Distributed Generation Connection Guide: Contents

Contents

Distributed Generation Connection Guide: Information Sheets

The following pages contain a number of information sheets. These bring information that is contained throughout the Guide into a single page. The information sheets include:

- Decision Tree for the Distributed Generation Connection Guide—to help you to identify whether this is the right Guide for you.
- Capacity cut off points—a diagram illustrating the impacts that the generation capacity of your generating equipment has on the requirements and opportunities for your project.
- Provision of Information: DNO websites—a summary of the information you can expect to find on DNO websites.
- Legislative and Regulatory Document Hierarchy—an illustration of document hierarchy, and list of key documents.

You will find the Guide introduction and contents after these information sheets.

Decision Tree for the Distributed Generation Connection Guide

There are a number of Distributed Generation Connection Guides, each with a corresponding 'Summary' guide. The purpose of the summary guides is to act as a quick check, providing only the most useful information in a condensed format. This flowchart guides you to the most relevant Connection Guide for the Distributed Generation you are planning to install. The Guides can be found on the Distribution Generation section of the ENA website.

Size of your generating unit within any single premises

Does your Power Generating Module (PGM) (or the aggregation of modules if there are more than one) have a capacity of 16A per phase or less, and is it connected at low voltage? In other words:

- Three phase—generation capacity of 11.04kW or smaller and connected at 400V
- Single Phase—generation capacity of 3.68kW or smaller and connected at 230V

Yes

Number of premises

In how many premises are you planning to install Micro-generators:

- within 500m of each other; or
- with the same postcode (ignoring the final two letters)?

1

Guide for EREC G98 projects for Single Premises

More than 1

Guide for EREC G98 projects on Multiple Premises

No

Size

Does your Power Generating Module have a registered capacity of less than 1 MW ?

Yes

Does your Power Generating Module have a connection point below 110 kV ?

Yes

Guide for EREC G99 Type A Power Generating Modules

No

Guide for EREC G99 Types B to D Power Generating Modules

Projects can no longer connect under EREC G83 and EREC G59.

Simplest process → Most complex process

Examples of Distributed Generation that is 16 A per phase or less

PV system: If you are installing solar panels on the roof of your home (or another similar building), it is likely that your project will be less than 16 A per phase, particularly if your array is about 30 m^2 or less; or about 18 panels or fewer.

Wind: Many small wind turbines are also less than 16 A per phase. For example:

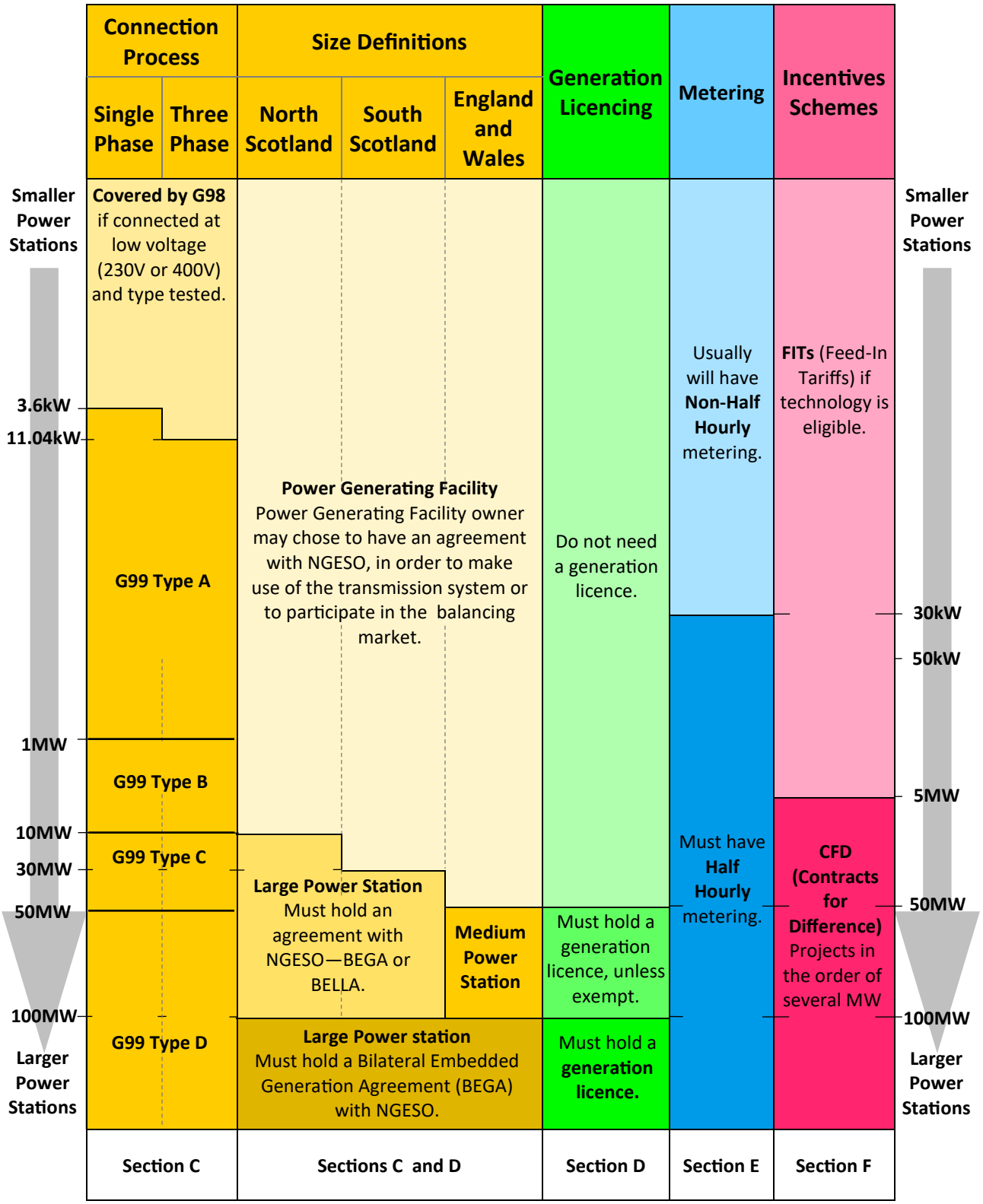
- **QR5 turbine**: Rated 6.5 kW with a rotating section of 5 m height
- **Bergey wind turbine**: Rated 10.0 kW with a diameter of 7 m

Combined Heat and Power (CHP): A micro-CHP plant rated 6 kW (3-phase) (the size of a big dishwasher 0.8 x 1 x 1 m) could have a thermal output of 18 kW.

Connection Process: Capacity Cut Off Points

The tasks that you have to undertake to get connected vary with the capacity of the generating plant. In general, the bigger the generator, the more complex the connection requirements.

The table below illustrates some of the impacts that the capacity of your generating units have on the connection process and requirements on you.



Provision of Information: DNO Websites

There is a great deal of published information available from your DNO that can 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.

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 every six months, and published annually.

Connection Charging 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 DNO websites.

Standards of Performance

Ofgem has set minimum performance standards for connections, both during and after their construction. 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

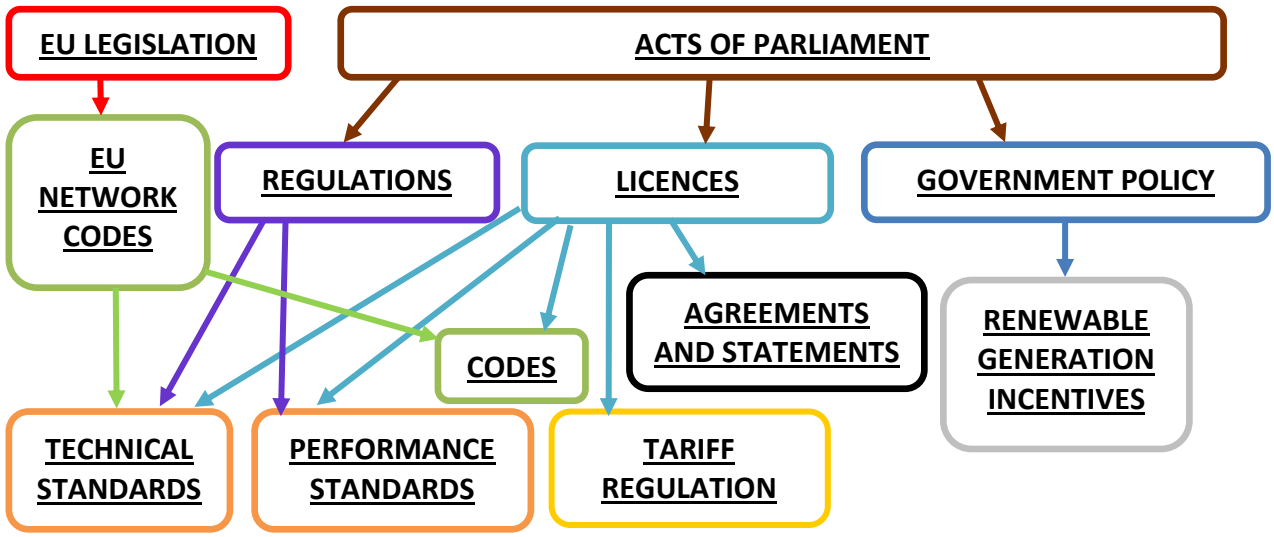
In recent years, there have been improvements to the information that DNOs provide, including:

- 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 (planned and historic).

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 Powergrid	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

Legislative and Regulatory Documents Hierarchy

The following diagram shows the legislative and regulatory documents in the power sector. These are grouped by category, and where possible the relationship between documents is illustrated. The documents have been colour coded by document category. The most relevant examples of each documents are included in the boxes below.



KEY: → Indicates where a document feeds into or influences another.

Document Category: Acts | Regulations | Licences | Policy | EU Legislation | Agreements / Statements | Code | Standards | Tariff regulation | Renewable Energy Programmes

ACTS OF PARLIAMENT:
- Electricity Act 1989
- Utilities Act 2000
- Energy Act 2004 (BETTA go-live direction)
- Energy Act 2008 (FITs etc.)
- Energy Act 2013 (CfD etc.)

REGULATIONS:
- Electricity Safety, Quality and Continuity Regulations 2002
- The Electricity (Standards of Performance) Regulations 2015

LICENCES:
- Generation
- Transmission
- Distribution
- Supply

EU LEGISLATION:
- EC No 714/2009

CODES
- Balancing and Settlement Code
- Connection and Use of System Code
- Distribution Code
- Grid Code
- System operator – Transmission owner Code (STC)

AGREEMENTS AND STATEMENTS
- Connection Agreements
- Charging Statements
- The Distribution Connection and Use of System Agreement
- Master Registration Agreement

GOVERNMENT POLICY:
- The Clean Growth Strategy 2017
- Upgrading our Energy Systems: Smart Systems and Flexibility Plan 2017 (also 2018 update)

TECHNICAL STANDARDS
- Engineering Recommendations
- Security and Quality of Supply Standard (SQSS)

PERFORMANCE STANDARDS:
- Guaranteed standards and DG standards

EU NETWORK CODES
- Requirements for Generators
- Demand Connection Code
- System Operation Guidelines (SOGL)

RENEWABLE GENERATION:
- FITs and CfD

TARIFF REGULATION:
- Ofgem Price Controls

PERFORMANCE STANDARDS
- Guaranteed standards and DG Standards

Distributed Generation Connection Guide: An Introduction

Who is this Guide for?

