network Innovation Allowance** (NIA, an allowance awarded to each network company) and **Network Innovation Competitions** (NIC, where network companies bid competitively to fund larger projects).

For more information, and details about individual projects, refer to the Smarter Networks Portal, hosted by the Energy Networks Association: www.smarternetworks.org/

Benefits of Distributed Generation

The benefits that increased Distributed Generation has on the UK and its electricity system include:

- **Increased energy mix** —often lower carbon; and
- If Distributed Generation is connected close to the point of use,
 - **Reduced need for network infrastructure**
 - **Reduction in transmission and distribution losses.**

The commercial benefits to having Distributed Generation, include:

- **Lower electricity bills**—through using your own energy onsite instead of importing from the grid;
- **Selling energy** that you generate, and gaining from **incentives** like FITs; and
- **Participation in Ancillary Services**—Larger units (more than around 3MW) may be able to participate.

Impacts of Distributed Generation

As well as introducing benefits, the increased penetration of Distributed Generation in UK distribution networks also poses challenges, including:

- **Thermal ratings** being exceeded;
- **System voltage** rising beyond the acceptable limits;
- **Reverse power flows**, i.e. power flows in the opposite direction to which the system has been designed;
- **Fault level** rising above the rating of equipment; and
- **Power quality** being affected, e.g. flicker, voltage unbalance or harmonics.

C: An Overview of Getting Connected

Below is a summary of the major tasks of the connection process. These tasks are described in more depth in this section of the guide.

1. FIND AN INSTALLER

Installers must be competent

2. REVIEW INFORMATION and DISCUSS WITH THE DNO

Hold meetings with your DNO

3. SUBMIT APPLICATION FORM

4. APPLICATION ACCEPTANCE

Accept a connection offer from your DNO

5. INSTALLTION AND COMMISSIONING

Infrastructure is installed and tested

6. INFORM THE DNO

Submit the Installation and Commissioning form

7. ONGOING RESPONSIBILITIES

1. Find an installer

The first task is to find a competent installer. Certified generation products and installers can be found [here](#).

2. Review Information and Discuss with the DNO

You should look for supporting information published on the DNO's website, as this can be a valuable resource.

You must also discuss your plans with the DNO before starting work, including issues such as feasibility and potential charges. You should do this as soon as possible in your planning, as the DNO's response may have a significant impact on how you plan your project.

3. Submit Application Form

Once you have planned the project and exchanged information about your plans with the DNO, it is time to submit an application form. The format of the application form is given in [Appendix 2 of EREC G83](#), or in [Appendix 3 of EREC G98](#). These are available free of charge on the Energy Network Association's website. Your installer should submit the application form on your behalf. The form should include both generation and storage details as applicable.

4. Application Acceptance

When you submit your application form the DNO will assess the impact that your generating equipment may have on the network. Once the DNO has conducted these assessments, they will produce a Connection Offer. This will specify the conditions for your connection, and inform you of any connection charge that you may be asked to pay.

You should ensure that you fully understand this offer before accepting it. You should discuss questions with your DNO if you are unsure.

General Tip: Communication with the DNO

Communication with the DNO from an early stage and throughout the project means you can discuss potential issues early, and allows you to plan your project effectively. You can also request additional information like budget estimates and feasibility studies, though some DNOs will charge for this.

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7. ONGOING RESPONSIBILITIES

5. Installation and Commissioning

The **installation** and commissioning requirements are covered in Section 7 of EREC **G83** / Section 8 of EREC **G98**. Your installer should be aware of these requirements.

Your DNO will also complete any work required on the network. Close communication with the DNO throughout this process will allow coordinated planning of construction and connection.

6. Inform the DNO

Your installer should notify the DNO **within 28 days** of commissioning each generating unit, and provide them with information on the installation. This information is captured on an “**installation commissioning confirmation**” form, which is given in [Appendix 3 of EREC G83](#) or the “**Installation Document**”, which is **Form B in Appendix 3 of EREC G98**. DNOs may have their own installation commissioning confirmation forms on their websites. **Note: you will need to submit a for each installation**

7. Ongoing Responsibilities

Ongoing commitments are outside of the scope of this Guide, but you should be aware of them. They include:

- maintenance of the equipment;
- **informing your DNO if you remove or replace your generating unit;**
- **Notifying your DNO of any operational incidents that affect your compliance with EREC G98; and**
- periodic testing specified by the DNO.

Health and Safety Considerations

Some of the safety requirements for Distributed Generation connections are set out in EREC **G83/G98**, which reflects Regulations and Acts such as the Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002, and also the relevant British Standards.

C: An Overview of Getting Connected

Grace Period

EREC G98 was introduced in May 2018. It is based on EREC G83, which was revised to take account of a European Network Code called Requirement for Generators. Generation connecting before 27th April 2019 can be connected under either EREC G83 or EREC G98, depending on which document the generating unit was designed to. Generating units connecting from 27th April 2019 must connect under EREC G98.

