

Distributed Generation Connection Guides: G98 for Single Premises Summary

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Acronym Guide

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

If you are planning to use storage in conjunction with PV (or other generation technology) to offset consumption in your home, you may be eligible for a G99 Energy Storage Fast Track procedure – refer to the full G98 Single Premises guide for more information.

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 G98 and 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 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. Note that the term 'DNO' as used in this guide generally refers to both DNO and IDNO companies.

This "summary" guide is written for the developers of distributed generation or storage projects which are covered by **Engineering Recommendation (EREC) G98**.

This covers Project 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 G98.

This guide is best suited for those developers who are connecting Distributed Generation or storage in a single property. If you are developing Distributed Generation or storage in more than one premises within a 'close geographic region', then there are alternative Guides that are more suited to your project: ('Distributed Generation Connection Guide—a guide for connecting generation to the distribution network in multiple premises that falls under G98').

If your project is outside of the scope of EREC G98, there are **alternative guides** you can read.

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 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 described.

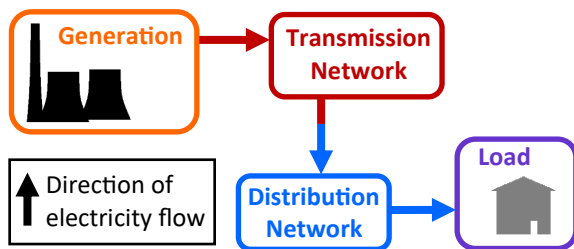
Governance of the Guide

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 voltage is 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 voltage is 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 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.

National Grid Electricity System Operator (NGESO): The System Operator of the transmission system in England, Wales & Scotland.

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.

Elxon: 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

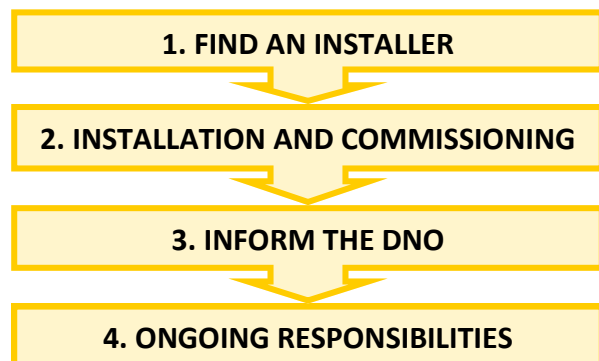
As well as introducing benefits, the increased penetration of Distributed Generation in UK distribution networks also poses challenges, including:

- **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

In most cases, the installation of small generating units into a single premises will have very little affect on the network. Therefore the connection process is relatively simple, and can be summarised as “fit and inform”.

Opposite is a summary of the major tasks of the connection process. These are explained below.



1. Find an installer

The first task is to find a competent installer. Certified generation products and installers can be found on the following website: www.microgenerationcertification.org

2. Installation and Commissioning

The installation and commissioning requirements are covered in Section 8 of EREC G98. Your installer should be aware of these requirements. During the commissioning, your installer will check that your equipment is working as it should.

3. Inform the DNO

Your installer must notify the DNO **within 28 days** of commissioning the generating unit, and provide them with information on the installation. This information is captured on an “**installation commissioning confirmation**” form, which is given in the “Installation Document”, which is [Form B in Appendix 3 of EREC G98](#). The form should include both generation and storage details as applicable. DNOs may have their own installation commissioning confirmation forms on their websites.

4. 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
- Notify your DNO of any operational incidents that affect your compliance with EREC G98
- Periodic testing specified by the DNO

EREC G98 was introduced in May 2018. It is based on the archived EREC G83, which was revised to take account of a European Network Code called Requirement for Generators. Micro-generators connecting to the distribution network must connect under EREC G98.

C: An Overview of Getting Connected

Health and Safety Considerations

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

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.

Vehicle to Grid

Vehicle to Grid (V2G) is in its infancy and trials are being undertaken to further understand and demonstrate its benefits. The electric vehicle will be considered as both a demand and a generator by DNOs. The generator application will depend on the power export capacity of the V2G and what generation or storage devices are already connected at the designated charging point. It is likely that V2G will be > 16 A/phase and therefore G98 is not applicable and G99 should be used.

The current situation is that installers follow one of two generation application processes and sets of forms, which are as follows below:

- Where the total of all generation, fixed storage and the power export capacity of the V2G is < 50 kW 3-phase or 17 kW single-phase, the G99 Simplified Application Form A1-1 can be used.
- Where the total of all generation, fixed storage and the power export capacity of the V2G is > 50 kW 3-phase, the connection application should be made using the Standard Application Form.