This Guide is intended to help you, as a developer or the prospective owner of Distributed Generation, to connect your generating unit to a distribution network in Great Britain. It may also be useful for installers or manufacturers of distributed generation equipment.

The types of generation that most frequently connect to the distribution networks include:

- renewable energy projects;
- waste to energy projects;
- energy storage devices (e.g. batteries); and
- on-site generation and Combined Heat and Power (CHP) projects.

What is the aim of the Guide?

The main aim of the Guide is to provide a 'route map' of the processes for getting a generation project connected to the distribution network. The Guide provides an overview of the connection process, as well as more details on the application stage.

The connection process involves discussions and agreements between you and your Distribution Network Operator (DNO). This process is more likely to be successful if you and the DNO can communicate effectively and understand each other's concerns. So, in addition to its main aim of providing a 'route map' of the connection process, the Guide has a number of other aims:

- to provide background information about the GB power sector and the role Distributed Generation has to play;
- to describe the main factors affecting connection costs and ongoing charges;
- to highlight your options relating to your connection works, identify different contracts relating to your connection and discuss some day-to-day operational issues; and
- to describe two key financial incentives for Distributed Generation: Feed-in Tariffs (FITs) and Contracts for Difference (CFD).

What is not covered in the Guide?

In addition to arranging a connection to the network, you will also have other issues to address in order to get your project up and running. These include:

- Designing, installing and operating the generation installation
- Buying and selling electricity (beyond FITs and CFDs)
- Planning the project
- Financing the project
- Resolving local planning issues

These issues are outside the scope of this Guide, but you will need to about these in parallel with the connection process.

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

Distributed Generation Connection Guide: An Introduction

The format of the Guide

This Guide has been written and formatted with you, the reader, in mind. In particular we think this Guide will be useful for customers with generation, installers and developers. 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:

- Terms which may be unfamiliar are defined or explained in boxes around the main text.
- Key points and summaries are highlighted.
- 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.

- At the end of most chapters there is a pointer on where to find more information.

Though this Guide is intended for the general public and should not require the reader to be technical or familiar with the energy industry, please be aware that the topics covered here are technical and complex. It is therefore necessary to refer to such concepts as voltage and power. Where possible, terms that may be unfamiliar have been explained.

Governance of the Guide

This Guide is a Distribution Code Review Panel (DCRP) document. The DCRP will update the Guide using similar processes it has for updating other distribution related documents.

There are many areas of regulation and legislation relating to Distributed Generation which are evolving and a number of issues are under consultation. The Guide has tried to capture the most up to date position at the time of writing. However, for the most up to date information you should refer to key documents and organisation websites. Please see the reference section for more information.

Governance of related Codes and documents

Many of the codes and other documents described in this guide are governed in such a way that any interested and materially affected party can propose a change to the codes and documents. This includes the Connection and Use of System charging arrangements (for both distribution and transmission) and the Distribution and Grid Codes. There are also groups with Distributed Generation community and DNO representation where issues can be raised and discussed which may lead to changes being proposed.

The overarching group to discuss commercial and procedural issues associated with connection is the ENA DER (Distributed Energy Resources) Connections Steering Group. Any issues you have for the Group should be raised through trade associations who are represented. Please note that practices between DNOs may be different; for example where the connection requirements are location specific or the connection risks and the network characteristics are different.

Distributed Generation Connection Guide: Is this the right Guide for my project?

The process of connecting Distributed Generation to the electricity distribution network varies depending on the size of the generation to be connected, and the specific technology to be used. In general, the larger the generation capacity, the more complex the process.

The Engineering Recommendations that cover the connection of Distributed Generation to the electrical distribution network are: EREC G98 (for smaller generation capacities) and EREC G99 (for all other projects). These are described further in the information boxes on the following pages.

A number of a Guides have been developed:

- EREC G98 compliant units in a single premises;
- EREC G98 compliant units in multiple premises within a close geographic region;
- Guides for G99 installations

A "summary" version of each Guide, containing the minimum, essential information from each chapter, is also available—refer to the ENA website.

The table on the next page includes a quick check for finding the right Guide for you. Read the information boxes for further explanations of terms that may be unfamiliar to you. Where you are installing multiple generating units, the application process (ie EREC G98) is based on the total installed capacity of the generating units in each premises, how many premises equipment will be installed in, and whether each unit is type tested. Alternatively you can connect new generating units under EREC G99—refer to the G99 Guides.

Important note: Generation projects can no longer connect under EREC G83 and G59. Generation will only be allowed to connect under EREC G98 and G99, with an exception for certain generators. For more information on this transition, refer to "Recent Changes to Regulations" page—just before Chapter A.

Distributed Generation Connection Guide: Is this the right Guide for my project?

<table>
<tr><th>Guide</th><th colspan="2">Criteria</th></tr>
<tr><td>A guide for connecting Distributed Generation that falls under EREC G98 in a single premises</td><td>Installation of one or more Distributed Generation units at a single premises.</td><td rowspan="2">Distributed Generation is compliant with EREC G98 if:
It meets the size definition of Micro-generator;
It is installed in accordance with EREC G98. Your installer should be familiar with these requirements; and
It has been tested and approved according to the relevant Type Testing Annex in EREC G98.</td></tr>
<tr><td>A guide for connecting Distributed Generation that falls under EREC G98 in multiple premises</td><td>Installation of Distributed Generating units at more than one premises within a close geographic region.</td></tr>
<tr><td>A guide for connecting Type A Power Generating Modules under EREC G99</td><td colspan="2">This Guide is written for installations where:
The registered capacity of each Power Generating Module is >16 A/phase, but less than 1 MW; and
The connection point is below 110 kV (in practice in GB this is at 66 kV or below).</td></tr>
<tr><td>A guide for connecting Type B—D Power Generating Modules under EREC G99</td><td colspan="2">This Guide is written for installations where the registered capacity is at or above 1 MW, or for any generation connected at or above 110 kV (in practice in GB this is at 132 kV or above).</td></tr>
</table>

Distributed Generation Connection Guide: Is this the right Guide for my project?

Engineering Recommendation G98

EREC G98 is called "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". It sets out the requirements you must meet before your Micro-generator can be connected to the network. The capacity threshold refers to the **aggregate generating capacity installed in a single premises**. EREC G98 is available on the Distribution Code website.

The document is aimed at the manufacturers and installers of your Micro-generator.

Engineering Recommendation G99

EREC G99 is called "Requirements for the connection of generation equipment in parallel with public distribution networks". The purpose of the document is to provide guidance to you and to DNOs on all aspects of the connection process. It contains a glossary of items and diagrams of Power Generating Module types and categorisation, which you may find helpful. EREC G99 is available on the Distribution Code website.

Micro-generator

A Micro-generator is defined in EREC G98 as "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 16A per phase. For the avoidance of doubt this includes electricity storage devices". 16 A per phase corresponds to **3.68 kW on a single-phase supply and 11.04 kW on a three-phase supply,** and refers to the **aggregate Micro-generator capacity installed in a single premises.**

Close Geographic Region

Typically, a Close Geographic Region is one which is fed by the same part of the distribution network, from a single feeder or distribution transformer. Your DNO will be able to advise you as to whether your installation sites are within a close geographic region. A general rule of thumb is that if your installations are within 500 meters of each other, or if the post codes are the same at least up until the last two letters, then they are likely to be within a close geographic region.

Distributed Generation Connection Guide: Is this the right Guide for my project?

Inverters

An inverter is an electrical device that converts Direct Current (DC) to Alternating Current (AC). This is required when you want to connect a generating unit with a DC output (eg. a Photovoltaic array) to the distribution network, which operates at AC.

The term Micro Inverter is used to describe small inverters which are connected to (multiple) small generating units, such as individual PV panels. This is often done so that if one panel is impaired for any reason, then the output of the others is not affected. As with any installation with more than one generating unit, the application process is dictated by the aggregate capacity of all generating units and not the individual units.

Type tested equipment

Type tested equipment is defined in EREC G98 and G99 as "A product which has been tested to ensure that the design meets the relevant requirements of this EREC G98/G99, and for which the Manufacturer has declared that all similar products supplied will be constructed to the same standards and will have the same performance". Examples of products which could be type tested include generating units, inverters and the interface protection. Using type tested equipment simplifies the connection and commissioning process.

EREC G98 and G99 annexes contain methodologies for testing equipment against a set of test conditions to demonstrate compliance. The manufacturer produces a Type Test or Compliance Verification Report to demonstrate compliance. Where the whole Micro-generator or Power Generating Module is type tested (rather than just a part), it is Fully Type Tested. All Micro-generators connecting under EREC G98 must be Fully Type Tested. The Fully Type Tested concept also applies in EREC G99.

The ENA hosts an online Type Test Verification Report Register. This contains certificate and test documentation for generation products and enables product identification and information sharing. The product manufacturer is responsible for uploading and maintaining data and documentation relating to their products. You can access the register at: http://www.ena-eng.org/gen-ttr/

Equipment Certification

The ENA are working with potential Equipment Certificate providers and manufacturers to investigate formal equipment certification. This will be progressed throughout 2019.

Distributed Generation Connection Guide: Is this the right Guide for my project?

Emerging Technology

EREC G98 and G99 have a relaxed set of requirements for generation that is classified as an Emerging Technology. This is because the Requirements for Generators (RfG) allows for this. The Emerging Technology status only applies to Type A generation, which has a generating capacity of 0.8 kW to 1 MW and is connected at less than 110 kV (in practice in Great Britain that is 66 kV or below). The Emerging Technologies are:

- 'Baxi Ecogen' generators (the specific products are the Baxi Ecogen 24/1.0, Baxi Ecogen 24/1.0 LPG and Baxi Ecogen System)
- KD Navien stirling engine m-CHP (Hybrigen SE) (the specific products are the 'NCM-1130HH – 1 KWel' and the 'NCM-2030HH – 2 kWel')
- Pellematic Smart_e
- Dachs Stirling SE Erdgas and Dachs Stilring SE Flussiggas

Recent Changes to Regulations

Requirements for Generators

The European Third Energy Package was adopted in July 2009, and has been law since March 2011. The Third Energy Package refers to a suite of legislation for both Electricity and Gas. It has three key objectives:

1. Enhancing sustainability and helping the European Union meet its decarbonisation obligations;
2. Ensuring security of supply in light of a changing generation mix; and
3. Creating a single European Market for Electricity.

The Third Energy Package requires the development of European Network Codes. The Network Codes cover three areas: grid connection codes; market codes and system operation codes. One of the Codes is called Requirements for Generators (RfG). This sets out requirements which new generators will need to meet.

The RfG, which became a binding EU regulation in May 2016, is available on the EUR-Lex website.

A joint Distribution Code Review Panel (DCRP) and Grid Code Review Panel (GCRP) workgroup was charged with implementing the Requirements for Generators in GB. This included setting parameters that the RfG leaves to national interpretation. The workgroup proposed changes to the Grid Code, Distribution Code and supporting Engineering Recommendations. The revised documents were consulted upon with stakeholders by the GCRP and the DCRP.