Dealing with Disputes

If you have a dispute during the connection process which you cannot resolve with the party directly, you can contact the Energy Ombudsman:

www.ombudsman-services.org/energy

As a last resort it can then be referred to Ofgem.

D: The Connection Application

There are two formal documents that you need to submit to your DNO throughout the connection process. Both of these are mentioned in the previous section of this Guide, and described in further detail here:

The Application for Connection Pro-forma

The Application for Connection Pro-forma is provided in [Appendix 2 of EREC G83](#), or in [Appendix 3 of EREC G98](#). It needs to be submitted to your DNO **before you begin installation**. Connection of the generation equipment will only be allowed to proceed after the DNO has approved the application, and any facilitating works for the connection have been completed.

The information required includes:

- details of the **installer** of the generating units, including their qualifications; and
- **information on the proposed equipment**, including the address, meter number, capacity and type testing reference number.

Note: if your generation project is part of a larger project, e.g. developing new housing, then your application needs to be co-ordinated with the connection application for the electricity supply for the whole project. This is because the DNO will need to take into account the new generation in the design of the overall connection.

The Commissioning Pro-forma

The Commissioning Pro-forma is provided in [Appendix 3 of EREC G83](#), or the “**Installation Document**”, which is **Form B in Appendix 3 of EREC G98** and needs to be filled in and given to your DNO **within 28 days of the date of commissioning**. The information required includes:

- **contact details** for the owner of the generating unit;
- details about the **site** where you are connecting your generating unit, including metering information;
- **technical information** about the generating unit itself, including the generating capacity, type test reference and primary energy source;
- details of the **installer** of the generating unit, including the party’s accreditation and qualifications;
- **supporting information**, e.g. circuit diagrams; and
- a **signed declaration** as to the compliance of the generating unit with the requirements of EREC [G83/G98](#).

E: Costs and Charges

Costs and charges can be divided into two categories:

CONNECTION CHARGES

ONGOING CHARGES

DNOs are obliged to publish documents about their charges, which can be found on their websites. These contain the **DNO's charging methodology** (i.e. how they calculate their charges), the **DNO's charging statement** (i.e. what the charges are), and other relevant information for connecting customers.

Connection charge

This is a one-off charge made by the DNO to cover the cost of your connection, which may contain charges for:

- **Infrastructure:** new equipment and reinforcement to the existing network necessary to accommodate your generation. You will be charged for extension to the network.
- **Budget Estimates and Feasibility Studies** (optional).
- Others, including: Administration, additional meetings or site visits, provision of Wayleaves, substation locks and notices.

Note that not all DNOs apply charges for all of these items, and that not all of these items will be relevant for your project.

To obtain a more accurate picture of the connection costs for your project, you can get a budget estimate from either the DNO, or from a specialist engineering consultant. You must be aware that this will be an estimate, and may not accurately reflect what you will be charged. It is likely that you will need to pay for this estimate.

Ongoing Charges

Use of System (UoS) charges cover the operation and maintenance of the distribution network. They are levied by the DNO to the supplier, so you will not be charged these directly. However, they may appear as an item on your bill.

DNOs are obliged to publish documents about their Use of System charges. You can find these on DNOs' websites.

UoS charges change depending on:

- the **voltage level** you are connected to (If you are compliant to EREC **G83/G98**, you are connecting to low voltage); and
- the **type of meter** you have. It is likely that you will have a Non-Half Hourly (NHH) meter, as only sites with a generation capacity of greater than a certain threshold (currently 30kW) are required to have a Half Hourly (HH) Meter (if metering export).

With the Common Distribution Charging Methodology charges for LV generation customers with NHH meters are in the form of a single unit rate (p/kWh).

F: Selling Electricity-Incentive Schemes

FEED-IN TARIFFS (FITs)

FITs are a financial incentive to support distributed renewable energy generation **up to 5 MW**. FITs are available for the following generation technologies:

- Anaerobic digestion
- Combined Heat and Power (CHP)*
- Solar PV
- Wind
- Hydro

*Up to 30,000 domestic Combined Heat and Power (CHP) units are supported through FITs under a Micro CHP pilot scheme. These units must have a capacity of no greater than 2 kW each.

There are three sources of financial benefit from a Generation project receiving FITs:

1. Generation tariff (FITs):

A fixed price for each unit of electricity **generated**, depending on the generation technology. The tariffs are reviewed regularly, and can be found on Ofgem's webpage. The tariff level that your generator will receive will remain the same throughout the eligible lifetime of the project, which for most technologies is 20 years.

2. Export tariff:

A **guaranteed price** for each unit of electricity **exported** to the grid. The tariffs are reviewed regularly, and can be found on BEIS's or Ofgem's webpages.