In addition, your installer should complete forms associated with a standard Electric Vehicle (EV) charge point, such as the ENA EV installation form ("Application Form for the Installation of Low Carbon Technologies"). The DNO may request further information, such as a photograph of your electric meter and consumer unit.

The ENA Low Carbon Technology Working Group has been looking at ways to simplify the connection application process and associated forms for V2G applications, including considering a single process that combines the aspects of EV as demand and generation. **This is now available and an updated version was published on the 7th July 21. The form is available at the [ENA website](#) under the heading "Connecting electric vehicles (EVs) and heat pumps".**

D: The Connection Notification

You do not need to talk to your DNO before your generation equipment is up and running. Your installer needs to inform the DNO and provide a number of pieces of information **within 28 days of the date of commissioning**. This information is defined in the Installation Document, which is [Form B in Appendix 3 of EREC G98](#).

The information required includes:

- details about the **site** where you are connecting your generating unit, including metering information;
- **contact details** for the owner of the generating unit;
- **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 G98.

If you appoint a competent installer, they should know about the requirements set out in EREC G98, and make sure that your installation meets them. You should check that your installer is aware of all these requirements.

E: Costs and Charges

Generation Distribution Use of System (UoS) charges

UoS charges cover the operation and maintenance of the distribution network. They are levied by the DNO on 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 vary depending on:

- the voltage level you are connected to (if you are compliant with EREC 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 greater than a certain threshold (currently 30kW) are required to have a Half Hourly (HH) Meter.

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). Distribution Use of System charges are subject to review by Ofgem and significant changes are underway. Refer to [Ofgem's website](#) for more information.

F: Selling Electricity-SEG

Important Point: The SEG scheme for generators opened on the 1st January 2020. The SEG scheme replaces the Feed-in Tariff (FIT) scheme that closed on the 31st March 2019 but works differently to FITs.

There are two sources of financial benefit from FIT payments which are:

- **Generation tariff:** A fixed unit for each unit of electricity generated.
- **Export tariff:** A guaranteed price for each unit of electricity exported to the grid.

The SEG scheme obliges electricity suppliers to offer an export tariff rate to an eligible generating unit.

Generators cannot receive SEG payments as well as FIT payments for exported electricity. However, if the generator continues to receive FIT generation payments and opts out of receiving FIT export payments then they are eligible to receive SEG export tariff payments.

F: Selling Electricity-SEG

Smart Export Guarantees (SEGs)

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

- Anaerobic digestion (AD)
- CHP and Micro-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 financial benefits for Generation projects that use the old FIT and new SEG scheme.

Generation and Export tariff (FITs):

Installations which receive payments under the FIT scheme will continue to receive the same generation and export tariffs that were current at the time of installation. The last export tariff under the FIT scheme, before the scheme closed on the 31st March 2019, was fixed at 5.24p/kWh. This differs from the export tariff rate offered through the SEG scheme, which depends on the electricity supplier you choose to contract with.

SEG Export Tariff

The SEG scheme is an export tariff, which is a guaranteed price for each unit of electricity exported to the grid. It is an obligation for licensed energy suppliers to offer eligible generation projects an export tariff rate. The electricity suppliers decide the SEG export tariff details i.e. the rate and the length of the contract. However, although wholesale electricity prices can fall below zero due to changes in demand, electricity suppliers must always offer a tariff which is greater than zero.

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 **Smart Export Guarantee** — [Ofgem SEG](#)
Note that your electricity supplier is your point of contact for the SEG scheme.

National Grid Electricity Transmission (NGET)—The 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

National Grid Electricity System Operator (NGESO) - The System Operator in England, Wales and Scotland: <https://www.nationalgrideso.com/>

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/departments-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 free of charge on the DCode website: www.dcode.org.uk/

The Grid Code of Great Britain — available free of charge on NGESO's website: [Grid code](#)

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](#)

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

Certified generation products and installers: www.microgenerationcertification.org

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 (System): 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: Recommendations for the Connection of Generating Plant to the Distribution Systems of Licensed Distribution Network Operators. This is not applicable to generation connecting after the 27th April 2019.

Smart Export Guarantees (SEGs): A financial incentive to support distributed and small-scale renewable energy generation, up to 5 MW.

Generating Unit: Any apparatus which produces electricity.

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

Glossary of Terms

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.

Micro-generator: A source of electrical energy and all associated interface equipment able to be connected to an electric circuit in a Low Voltage electrical installation and designed to operate in parallel with a public Low Voltage Distribution Network with nominal currents up to and including 16 A per phase.

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: The operator of the transmission networks, the System Operator balances supply with demand on a minute by minute basis.

Transmission Network (System): 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 G98 or G99. Using type tested equipment simplifies the connection and commissioning process.