This work resulted in the publication of Engineering Recommendations G98 and G99, as well as revisions to the Distribution Code and Grid Code. These new EREC documents apply to generation that is connecting to the distribution network. The old EREC G83 and EREC G59 should no longer be used after the 27th April 2019.

Key Terms for EREC G98 and G99

In the process of drafting EREC G98 and G99, the opportunity was taken to align with European terms used (eg from the Requirements for Generators document) and to consolidate terms previously used in GB documents. This means some new terms have been introduced, which are used widely in the documents. The key terms are summarised on this page, and some are explained further in break out boxes throughout the document or in the main text.

Terms that are particularly relevant for EREC G98 are indicated with a *.

Fully Type Tested*	The whole Micro-generator / Power Generating Module is type tested, rather than just part of the Micro-generator / Power Generating Module.
Micro-generator*	A source of electrical energy and all associated interface equipment connected at Low Voltage to the distribution network, with nominal currents up to and including 16 A per phase.
Micro-generating Plant*	An electrical installation with one or more Micro-generators with nominal currents in sum not exceeding 16 A per phase.
Generating Unit	Any apparatus that produces electricity.
Power Generating Module (PGM)	Either a Synchronous Power Generating Module (SPGM) or a Power Park Module (PPM) - see below.
Synchronous Power Generating Module (SPGM)	An indivisible set of Generating Units—ie one or more units which cannot operate independently of each other—which generate electrical energy in synchronism.
Power Park Module (PPM)	Generating Units that are connected to the network either through power electronics (eg solar PV or electricity storage devices connected through an inverter) or asynchronously (eg some wind turbines are induction or asynchronous generation). They have a single Connection Point to the distribution network.
Power Generating Facility (PGF)	One or more Power Generating Modules connected to at one or more Connection Points.
Registered Capacity	The normal full load capacity of a Power Generating Module less the MW consumed when producing the same (ie auxiliary load). For Power Generating Modules connected via an Inverter, the Inverter rating is the Power Generating Module's rating.
Type A / B / C / D	Classifications of Power Generating Modules by size and connection voltage, to determine technical and compliance requirements.

A: A Guide to the GB Power Sector

In this section:

- An overview of the commercial structure of the power sector
- An introduction to the GB power sector and how it is changing
- A discussion about the various types of organisations that you may come across while developing your Distributed Generation project
- A discussion on Network Innovation projects
- Guidance on where to find more information

Tip: Read the information boxes for definitions or explanations of terms that may be new or unfamiliar.

Introduction

Understanding a little about the GB power sector may be useful when discussing your Distributed Generation project. This section aims to give some background explanation about the GB power sector and how it is changing to meet the challenges of protecting the environment and changing Government policy.

There are many organisations involved in the GB power sector, which are introduced in this section.

Apart from the physical structure of the power sector, there is also a commercial structure, which is discussed in this section.

The Commercial Structure of the Power Sector

The commercial structure of the electricity industry in Great Britain provides a competitive market in electricity retailing. This enables customers to contract with any one of a number of competing electricity suppliers. The sale of energy is also a competitive market. Note, your Feed-In Tariff level is an indication of the minimum you can expect to be paid for the electricity you generate.

Generators sell the electricity that they generate in the wholesale market or directly to suppliers. Suppliers sell the electricity they purchase to customers. The majority of trading occurs in advance of the time of use.

The wholesale market is governed by British Electricity Trading Transmission Arrangements (BETTA), which was introduced in 2005.

If you install Distributed Generation you can use the electricity you produce on site to reduce the amount of electricity that you need to buy thus lowering your electricity bills.

You can also sell electricity to customers, suppliers or, depending on the size of the generation, on the wholesale market. You can read more about power trade options in Section F. Selling Electricity.

The Physical Infrastructure of the Power Sector

Traditional electricity system

The diagram below illustrates the infrastructure of the traditional power sector.

Large power stations feed into the transmission system, and the electricity is then transported to the distribution system.

The distribution system carries the electricity to loads, such as homes and businesses.

The transmission and distribution systems are also called transmission and distribution networks. Both terms are used in this Guide.

Power Stations

Mostly large coal, gas and nuclear power stations.

This symbol represents a transformer. These are used throughout electricity networks to change voltage levels.

Transmission System

Transports electricity over long distances across the country.
Electricity is transported at a high voltage to reduce losses.

Voltage Range: 275kV or 400kV. In Scotland, 132kV is also used.

Other Distribution Systems

'Grid Supply Point'

These arrows show the normal direction of the flow of electricity through the system.

In a traditional power system, electricity flows from large generation sites, through the transmission and distribution networks, to the loads.

Distribution 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.

Voltage Range: 132kV and lower in England and Wales, or lower than 132kV in Scotland. Most residential customers are supplied at 230V.

Loads

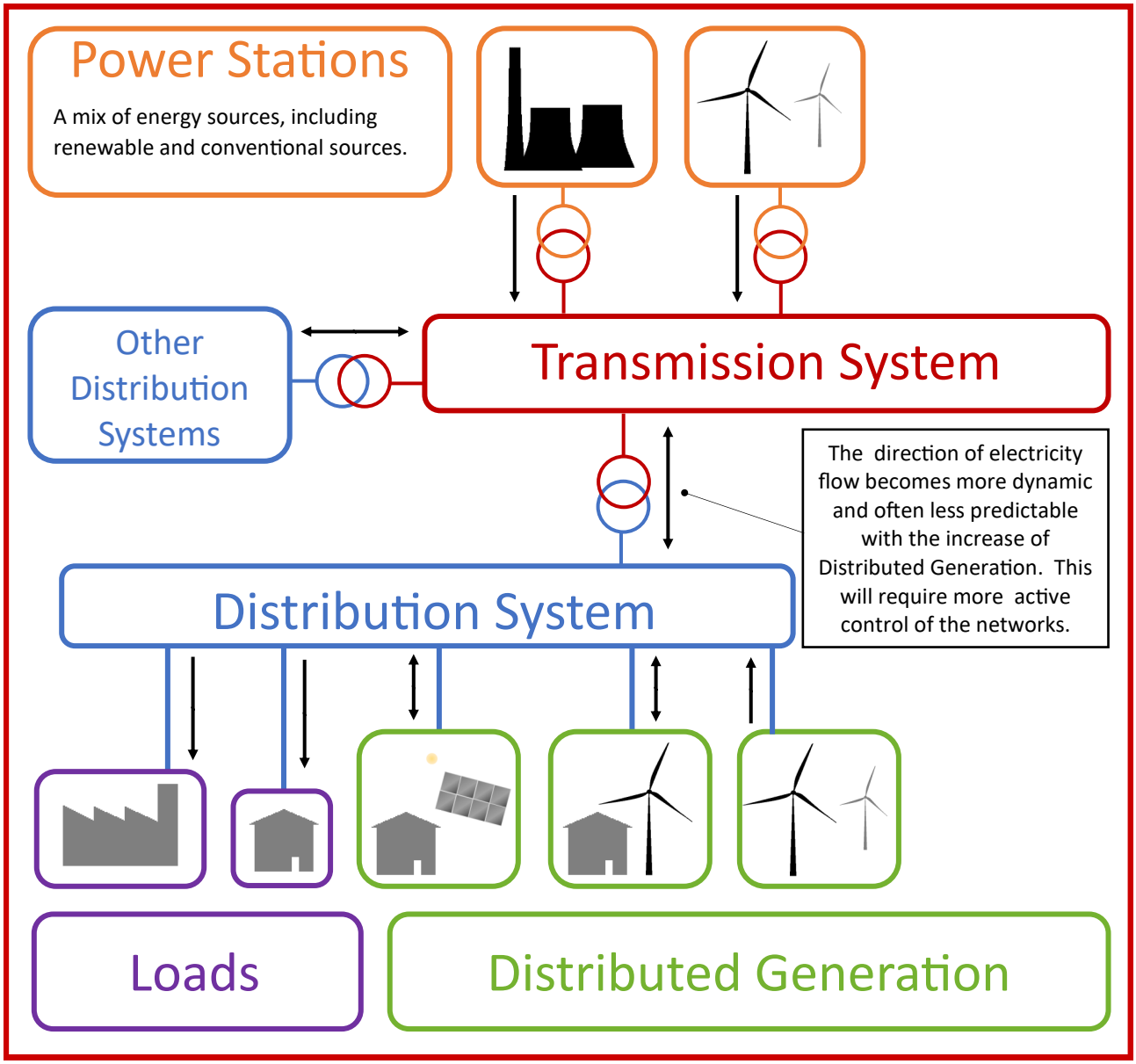
The Physical Infrastructure of the Power Sector

Changing electricity system

In addition to the large power stations connected to the transmission system, an increasing number of small power stations are being developed, often connected to distribution networks. Generation connected to the distribution network is called Distributed Generation. The diagram below illustrates this changing electricity system.

Distributed Generation can result in electricity flows in both directions; from the distribution network to customers, and from customers with Distributed Generation back into the distribution network. The system is no longer a "waterfall" system, with electricity flowing from the large power stations in one direction towards customers. Instead, electricity flows are more unpredictable.

Distributed Generation (DG or 'Embedded Generation')
A generation project is classed as Distributed Generation if it operates while electrically connected to the distribution network. Energy generated from Distributed Generation may be used onsite, or some or all of it may be exported to the distribution network.



Key Organisations

The transmission and distribution systems are owned and operated by regulated monopoly businesses. Transmission and distribution businesses recover the costs of operating and maintaining their systems by levying Use of System charges on electricity traded using their network.

Distribution Network Operator (DNO)

A DNO owns, operates and maintains public electricity distribution networks in one or more regions in the GB. They must hold a Distribution Network Operator Licence. Under the terms of their licence, each DNO is allowed to distribute electricity both inside and outside its legacy geographic area.

There are six DNOs in Great Britain. The regions where they operate are shown on the map below.