3. Import Reduction:

Reducing your electricity bill by using your own electricity rather than importing from the grid.

In the case of solar PV, your tariff will also be dependent on the number of PV installations that you are receiving FIT payments from, and the energy efficiency of the property itself.

FITs are subject to "**deployment caps**" - this is a limit on the capacity that can receive a particular FIT tariff, in a particular tariff period.

The accreditation process for your generation project will depend on the generating technology you are using. **To find out more, please see Ofgem's [website](#).**

The **Feed-in Tariffs (Amendment) Order 2015** allows two projects to share one grid connection and receive separate tariffs based on their individual generating capacity, provided that at least one project is owned by a **community organisation**. Both parties sharing the grid connection will be individually required to seek support under the FITs scheme and to meter their generation separately.

Community Energy Schemes: The Feed-in Tariffs (Amendment) Order 2015 has introduced an exemption to the definition of the term "site" in the FIT legislation, which is effective from April 2015. The amendment allows two projects to share one grid connection and receive separate tariffs based on their individual generating capacity, provided that at least one project is owned by a community organisation. Both parties sharing the grid connection will be required to seek support under the FITs scheme. In order to enable Ofgem to treat the individually owned sections as separate eligible installations each will be required to register as separate FIT generators and to meter their generation separately.

Where to Find More Information

Some Useful Organisations:

Energy Networks Association —the industry body for UK energy transmission and distribution licence holders and operators: www.energynetworks.org

Ofgem is a good source of up to date information about **Feed in Tariffs** —www.ofgem.gov.uk/environmental-programmes

Note that your electricity supplier is your point of contact for the FIT scheme.

National Grid Electricity Transmission (NGET)—The Great Britain System Operator and Transmission System Owner in England and Wales: www.nationalgrid.com/uk/Electricity/
Has a lot of useful information available, including the National Grid Electricity Transmission Ten Year Statement and more information about connection and agreements

Department for Business, Energy and Industrial Strategy (BEIS) - For the most up to date information on relevant Government policy <https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy>

Energy Saving Trust—www.energysavingtrust.org.uk/Generate-your-own-energy

Some Useful References:

Engineering Recommendation G98 and G99— available on the DCode website: www.dcode.org.uk/annexes.html

Engineering Recommendation G59 and G83—available on the DCode website and the ENA Document Catalogue System: www.ena-eng.org/ENA-Docs/

The Grid Code of Great Britain — available free of charge on NGET's website: www.nationalgrid.com/uk/Electricity/Codes/gridcode/

The Distribution Code of Great Britain—available free of charge on the Distribution Code website: www.dcode.org.uk/

The European Network Code, Requirements for Generators—available on the [EUR-Lex website](http://eur-lex.europa.eu)

Metering Codes of Practice: www.elexon.co.uk/bsc-related-documents/related-documents/codes-of-practice/

Certified generation products and installers: www.microgenerationcertification.org

Where to Find More Information

There is a great deal of published information that your DNO will provide that will be helpful for your project planning. Some of the most useful sources are summarised here, and links to the DNO websites are in the table below. You should also contact your DNO from an early stage in your project, and they will be able to advise you with information specific to your situation.

Long Term Development Statement (LTDS)

Covers the development plans for the network, and other information useful for prospective developers. An introductory chapter is generally available on the DNO's website and DNOs will give access to the full document on request. These documents are updated annually.

Connection Charge Documents

Statements and methodologies will be given for both connection charges and Use of System (UoS) charges. This information may be included in a single document, or in several, and are updated regularly. These are available on your DNO's websites.

Standards of Performance

Ofgem has set minimum performance standards for the provision and performance of connections, and if your DNO fails to meet these standards, you may be entitled to receive payment. Ofgem has guidance documents about these Standards on their website:

www.ofgem.gov.uk/licences-codes-and-standards/standards/quality-service-guaranteed-standards

Distributed Generation "Work Plan"

The Incentive for Customer Engagement (ICE) exists to encourage DNOs to engage with and respond to the needs of major connections customers (which includes generation customers), and includes a requirement on DNOs to set out plans on what improvements they plan to make in the next regulatory year, consisting of two parts. Part 1 covers plans for improvements for the forthcoming year; and Part 2 reviews the progress in the previous year. Check your DNOs Distributed Generation web pages.

Other Supporting Information Provided by DNOs

In recent years, there have been improvements to the information that DNOs provide, including:

- web portals and decision support tools/application hotline;
- capacity "heat maps", indicating areas that can more readily facilitate connections;
- holding events such as "open surgeries" for Distributed Generation customers; and
- **more details provided on outages (historic and planned outages).**

Region	DNO	Website
North Scotland, Southern England	SSE Power Distribution	www.ssepd.co.uk
South Scotland, Cheshire, Merseyside and North Wales	SP Energy Networks	www.spenergynetworks.com
North East England and Yorkshire	Northern Power Grid	www.northernpowergrid.com
North West	Electricity North West	www.enwl.co.uk
East Midlands, West Midlands, Southern Wales, South West England	Western Power Distribution	www.westernpower.co.uk
Eastern England, South East England, London	UK Power Networks	www.ukpowernetworks.co.uk

Glossary of Terms

Balancing and Settlement Code company: Governs the operation of the balancing mechanism. They charge generators and suppliers for the cost to the System Operator to balance the market. The Balancing and Settlement Code company for Great Britain is Elexon.

Close Geographic Region: Typically, an area which is fed by the same part of the distribution network, from a single feeder or distribution transformer. A general rule of thumb is that if your installations are within 500 meters of each other, then they are likely to be within a close geographic region.

Commissioning: A set of visual inspections and tests performed on equipment after installation, renovation or maintenance, and before it goes into full operation. Commissioning aims to ensure the equipment is working safely and as it should.

Distribution Code: The code required to be prepared by a DNO pursuant to condition 21 (Distribution Code) of a Distribution Licence and approved by the Authority (The Gas and Electricity Markets Authority - Ofgem) as revised from time to time with the approval of, or by the direction of, the Authority.

Distributed Generation: A generation project is classed as Distributed Generation if it operates while electrically connected to the distribution network. Also known as 'Embedded Generation'.

Distribution Network: Transports electricity from the Transmission System to loads like homes and businesses. The voltage is reduced to the correct supply voltage for the loads. The voltage is 132kV and lower. Most customers are supplied at 230V.

Distribution Network Operator (DNO): Owns and maintains public electricity distribution networks. They must hold a Distribution Network Operator Licence. These are regulated monopoly businesses which recover their costs by levying use of system charges on electricity traded using their network. There are six DNOs in Great Britain.

Engineering Recommendation (EREC) 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 on or after 27 April 2019.

Engineering Recommendation (EREC) G99: Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019.

Engineering Recommendation (EREC) G59: EREC G59 is called "Recommendations for the Connection of Generating Plant to the Distribution Systems of Licensed Distribution Network Operators." The purpose of the document is to provide guidance to you and to DNOs on all aspects of the connection process.

Engineering Recommendation (EREC) G83: EREC G83 is called "Recommendations for the Connection of Type Tested Small-scale Embedded Generators (Up to 16 A per Phase) in Parallel with Low-Voltage Distribution Systems." It sets out the requirements you must meet before your generating unit can be connected to the network. The document is aimed at the manufacturers and installers of your generating unit.

Feed-in Tariffs (FITs): A financial incentive to support distributed and small-scale renewable energy generation, up to 5 MW.

Glossary of Terms

Generating Unit: Any apparatus which produces electricity. Is a synonym of a generation set as defined in the Distribution Code.

Generator: A person who generates electricity under licence or exemption under the Electricity Act 1989.

Independent Distribution Network Operator (IDNO): A holder of a distribution licence, an IDNO designs, builds, owns and operates a distribution network, which is an extension to existing DNO network. They typically build network for new developments such as business parks, retail and residential areas and leisure facilities. Your local DNO will be able to inform you if you are connected to an IDNO's network or a private network rather than the DNO's network.

Office of Gas and Electricity Markets (Ofgem): The regulator of the electricity system. They are responsible for regulating prices and performance in the monopoly elements of the electricity supply industry, resolving disputes between different parties when necessary, and granting the various licences in the power sector, including generation licences.

Small-Scale Embedded Generation (SSEG): A source of electrical energy and all associated interface equipment, rated up to and including 16 A per phase, single or multi phase 230/400 V AC and designed to operate in parallel with a public low voltage distribution network. In EREC G98 this is referred to as a Micro-generator.

Suppliers: Buy electricity in bulk from generators, and then sell to consumers. They are responsible for providing bills and customer services, and arranging metering and meter reading.

System Operator: Responsible for balancing demand with generation on a second by second basis. National Grid Electricity Transmission (NGET) is the System Operator in Great Britain.

Transmission network: Transports electricity over long distances across the country. Electricity is transported at a high voltage to reduce losses. The voltage is 275kV or 400kV. In Scotland, 132kV is also used.

Transmission Owner (TO): Owns and maintains the high voltage transmission system.

The Transmission Owners are as follows:

- National Grid Electricity Transmission (NGET) in England and Wales
- Scottish Power in southern Scotland (SP Transmission Plc)
- Scottish and Southern Energy (SSE) in northern Scotland (Scottish Hydro Electric Transmission Plc)

Type tested equipment: Equipment that has been tested to ensure that it meets the requirements of EREC G83, G98, G59 or G99. Using type tested equipment simplifies the connection and commissioning process.