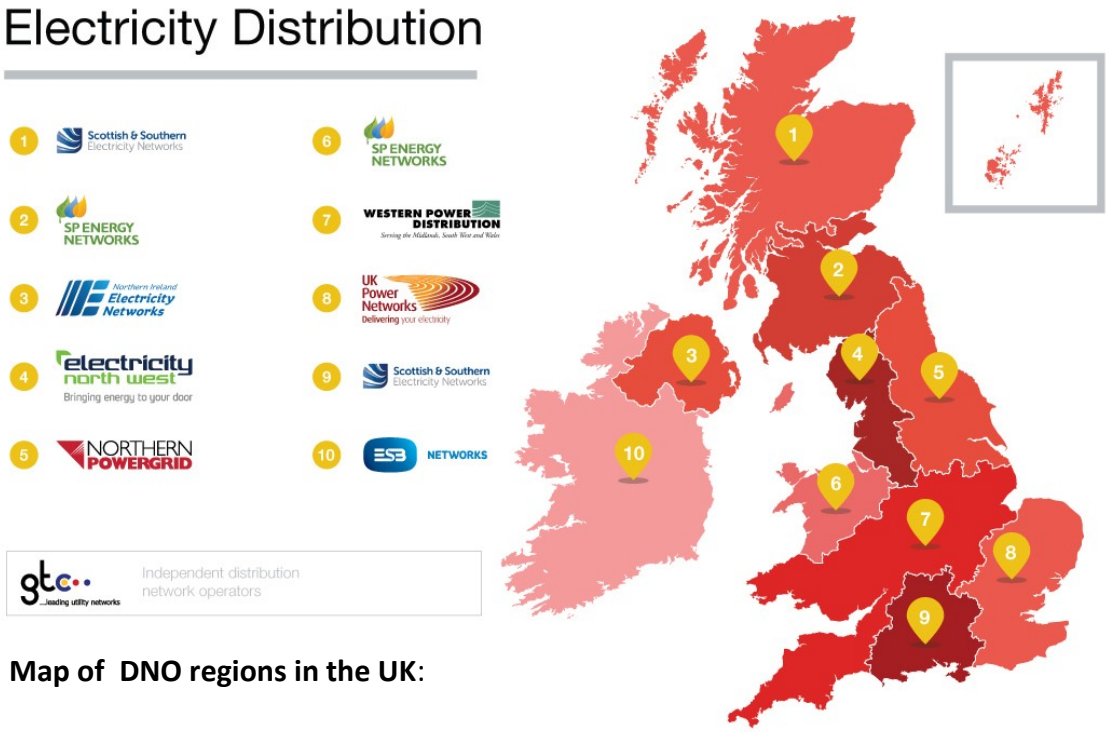
To facilitate competition in supply, each DNO is required to allow any licensed supplier to use its distribution network to transfer electricity from the transmission system (and from Distributed Generation) to customers. DNOs charge suppliers for using the distribution system.

DNOs can form part of a group that undertakes other areas of business as well, e.g. electricity supply. However, these businesses have to be kept separate, and you, as a developer, will have to interface with the network operator business.

Independent Distribution Network Operators (IDNOs)

An IDNO designs, builds, owns and operates a distribution network, which is an extension of an existing DNO network. They typically build network for new developments such as business parks and residential areas. IDNOs differ from DNOs in that:

- they do not have service areas (they are not tied to a geographical location);
- they are regulated like DNOs, though have fewer licence conditions to meet.



Map of DNO regions in the UK:

For DNO website details, please see the membership area of the ENA website.

Key Organisations

If you are connecting your Distributed Generation to an IDNO's network, the process is almost identical to that if you are connecting to a DNO. There are a few exceptions to this, which are discussed in Section C of this Guide.

Transmission Owner (TO)

A TO owns and maintains the high voltage transmission system, known as the National Electricity Transmission System, referred to in this Guide as the transmission system. Transmission Owners are responsible for making sure that transmission services are available to the System Operator (see explanation later in this section). The Transmission Owners are as follows:

- **National Grid Electricity Transmission (NGET)** in England and Wales
- **SP Energy Networks (SP Transmission plc)**
- **Scottish and Southern Electricity Networks (Scottish Hydro Electric Transmission plc)**

Private Networks

Private networks are similar to IDNO networks in that they are extensions of the DNO network which are not owned by the DNO itself. The owners of private networks are distinct from an IDNO because they do not need to be licenced and are unregulated.

For example, private networks can be owned by hospitals, airports, industrial sites, etc. This Guide is not intended to address connections to private networks. If you are connected to a private network, you should discuss your plans with the network owner as soon as possible.

Suppliers

Supply is the retail of electricity. 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.

Aggregators

Aggregators specialise in co-ordinating demand and generation (including storage) to provide demand response and other market services. The Network Operators and Suppliers may buy demand response and other grid balancing services from aggregators.

Energy Service Company (ESCO)

A Government paper defines ESCOs as "a company that provides a customer with energy solutions" rather than simply being an electricity or gas supplier. ESCOs can enter into long-term contracts to provide information, installation, finance, operation and maintenance. There are various models the ESCO can take. ESCOs can work on a performance contract, where they guarantee energy savings and make charges based on the extent to which these savings are achieved. This model is typically used by commercial and industrial customers. ESCOs can also work for communities, servicing a group of customers in the same local area.

ESCOs may develop into a household model, to provide energy efficiency savings and small scale generation for home owners, rather than just supplying electricity.

Generators

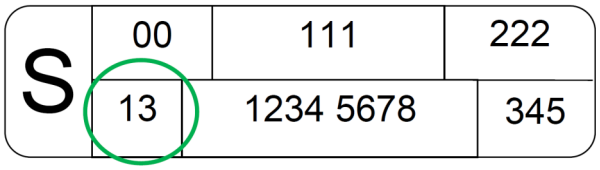
Generators own, operate and maintain power stations which generate electricity from various energy sources, eg. coal, gas, hydro and nuclear. Newer generation technologies include wind, solar, tidal and wave. See the end of this section for links to more information on generating technologies.

Key Organisations

To identify your DNO or IDNO:

If you already have a meter at your site, find the first two digits of your **MPAN** (Meter Point Administration Number), which is shown on your electricity bill, and may be shown on your meter. This corresponds to your DNO or IDNO, see table below.

Example MPAN, with first two digits indicated



If you do not have a meter at your site, you can contact the DNO whose geographic area you believe you are in and they will be able to confirm. See the map on page 13.

First 2 MPAN digits	Service Area	Distribution Business
10	Eastern England	UK Power Networks– Eastern England
11	East Midlands	Western Power Distribution (WPD) – East Midlands
12	London	UK Power Networks (UKPN) – London Power Networks (LPN)
13	Cheshire, Merseyside and North Wales	SP Energy Networks – Cheshire, Merseyside and North Wales
14	West Midlands	Western Power Distribution (WPD) –West Midlands
15	North Eastern England	Northern Powergrid (NPG)
16	North Western England	Electricity North West (ENW)
17	Northern Scotland	SSE Power Distribution – Scottish Hydro Electric Power Distribution
18	Southern Scotland	SP Energy Networks
19	South Eastern England	UK Power Networks (UKPN) – South Eastern Power Networks (SPN)
20	Southern England	SSE Power Distribution – Southern Electric Power Distribution
21	Southern Wales	Western Power Distribution (WPD) – South Wales
22	South Western England	Western Power Distribution (WPD) – South West
23	Yorkshire	Northern Powergrid (NPG)
24	No area—IDNO	GTC (Independent Power Networks)
25	No area—IDNO	ESP Electricity Limited
26	No area—IDNO	Energetics Electricity Limited
27	No area—IDNO	GTC (The Electricity Network Company)
29	No area—IDNO	Harlaxton Energy Networks Limited
30	No area—IDNO	Leep Electricity Network Limited
31	No area—IDNO	UK Power Distribution Limited
32	No area—IDNO	Energy Assets Networks Limited
33	No area—IDNO	G2 Energy IDNO Limited
34	No area—IDNO	Murphy Power Distribution Limited
35	No area—IDNO	Fulcrum Electricity Assets Limited
36	No area—IDNO	Vattenfall Network Limited
Tbc.	No area—IDNO	Utility Assets Limited

Key Organisations

System Operator (SO)

Electricity cannot be stored at a large scale and so demand has to be balanced with generation on a second by second basis by the System Operator. The SO makes requests of generators to increase or decrease output from their units, or may ask some large customers to control their demand. NGESO is the System Operator in Great Britain. Following a government consultation on greater separation between the System Operator role performed by National Grid and the rest of the National Grid group, National Grid has established a new, legally separate company to carry out the Electricity System Operator function within the National Grid Group, which is called the National Grid Electricity System Operator (NGESO). This separation took place on 1st April 2019.

Balancing Settlement Code company

Elexon is the company that manages the balancing and settlement of electricity trading. They do this by identifying where generators have not generated the amount of electricity they are contracted to produce, and suppliers' customers have not consumed the amount of electricity that was expected. Out of balance parties are charged based on the additional cost to balance supply and demand (often by buying or selling electricity at short notice).

The Balancing and Settlement Code (BSC) governs the operation of this balancing mechanism.

Regulator

The Office of Gas and Electricity Markets (Ofgem) is responsible for:

- regulating prices and performance in the monopoly elements of the electricity supply industry;
- resolving disputes between different parties when necessary; and
- granting licences for the following activities in the power sector:
  - Generation
  - Transmission (and interconnection, a transmission link with another country)
  - Distribution
  - Supply

Generation licence requirements for Distributed Generation are discussed in Section D. The Connection Application: Generation Licensing.

European organisations

The regulatory arrangements that apply across continental Europe are implemented by National Regulator Authorities (NRA) in each member state of the European Union; Ofgem is the National Regulatory Authority for Great Britain. The regulations are required to comply with policy criteria determined by the European Parliament and implemented through European Directives and Regulations. To assist with this process in relation to electricity networks, a number of bodies have been set up that represent regulators and transmission system operators. National Energy Regulators work with the Agency for the Cooperation of Energy Regulators (ACER) and the Council of European Energy Regulators (CEER) on policy developments in different areas of electricity market liberalisation.

ENTSO-E, the European Network of Transmission System Operators for Electricity, is a membership body for Transmission System Operators (TSO). ENTSO-E promotes cooperation across Europe's TSOs. One of ENTSO-E's roles is drafting the European Network Codes, which includes the Requirements for Generators (RfG).

The UK's membership in these agencies post-Brexit will be subject to negotiations.

Network Innovation and Industry Developments

Innovation Funding

New challenges and applications in energy networks have motivated many projects that aim to develop innovative tools and products to improve the way networks operate and customers are connected.

Ofgem has a number of mechanisms that the DNOs and other organisations can use to fund electricity network innovation. The two main mechanisms for network companies are called the Network Innovation Allowance (NIA) and Network Innovation Competition (NIC), which apply to both electricity and gas distribution and transmission.

- NIA is an allowance each network company receives to fund smaller scale innovation projects which have the potential to deliver benefits to network customers.
- NIC is an annual competition, where network companies compete for funding for development and demonstration of network innovations such as new technologies or novel operating and commercial arrangements.

Learning from these projects is shared amongst all DNOs and TOs for the benefit of the power sector as a whole. Incorporation of the learning into business as usual practices is laid out in the business plans of the individual network companies.

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

http://www.smarternetworks.org/

Electricity Network Innovation Strategy

Following a review of the NIA and NIC, Ofgem proposed a number of changes to the innovation funding schemes. One of these was the requirement on network companies to collaboratively produce an industry wide innovation strategy. The Electricity Network Innovation Strategy sets out a jointly agreed roadmap which demonstrates how innovation can accommodate future whole-system requirements and lead to benefits. The document was first published on 29th March 2018 and will be reviewed every 2 years at a minimum. Further information is available on the ENA website.

Transmission and Distribution Interfaces

There has been a significant increase in the amount of connected Distributed Generation in the last few years. This has meant that the DNOs, TOs and the SO have to change the way they work together, to maintain an economic and secure network. In order to address these challenges, the Transmission Distribution Interface (TDI) Steering Group was established by ENA and its members. Network companies recognise the need for distribution and transmission companies to work together more closely in order to consider how they can tackle the whole system impact of Distributed Generation and other technologies such as storage.

In January 2017 the Open Networks Project was launched by the Steering Group. The aim of the Open Networks Project is to transform the way electricity networks operate and provide the first step towards creating a smart grid.

Full details of the work done so far can be found in the Open Networks Project 2018 report. Network companies have consulted on their future structure in a world where they become system operators. The 2018 report contains some case study examples of changes that the network companies are implementing. The work is continuing in 2019.

Network Innovation and Industry Development

New technologies

Active Network Management (ANM) schemes, which have been trialled in innovation projects, are now being included as part of Business As Usual Connection Offers. ANM uses control systems to manage Distributed Generation in constrained areas. Note that ANM connections may only be available in selected parts of the network.

Export limiting devices are also coming into use. These devices allow a limit to be set above which the generation will not export. This may allow generation to have a constrained connection, to reduce the need for reinforcement. If you want to explore the use of these devices, seek guidance from your DNO. ENA has published Engineering Recommendation (EREC) G100, which provides technical guidance on the connection of Customer Export Limiting Schemes that operate in parallel with the distribution systems of licensed DNOs. This is available on:

http://www.energynetworks.org/electricity/engineering/distributed-generation/engineering-recommendation-g100.html

Energy storage is becoming increasingly prevalent in distribution networks. For more information on network connected storage (e.g. batteries), refer to Chapter C: Getting Connected—Energy Storage.

Where to Find More Information

There are some very good guides to the UK power sector available in the public domain. In particular, if you want to read more on this subject, you may wish to read the following:

- A Guide: Sale of Power Opportunities for Distributed Generators; DTI (Department for Trade and Industry);
- Guidance Note – The Electricity Trading Arrangements: A beginner's guide; Elexon

  www.elexon.co.uk/knowledgebase/about-the-bsc/

A good source of information on the organisations we have introduced are their own websites:

- Energy Networks Association —the industry body for UK energy transmission and distribution licence holders and operators: www.energynetworks.org
- A list of IDNOs can be found on the Ofgem website:

  www.ofgem.gov.uk/Networks/ElecDist/Policy/IDNOs/Pages/IDNOs.aspx
- Ofgem—The Regulator: www.ofgem.gov.uk
- National Grid —The Great Britain Electricity System Operator, and Transmission Owner in England and Wales: www.nationalgrid.com/uk/Electricity/
- Elexon—The Balancing and Settlement Code Company: www.elexon.co.uk

For more information on ESCOs, the following document is a useful reference:

- Making ESCOs Work: Guidance and Advice on Setting Up and Delivering an ESCO; London Energy Partnership, which is on the London Energy Partnership website: www.lep.org.uk

The following website gives more information on generation technologies:

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

The GB Distribution Code, Annex 1 and Annex 2 documents and the associated GB Distribution Code User Guide can be found in the link below:

- DCode: http://www.dcode.org.uk/

The GB Grid Code and the associated Guide can be found in the link below:

- GCode: http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-Code/

Information about licence exceptions and private networks can be found:

- UK legislation: http://www.legislation.gov.uk/uksi/2001/3270/contents/made

B: The Role of Distributed Generation

In this section:

- An introduction to the role of Distributed Generation
- A discussion on the drivers for Distributed Generation
- Some of the benefits and impacts of Distributed Generation
- References to some documents where you can find out more on these issues

Introduction

As explained in Section A of this Guide, the electricity industry is undergoing changes with increasing amounts of Distributed Generation being connected to the system. There are a number of drivers behind this:

- Environmental issues;
- New Government Policy;
- Security of supply; and
- Technological innovation.

In this section, these drivers are discussed in more detail. We will also introduce some of the benefits and challenges of Distributed Generation.

We refer to some useful documents and reports for further reading on this topic.

What is Driving Distributed Generation?

Environmental concerns

Globally there has been increasing concern over greenhouse gas emissions and the impact that they may be having on the environment.

Most of the electricity in the UK has traditionally been generated by power stations fuelled by fossil fuels, for example coal, gas and oil. The burning of these fuels makes a significant contribution to emissions.

There is therefore a drive to change the mix of generation technologies we have, to include more low-carbon options.

Technological innovation

Technology is developing all the time, and due to drivers such as environmental concerns and government policy, there are more generating technologies available now than there were when the national grid was being developed. For example, wind, wave, solar and biomass generation.

Although the connection and integration of these newer generating technologies may pose challenges, innovative technical solutions are being sought to overcome these challenges. These are discussed on page 17.

Government policy

The Department for Business, Energy and Industrial Strategy (BEIS) oversees energy policy and climate change mitigation policy. The UK energy supply is one of BEIS's key policy areas. 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. However, BEIS also has to ensure that energy prices are maintained at affordable levels. Relevant pieces of legislation include:

- Climate Change Act 2008
- Energy Act 2008
- Energy Bill

What is Driving Distributed Generation?

The Climate Change Act sets out legally binding targets for emissions reductions. As such, policy has been developed, which introduces initiatives such as:

- Climate Change Agreement (Climate Change Levy)
- Zero Carbon Homes

As well as legislation from the UK Government, the EU also introduces relevant legislation and initiatives, such as the EU Emissions Trading System and the European Third Package, which is driving a set of new European Network Codes.

Security of Supply

The UK increasingly relies on importing fuel, in the form of gas, coal and oil. This introduces a great deal of uncertainty as the cost and reliability of supply is outside of UK control. It is therefore an advantage to have a diverse mix of energy sources, which would make the UK less vulnerable to a restriction in fuel availability or rise in price.

It is also known that fossil fuels will eventually run out as they are being used much faster than they are being created. As they become more scarce, the prices will rise as the markets become more competitive. Therefore to ensure the security of the energy supply into the future, alternative sources are being encouraged.

Benefits of Distributed Generation

There are a number of benefits that increased Distributed Generation has for the UK and its electricity system. These include:

- **Increased energy mix** —Distributed Generation is often a renewable source of energy, such as solar, wind or biomass, or uses the energy in a more efficient way as with Combined Heat and Power (CHP) projects. Therefore increased Distributed Generation results in a lower carbon mix of energy sources in the electricity system.
- If Distributed Generation is connected close to the point of use, there is a **reduced need for the distribution and transmission infrastructure**. In some cases, this can delay the need for reinforcement, although the TO and the DNO also need to ensure that the network provides adequate security of supply for its users.
- Where there is a balance between Distributed Generation and local demand the **transmission and distribution losses are reduced**, when compared with the alternative of the centralised power stations and bulk transmission of electricity.
- The introduction of local generation in businesses and communities can lead to **greater awareness of energy issues**.

There are a variety of commercial benefits to having Distributed Generation, which include:

- **Self Consumption**, where you use the electricity that you generate to avoid importing from the grid, therefore lowering your electricity bills.
- **Selling electricity** that you generate, including gaining Feed In Tariff (FIT) payments and Contracts for Difference (CFD). This is discussed further in Section F: Selling Electricity.
- Climate Change **Levy Exemption Certificates (LECs)** are issued to generators of renewable energy and good quality Combined Heat and Power (CHP). These can be sold to the supplier

Benefits of Distributed Generation

along with the energy generated. Companies can use LECs to avoid paying the Climate Change Levy tax.

- **Embedded benefits** of the generating unit being connected to the distribution rather than the transmission network, e.g. charge avoidance of Transmission Network Use of System charges and Balancing Services Use of System charges.
- Generators whose equipment has a capacity greater than 3 MW (and/or the ability to deliver in excess of +/- 15 MVAr of reactive power) can enter into agreements with NGESO to provide **Ancillary Services**, for which they will be paid.
- Generation that is not receiving low carbon support (e.g. Feed-in Tariffs, Renewables Obligation) and does not have a long-term contract to provide Short Term Operating Reserves (STOR) to National Grid Electricity Transmission could be eligible to enter the **Capacity Market**, and receive payments for delivering energy at times of system stress.
- **EU Emissions Trading System (ETS)** - applies to approximately 10,000 energy intensive users in the UK such as metal industry, paper factories and refineries. These large energy users have been allocated green-house gas allowances for their operations. At the end of each year, they must ensure they have enough allowances to cover their emissions: they can buy additional allowances or sell any surplus allowances generated from reducing their emissions.

Impacts of Distributed Generation

As well as introducing benefits, the increased penetration of Distributed Generation in UK distribution networks also poses challenges. These will depend on a variety of factors, such as the generation technology, the voltage level the Distributed Generation is connected to, the size of the generating unit(s), the level of export to the distribution system, and on the type of network (e.g. urban or rural).

Some examples of the challenges posed to distribution networks by Distributed Generation include:

- Distributed Generation changes the current flows and shape of the load cycle where they are connected. This could cause:
  - **Thermal ratings to be exceeded**.
  - **System voltage to rise** beyond the acceptable limits.
  - **Reverse power flows**, i.e. power flows in the opposite direction to which the system has been designed.
- Distributed Generation can contribute to **fault level**, which can raise the fault level above the rating of network equipment.
- There are a number of **power quality** limits that can be affected by Distributed Generation, including:
  - **Contributions to harmonics**, particularly if a significant number of invertor controllers are present.
  - **Voltage unbalance** which affects power quality, if there are lots of single-phase generating units.
  - **Voltage fluctuation or flicker,** if the output of the Distributed Generation changes rapidly.

Note: The technical terms used above are defined in the glossary.

Where to Find More Information

The amount of generation connected to distribution networks has increased significantly since 2010. Today there is over 27,000 MW of Distributed Generation in the UK. The benefits and challenges of Distributed Generation are complex, and the industry's understanding of them is evolving as experience increases. For more information on current initiatives in distribution networks, the following documents are useful:

- The Electricity Networks Innovation Strategy; Energy Networks Association; 2018
- The Open Networks project; Energy Networks Association

The following documents are useful if you want more information on Government policy:

- The Clean Growth Strategy; BEIS; 2017
- Upgrading our energy system: smart systems and flexibility plan; BEIS; 2017

For the most up to date information on relevant Government policy, refer to the BEIS website:

https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy

For more information on Embedded Benefits, the following document is useful:

- Embedded Generation and Embedded Benefits; Elexon; March 2019

C. An Overview of Getting Connected

In this section:

- An introduction to getting connected
- The main tasks in the process of connecting small generating units in multiple premises
- Guidance on where to find more information

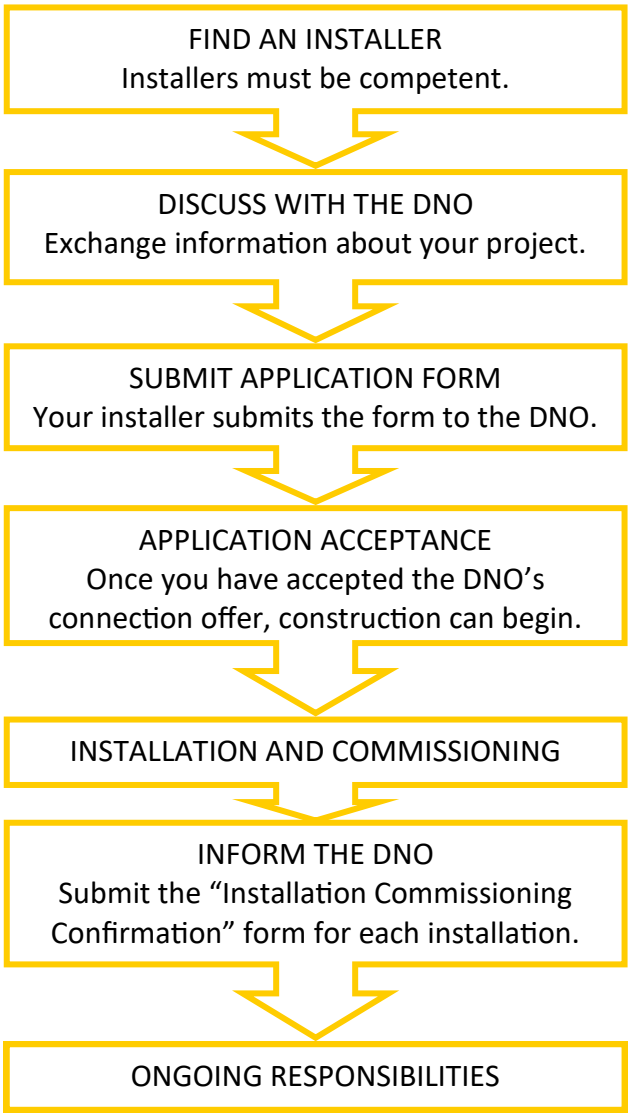
Introduction

While the process for connecting small-scale generation in a single premises is relatively simple, the process for connecting small-scale generation in multiple premises is more involved. Projects involving multiple installations could be, for example:

- A housing refurbishment programme in the same road or street
- A new housing development

There is a key difference between connecting units at one customer site and multiple units within different customer sites within a close geographic region: for multiple sites **you need to get approval from the Distribution Network Operator (DNO)** before you can connect.

The diagram opposite presents the key actions that you have to complete to connect multiple units of small-scale generation within different customer sites and in a close geographic region. These tasks are based on the requirements set out in EREC G98, and are described further in this section.



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. See www.nie.co.uk

Getting Connected—Main Tasks

Finding an Installer

The first task is to find a competent installer, who is using type tested equipment (see note in "Is this the right Guide for my project?"). Installation must be carried out by installers who are competent and have sufficient skills and training to apply safe methods of work to install a generating unit in compliance with EREC G98. This includes having recognised and approved qualifications relating to the primary energy source and general electrical installations. There are companies who design, install and commission domestic generation. They can fully certify and sign off installations.

Certified generation products and installers can be found on the following website:

www.microgenerationcertification.org

The Microgeneration Certification Scheme is operated by the Department for Business, Energy and Industrial Strategy (BEIS). Your installer must be certified in order for you to claim Feed-in Tariffs, with the exception of hydro and anaerobic digestion projects, which have to go through the ROO-FIT process. There is more information about this in Section F: Selling Electricity - Feed-in Tariffs (FITs).

All Micro-generators connecting under EREC G98 must be Fully Type Tested. This is where the whole Micro-generator is type tested, rather than just part of the Micro-generator.

Discussions with the DNO

You must discuss your plans with the DNO before starting work. You should do this as soon as possible in your planning, as the DNO's response may have a big impact on how you plan your project. You may discuss the feasibility of your connection, and if there will be any charges for connection (charges are discussed further in Section E—Costs and Charges).

If your generation project is part of a larger project, eg. developing new housing, then your application needs to be co-ordinated with the connection application for the import supplies themselves. The DNO will need to take into account the new generation in the design of the overall connection.

All DNOs provide information to support generation developers, such as capacity heat maps, on their websites. These can be an important source of information. In addition, there may be dedicated generation 'surgeries' or 'drop in' sessions to discuss your project with the DNO.

Submitting an 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 Form A in Appendix 3 of EREC G98 , which are available on the Energy Network Association's website. Your installer should submit the application form on your behalf.

Application acceptance

When you submit your application form you need to include technical details of the equipment. The DNO needs this information to 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 (charges are discussed further in Section E—Costs and Charges). You should ensure that you fully understand this offer before accepting it. You should discuss questions with your DNO if you are unsure.

Getting Connected—Main Tasks

Installation and Commissioning

Your installer should be aware of the requirements to ensure that installation and commissioning is in line with EREC G98. This includes ensuring that the installation complies with the wiring regulations (BS 7671) and is correctly earthed.

Your installer must also ensure, among other things, that:

- No modifications should be made to the equipment;
- Appropriate safety labelling is provided;
- The generating unit will disconnect from the distribution network if your mains power is interrupted; and
- The generating unit is installed in accordance with the manufacturer's instructions

During the commissioning, your installer will check that your equipment is working as it should.

Informing the DNO

Once your installation is complete, the DNO needs to be made aware of your generating unit(s). This is so that the DNO can take this into account when operating and designing the network.

Your installer must notify the DNO within 28 days of commissioning the generating units in each premises, and provide them with information on the installation. The content and format of the installation commissioning confirmation is set out in the "Installation Document", which is Form B in Appendix 3 of the EREC G98. These forms are available on the Energy Networks Association website.

Note: DNOs may have their own installation commissioning confirmation forms on their websites—a web search should help you locate the forms you need, or try telephoning your DNO.

Ongoing responsibilities

Although the focus of this Guide is to inform you about the process of connecting generation to the distribution network, you (or the owner of the equipment if that is not you) should be aware that once it is connected you have some responsibilities. These include:

- The responsibility to keep it maintained by someone who is competent to do so;
- Notify your DNO of any operational incidents or failures that affect your compliance with EREC G98; and
- Inform your DNO if you remove or replace your generating unit.

Getting Connected — IDNO's Networks

The process for connecting your Distributed Generation to an IDNO's network follows EREC G98 or G99, and is therefore similar to connecting to a DNO's network. IDNOs are licensed entities and are bound by some of the same licence conditions as DNOs, including certain performance standards such as timescales for responding to requests for quotes. The majority of what is included in this guide applies to both DNO and IDNO connections. However, there are a few key differences for a Distributed Generation connection to an IDNO network:

- **Provision of Information:** IDNOs have a reduced set of licence conditions compared with DNOs, and they are not obliged to provide the same documents for customers. IDNOs are not required to produce Long Term Development Statements nor Connection Charging methodologies and statements.

Getting Connected — IDNO's Networks

- **Interaction between the IDNO and the DNO:** When an IDNO receives an application for connection for Distributed Generation, they need to get approval from the DNO before they can offer to connect you.
- If your generation project would cause certain network parameters to exceed defined limits, such as voltage or export to the DNO network, the IDNO and DNO will explore options for accommodating your project. This discussion will take place between the IDNO and the DNO, and will not involve you directly. However, the IDNO may then discuss different options with you for the most appropriate generation project to be connected.
- **Formal Agreements:** IDNOs will not necessarily insist on the same set of formal agreements that the DNOs will. Agreements such as the connection and adoption agreements may not be required.

To determine whether you are connected to a DNO or IDNO network, refer to the guidance on page 15.

Customer Service and Provision of Information

There are a number of drivers for DNOs to provide a good level of service to customers, including:

- The new price control proposals;
- Standards of Performance; and
- Ofgem Distributed Energy Resource (DER) forums.

Price Control Proposals (RIIO-ED1)

Ofgem administers a price control regime which allows DNOs to earn a fair rate of return while limiting costs passed on to customers. The current price control period is called RIIO-ED1, which runs until 2023. The RIIO-ED1 proposals include a number of mechanisms to incentivise DNOs to provide a good service to Distributed Generation customers, including:

- A new Time to Connect Incentive for minor connections customers (less than 70kW and connected at LV);
- An Incentive on Connections Engagement (ICE) - 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:
  - Part 1: Plans for improvements for the forthcoming year; and
  - Part 2: Reviews the progress in the previous year.

ICE workplans can be found on individuals DNO websites

- The Broad Measure of Customer Satisfaction (BMCS) surveys.

DNOs publish annual ICE plans for stakeholder engagement.

Guaranteed Standards of Performance

The guaranteed standards of Performance are set out in Standard Licence Condition 15A. They include, for example, maximum timescales in which DNOs must provide you with a quotation (Connection Offer). Ofgem has guidance documents about these Standards on their website.

Customer Service and Provision of Information

Distributed Energy Resources (DER) Forum

The Distributed Energy Resource (DER) Forums, hosted by the ENA on behalf of DNOs, are events that are used to explore issues and concerns around Distributed Generation connections, including barriers to Distributed Generation and process issues. They are open to anyone, and are attended by DNOs and developers. Details can be found on the ENA Events website.

Improvements made to DNO Services

In recent years, there have been a number of improvements to DNO services as a response to these drivers and feedback, including:

- Increased internal resources;
- Improved provision of information, including more detailed breakdown of costs, web portals, decision support tools/application hotline, and capacity "heat maps", indicating areas that can more readily facilitate connections;
- Holding stakeholder and customer events; and
- Exploring the possibility for discussions prior to formal application ("connection optioneering"). This process is being carried out in different ways by different DNOs. Refer to your DNO for more information.

DNOs have promised to bring about continued improvements, including:

- Shortening connection timescales;
- Enhancing the publicly available network capacity information, eg. contracted capacity reports;
- Publishing case studies; and
- Enhancing the connection application and the wayleaves/consents processes.

DNOs publish Distributed Generation 'Work Plans' that outline progress against improvement initiatives. Check your DNO's Distributed Generation web pages.

Getting Connected — Energy Storage

Storage devices for electrical energy are becoming more prevalent, and can be used as part of Distributed Generation schemes to allow generated electricity to be stored within the premises rather than exported to the distribution network. DNOs treat storage as demand when its importing from the distribution network and generation when its exporting to the distribution network, and need to be aware of storage because of the potential impact on their networks. Therefore storage needs to meet the relevant connection requirements (EREC G98 or G99).

If you are planning to use storage in conjunction with PV (or other technologies) to offset consumption, the total connected generation is likely to be above 16A / phase and G99 applies. However, DNOs have implemented a fast track application process, for domestic scale storage. This involves submitting the G99 Form A1-2 : Application for connection of Fully Type Tested Integrated Micro Generation and Storage installations and reduces the time for the DNO to provide confirmation that the connection is acceptable from 45 days to 10 days or less. If the storage is intended to be operated in island mode (during a power outage) the fast track process is not applicable and the standard G99 process applies.

Getting Connected

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.

EREC G98 exceptions

If you are installing a generating unit under EREC G98 then the requirements apply in full in most circumstances. However, if your generating unit is one of the following, some of the technical requirements in EREC G98 do not apply:

- Classified as an Emerging Technology (see Emerging Technology box on page 7)
- An electricity storage device
- Has a registered capacity of < 800 W

The full details of the requirements that do not apply are in EREC G98.

If you are installing generating units that are connected via an inverter, the 800 W threshold applies to the **aggregate** installed capacity of generation. So, for example, if you are installing 3 x 500 W solar PV inverters, the aggregate installed capacity exceeds 800 W and EREC G98 applies in full. However, because storage is one of the exceptions, it does **not** count towards the aggregate capacity when considering the 800 W threshold. For example, if you are installing a 500 W solar PV inverter and a 500 W storage inverter, they are both excepted from certain requirements in EREC G98.

Supply Issues

Your DNO is obligated to maintain the power quality on their network within a set of defined limits. These include maintaining voltage at the required levels. This is so that customer equipment is not damaged. If you have a voltage complaint you should contact your DNO. Your DNO should respond to your complaint within 5 working days, or visit within 7 working days. If work is required to correct the issue, the DNO should complete this within 6 months.

Health and Safety considerations

Safety is very important in the design of generation connections. Some of the safety requirements for Distributed Generation connections are set out in EREC G98. This document references the Regulation that informs these requirements, the Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002, and also lists the relevant British Standards.

You can find out more about Health and Safety aspects of Distributed Generation connections on the following websites:

- The Electrical Safety Council (ESC): www.esc.org.uk
- The Energy Networks Association—Safety, health and environment: www.energynetworks.org/electricity/she/overview.html

Getting Connected — 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.
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. It is likely that V2G will be > 16 A/phase and therefore G98 is not applicable and G99 should be used.

Where to Find More Information

If you want to find out more, these documents are particularly relevant:

- **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 on or after 27 April 2019. This can be downloaded free of charge via the DCode as well as ENA website.
- **Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002, Section 22**: Statutory Instrument Number 2665, available free of charge.
- Ofgem's information about how to get an electricity connection for a new building or site.

Some DNOs have produced their own guidance notes for small scale generation connections - check your DNO's website.

Dealing with disputes
If you are not satisfied with a particular aspect of service during the process of connecting your generation, your first port of call should be the party with whom the issue lies, eg. the DNO, supplier, etc. DNOs have their complaints process set out on their website. If you still cannot resolve the issue you can contact the Energy Ombudsman:
www.ombudsman-services.org/energy.html
If you are still unable to resolve the matter, as a last resort it can be referred to Ofgem.

D. The Connection Application: Connection Application Process

In this section:

- How to apply to your DNO for connecting generating units in multiple premises
- Details of the information that you will need to provide to the DNO and the design work they may need to do to assess your connection
- How to notify the DNO that your generation unit(s) has been installed and commissioned in accordance with EREC G98

Introduction

This section of the Guide describes how to inform your DNO that you are planning to install a number of generating units that fall under EREC G98 in to different customer sites within a close geographic region.

This section also explains the notifications which the installer of your equipment will need to give to your DNO once the units are commissioned.

The Application for Connection Pro-forma

The Application for Connection Pro-forma included in EREC G98 should be completed by your installer if you are planning to install generating units covered by EREC G98 in different customer sites within a close geographic region. This should be submitted **before any generation is installed**, as the DNO needs to assess the possible impact of your generating equipment on the distribution network. The format for the application is shown in Form A in Appendix 3 of EREC G98. These are available on the Energy Networks Association website.

The form requires a number of pieces of information:

- 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.

When the application has been submitted to the DNO by your installer, the DNO will assess the impact of the generation on their network. Where necessary, they will carry out design work, eg. for network reinforcement.

As mentioned, if your generation project is part of a larger project, eg. developing new housing, then your application needs to be co-ordinated with the connection application for import supplies.

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.

Installation and Commissioning

If the DNO gives permission for the installation of your generation equipment to proceed, your installer will install and commission the generating units. They must then notify the DNO that this has been done, in accordance with the Electricity Safety, Quality and Continuity Regulations (ESQCR). The process and timescales for doing this are described below.

The Installation Document

The installer of your generating units has to tell the DNO about each generation installation **within 28 days of the date of commissioning** (including the commissioning day itself).

The Installation Document in EREC G98 is a convenient way of capturing all of the information that the DNO needs to know once your installer has commissioned each of your generating units.

This can be found in Form B in Appendix 3 of EREC G98. These are available on the Energy Networks Association website.

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**, eg. circuit diagrams; and
- a **signed declaration** as to the compliance of the generating unit with the requirements of G98.

One installation document is required for each generating unit.

Other Requirements

The declaration that your installer signs on the Installation Document requires them to confirm that they've installed your generating unit in accordance with EREC G98. It's important that you use an installer who is familiar with the requirements of these standards. If you appoint a competent installer (see Section C. An Overview of Getting Connected), they should know about these standards and make sure that your installation meets with all the relevant standards.

E. Cost and Charges: Overview of Charges

In this section:

- An introduction to connection costs
- The basis of DNO connection charges for infrastructure
- Other elements of connection charges and where to find indicative costs and examples
- Generation Distribution Use of System charges

Read the boxes for definitions or explanations of terms that may be new or un-familiar.

Introduction

There are two categories of charges made by the DNO:

- **Connection charge**: this is a one-off charge made by the DNO, which primarily covers the cost of work and equipment associated with connecting your generating project to the distribution network.
- **Use of System charges**: these are ongoing charges, which primarily cover operation and maintenance costs and include the costs of ongoing network development including general reinforcement.

DNOs are obliged to publish documents describing the basis of their connection charges and their charging methodology. They also present the different elements of connection charges, and indicative costs for works and equipment of significant cost. This will help you to understand the charges they quote you.

This information is contained in the DNOs Statement of Methodology and Charges for Connection to the electricity distribution system. All DNOs' statements follow the same format, and are available on their websites. This document contains:

- The DNO's connection charging methodology (iehow they calculate their charges);
- The DNO's connection charging statement (iewhat the charges are);
- An indication of the costs of providing a connection quotation / budget estimate; and
- Other relevant information for connecting customers.

The basis and elements of connection charges, as well as indicative costs and examples are discussed in this section.

Use of System charges are levied by the DNO on the supplier, so as a generator you will not be charged these directly. However, this section is included for your information, as Use of System charges may appear as an item on your bill.

Connection Charges

Depending on the location and size of your generating units, new equipment and reinforcement to the existing network may be necessary to accommodate your generation. In the connection charge, you will be charged for any extension to the network.

DNOs are obliged to publish a document describing the basis of their connection charges and their charging methodology. You can refer to this document to see what costs you will be charged for. These are available on DNO websites.

Connection Charges—Other Elements

Elements of charges

As well as charges for any network extension (if required), there are other elements that are covered in the connection charge. These can include the following:

- System / feasibility / fault level studies
- Provision of Wayleaves
- Additional meetings with the DNO or site visits
- Administration

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.

Indicative costs and examples

Equipment costs and charges for services vary across DNOs; it could therefore be misleading to list indicative costs in this Guide. If you want to get an idea for indicative costs, the best place to look is the **DNO's Statement of methodology and charges for connection**. You can find this on the DNO's website.

Aside from giving indicative costs for connection charges, these documents typically contain other useful information, including guidance on the connection process and examples of various connections and their associated cost breakdown. It is updated annually.

The connection charging methodology is governed by the Distribution Connection and Use of System Agreement (DCUSA) and is subject to open governance so any party materially affected by it can propose a change to it. The process for doing this is laid out within the DCUSA itself. See the DCUSA website for more information: www.dcusa.co.uk

The Distribution Charging Methodologies Forum exists to enable parties to discuss ideas for improving the methodology possibly prior to submitting a formal change proposal.

Estimating costs and getting a quotation

As mentioned, you can obtain indicative costs for works and equipment from DNO documents. To obtain a more accurate picture of the connection costs for your project, you can:

- Ask the DNO for a budget estimate
- Obtain an estimate of connection costs from a specialist engineering consultant

You should exercise care in interpreting budget estimates.

Payment of connection charges

Connection charges are paid either:

- in full at the time that the connection offer is accepted; or
- in staged or phased payments, as per a payment schedule.

Staged payments are typically used for generation projects which are greater than a certain size, eg. in project value or duration. The staged payments cover committed

Connection Charges—Other Elements

expenditure by the DNO.

If your connection does not proceed, it is possible that some of the connection charge will be refundable depending on if the DNO has performed the work. You should inform your DNO as soon as possible if you decide not to go ahead with your project.

What is a budget estimate?

You may read about **budget** or **indicative estimates** and **formal quotations**. The differences between these two terms are summarised in the following table.

Budget or Indicative estimate	Formal quotation
Requested in the early stage of a project, and generally only for larger capital schemes	Requested when electrical requirements have been finalised
The DNO doesn't require much information from you	The DNO requires a lot of information from you
Based on a desktop study—the DNO is unlikely to carry out detailed designs or studies	Based on detailed design work, and may require other input such as site surveys
To give an **indication** of costs, and is therefore subject to change	Provides formal contract offer
Not open for acceptance	Open to acceptance, subject to conditions
DNO may charge	DNO will not charge

Assuming that you ask the DNO to undertake all of the work involved in your connection, the timescale for the DNO to provide a budget estimate is 10 working days.

Connection Offer expenses (Assessment and Design fees)

Following a recent government consultation, BEIS is now allowing DNOs to charge Connection Offer expenses (also known as Assessment and Design fees), regardless of whether or not the subsequent Connection Offer is accepted. Connection Offer expenses are a charge by the DNO for the cost of producing Connection Offers, and cover activities such as network modelling, connection design and site surveys. These changes came into force in April 2018. For further information on the recent consultation, refer to the BEIS website.

Note that DNOs are applying these charges differently. For example, some are only applying them to projects with certain connection voltages. Refer to your DNO website for details on how they are applying the charges.

Use of System Charges

Use of System charges are levied by the DNO to the supplier, so as a generator you will not be charged these directly. However, this section is included for your information, as Use of System charges may appear as an item on your bill.

What are Use of System charges?

Use of System charges cover the development, operation, maintenance and repair of the distribution network. DNOs make Use of System charges to suppliers. Suppliers may reflect these charges to their customers as either:

- a 'pass-through' item so that the customer can clearly see the Use of System element; or
- 'wrapped-up' in a total electricity supply tariff where the customer may not be able to clearly see the Use of System element.

DNOs are obliged to publish documents about their Use of System charges. These cover their Use of System charging methodology and a statement of what the charges are for both generation and demand customers. You can find these on DNOs' websites. All generators connected at Low Voltage are subject to Generation Distribution Use of System charges under the Common Distribution Charging Methodology (CDCM). These charges are currently negative (iecredits). You can find out more about the Common Distribution Charging Methodology (CDCM) by looking at Distribution Charging on the Ofgem website, Distribution Charges Overview on the Energy Networks Association website and some DNOs' websites.

Categories of Use of System charges

UoS charges are categorised by:

- the voltage level your equipment is connected to and;
- the type of meter you have.

The boxes below define the voltage level that will apply to EREC G98 compliant equipment (Low Voltage) and the metering arrangements that are likely to apply to this equipment (Non -Half Hourly meters). 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).

LV (Low Voltage)	400/230 V in practice, less than 1 kV in general.

Non-Half Hourly Meters (NHH)
NHH meters record total energy passing through the meter, but do not record the times the energy is transferred. Typically the recorded data would be collected a few times a year, eg. every quarter. Most domestic and small commercial properties have NHH meters. You can contact your current electricity supplier to discuss the provision of NHH meters, or other meter suppliers.

F: Selling Electricity- Feed-in Tariffs (FITs)

In this section:

- An introduction to the Feed-in Tariff Incentive
- Eligibility and Accreditation
- Deployment caps and how they work
- Guidance on where to find more information

Tip: Read the information boxes for definitions or explanations of terms that may be new or unfamiliar.

Introduction

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

FITs are available for the following generation technologies:

- Anaerobic digestion
- Hydro
- Solar PV
- Wind

A number of domestic Combined Heat and Power (CHP) units are also supported through FITs under a Micro CHP pilot scheme. The Micro CHP pilot will support up to 30,000 installations with an electrical capacity no greater than 2 kW.

This section will detail the structure of the tariffs and will explain how to get accredited with FITs.

Important Point: the FIT scheme for generators closed on the 31st March 2019. From the 1st April 2019 onwards, network applications for generators will not be eligible to obtain a FIT from their energy supplier.
Applications that were submitted before the 31st March 2019 will have a deadline (depending upon technology and ownership) to install the distributed generation. The period of installation is as follows:

- Wind projects must be installed within 12 months
- Hydro projects must be installed within 24 months
- Anaerobic digestion (AD) must be installed within 12 months
- Solar projects must be installed within 6 months

If the generation projects are FIT accredited by a community then a 6-month extension will be granted to the above timescales. Please refer to https://www.ofgem.gov.uk/system/files/docs/2018/12/cs_guidance_version_4.pdf for more information and the definition of a community.

Tariff Structure

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

- **Generation tariff (FITs):** A fixed price for each unit of electricity generated.
- **Export tariff:** A guaranteed price for each unit of electricity exported to the grid.
- **Import reduction:** reducing your import from the grid by using your own electricity.

Tariffs are adjusted annually for inflation. The generation tariffs are published by Ofgem, and you can access them on their webpage:

www.ofgem.gov.uk/environmental-programmes/feed-tariff-fit-scheme/tariff-tables

The tariff level that you will receive will be the most recent tariff level on the eligibility date of the installation. You will continue to receive this same tariff throughout the eligible lifetime of the project, which for most technologies is 20 years.

FITs for PV generation

The FITs for PV are structured in a slightly different way. PV installations are subject to the following criteria:

- Energy efficiency requirements—the building to which the solar PV is attached should achieve an Energy Performance Certificate (EPC) rating of level D or above for installations up to and including 250 kW; and

- Multi-installation tariffs—applies to any solar PV installation where the recipient of the FIT already receives FIT payments from 25 or more other PV installations.

The impact of these criteria on the tariff level received is summarised in Ofgem's tariff tables. Refer to the BEIS or Ofgem websites for the most up to date information.

Export Tariff

The export tariff is a guaranteed price for the export of your generated electricity, and is the same for all installations which are eligible for FITs. At the time of writing, the export tariff is set at 5.24p/kWh, but this is subject to regular reviews. Refer to the BEIS or Ofgem websites for the most up to date information.

Metering Requirements

You will need to measure three electrical flows to get the most out of the FIT scheme; import (this is your usual electricity meter), generation and export. For your generation financial stream, each of your generating units must be measured separately.

For your export payments, you may choose to measure your export to the grid via a meter (often called an export meter). However, the Government is allowing an interim measure of estimating export, subject to conditions. For example, the Energy Savings Trust website states that domestic FIT installations are likely to have an estimated export level of 50% of electricity generated.

Your electricity supplier is a good first port of call to discuss metering arrangements.

Eligibility and Accreditation

Renewable Energy generators under 5 MW are eligible for Feed-in Tariffs. Renewable Energy generators supplying off-grid or private networks are also covered by the FITs scheme. They receive generation tariffs and the benefit of avoiding the costs of generating electricity by other means e.g. Diesel.

Accreditation steps:

There are two routes to accreditation. For wind or solar PV generation up to and including 50 kW, and for micro CHP, the accreditation process is as follows ("MCS-FIT"):

1. Install your generating unit—**you must use a Microgeneration Certification Scheme (MCS) installer** (see below);
2. Your installer will register you on a central accreditation system;
3. You will receive a certificate confirming you are eligible for FITs;
4. Register for a FIT with your supplier, and provide them with your FIT compliance certificate so that they can verify your eligibility;
5. Indicate to your supplier if you are opting for the guaranteed export tariff or if you prefer to sell your electricity using a Power Purchase Agreement (a legal contract between you and your electricity supplier);
6. Your supplier will then be responsible for the level of payment you will receive for the electricity generated and exported, for which you may be required to provide meter readings.

See Ofgem's website on MCS-FIT accreditation: www.ofgem.gov.uk/environmental-programmes/feed-tariff-fit-scheme/applying-feed-tariff/mcs-fit

For anaerobic digestion and hydro generators and for solar PV and wind generation over 50 kW, the following "ROO-FIT" process applies (see information box on page 41):

1. Install your generating unit;
2. Apply for accreditation through Ofgem's Renewable and CHP register (see ROO-FIT box on page 41);
3. Successful applicants will be awarded an accreditation number;
4. Register for a FIT with your supplier, and provide them with your accreditation number so that they can verify your eligibility.

Steps 5 and 6 are as above.

While Ofgem is responsible for establishing and maintaining the central FITs register, suppliers manage the registration process—they will be your point of contact.

Microgeneration Certification Scheme (MCS)

The MCS is currently the only formalised industry standard in the UK based on European and international standards for microgeneration projects. MCS is a BS EN ISO/IEC 17065:2012 Certification scheme covering Renewable Energy products (wind and PV up to 50 kW (electrical), solar thermal, biomass and heat pumps up to 45 kW (thermal), Micro CHP and hydropower) and Renewable Energy installation companies.

MCS checks for the products' performance and quality and for the installation methods and quality. MCS will increase your confidence in the Renewable Energy technology you are buying and in the company installing it. The MCS is linked with FITs accreditation for Renewable Energy generation ≤ 50 kW electrical capacity.

For more information please refer to the MCS website: www.microgenerationcertification.org

Deployment Caps

Deployment caps were introduced to the FIT scheme in February 2016. A deployment cap is defined as a limit on the capacity that can receive a particular FIT tariff, in a particular tariff period.

Once a deployment cap has been reached, no further installations are eligible to receive the tariff rate applicable for that band, in that tariff period. All the remaining tariff periods will degress by a further 10% (in addition to the default degression). Ofgem will publish a report once the deployment cap has been reached. Indicative queues for each ROO-FIT and Standalone deployment cap can be found on the Ofgem website.

The deployment caps queue is based on the date and time you submit your FIT application to Ofgem. A place in the queue does not guarantee eligibility for a particular tariff or eligibility for support under FITs, as it will depend on the volume of applications ahead of you.

Two examples are given below:

1. A tariff period opens on 1 April 2016 at 00:00:00 and closes on 30 June 2016 at 23:59:59. A standalone PV installation submits an application to Ofgem on 1 June 2016 at 12:20:35. The deployment cap for this technology and tariff band has not been reached and there is sufficient capacity available to accommodate this installation. The tariff rate for this installation is the tariff rate that applies to the tariff period that the application was submitted in.

2. A tariff period opens on 1 April 2016 at 00:00:00 and closes on 30 June 2016 at 23:59:59. A standalone PV installation applies and exceeds the relevant cap for that tariff period on 1 June 2016 at 12:20:35. The tariff rate for that tariff period is applicable to installations with an application date and time from 1 April 2016 at 00:00:00 to 1 June 2016 at 12:20:34. Applications received on or after 1 June at 12:20:35 are queued for entry into the next available tariff period. The tariff rate applicable for applications submitted after the cap is exceeded will be the tariff rate associated with the next tariff period, with capacity available to accommodate the capacity of the installation. The next tariff period opens on 1 July 2016 at 00:00:00 and there is sufficient capacity to accommodate the capacity of the installation. The installation receives the tariff rate available in that tariff period.

Eligibility and Accreditation

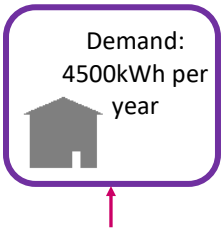
ROO-FIT accreditation arrangements:
Anaerobic Digestion and hydro installations of any size are accredited by the Renewables Obligation (RO) Order Feed-in Tariff ("ROO-FIT") process, rather than the MCS accreditation process ("MCS-FIT"). Wind and solar installations greater than 50 kW are also accredited in this way. The ROO-FIT accreditation process is run by Ofgem (rather than the generation installer / supplier), via Ofgem's Renewable and CHP register. There is more information about it on Ofgem's website:
www.ofgem.gov.uk/environmental-programmes/feed-tariff-fit-scheme/applying-feed-tariff/roo-fit

Micro CHP Pilot: The Micro CHP pilot will support up to 30,000 installations with a review to start when the 12,000th installation has occurred. To qualify the CHP unit must have an electrical capacity no greater than 2 kW.

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.

FIT Example
The **example** tariff levels are:
Import tariff: 10p/kWh,
Generation tariff: 8.19p/kWh

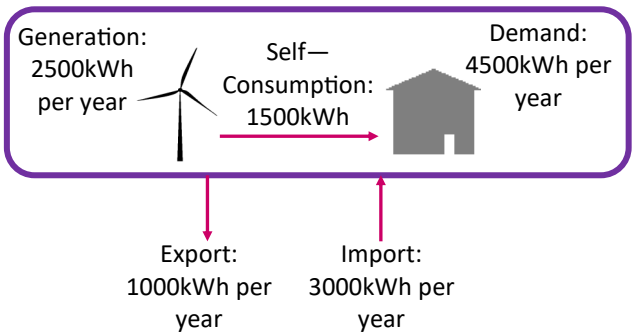
Before Installation



Import: 4500kWh per year

Cost of Import per year:
4500kWh x 10p/kWh = **£450**

After Installation of Distributed Generation



Income per year:	Cost of Import per year:
Generation: 2500kWh x 8.19p/kWh = £204.75 Export: 1000kWh x 5.24p/kWh = £52.40 This is a **total income of £257.15**	3000kWh x 10p/kWh = £300 This is a **saving of £150** due to avoided import.

Total net benefit: £257.15 + £150 = **£407.15 per year**

Where to Find More Information

For more guidance and the most up-to-date information on Feed-in Tariffs, please see the following organisations' websites:

- Energy Saving Trust — Initial port of call for information
www.energysavingtrust.org.uk/Generate-your-own-energy/Financial-incentives/Feed-In-Tariffs-scheme-FITs
- Carbon Trust — Initial port of call for information for businesses:
www.carbontrust.com
- Department for Business, Energy and Industrial Strategy (BEIS) — Policy setting
https://www.gov.uk/feed-in-tariffs
- Ofgem—FIT administrator
www.ofgem.gov.uk/Sustainability/Environment/fits/Pages/fits.aspx

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

Glossary of Terms

Aggregator: An organisation which specialise in co-ordinating demand and generation (including storage) to provide demand response and other market services. Network operators and suppliers may buy demand response and other grid balancing services from aggregators.

Balancing and Settlement Code (BSC): The Code which determines the rules governing the Balancing Mechanism and settlement process for electricity trading in Great Britain. A BSC Panel has been charged with overseeing the management, modification and implementation of the BSC rules, as specified in Section B of the BSC. The Balancing and Settlement Code Company (ELEXON) supports the BSC Panel.

Balancing Mechanism: NGESO has a licence obligation to manage the Transmission System and, and needs to have an arrangement in place for the scenario where more energy is generated than consumed, or vice versa. Unchecked, this would result in system frequency falling or rising to an unacceptable degree. The balancing mechanism provides a means by which NGESO can buy or sell additional energy close to real-time to maintain energy balance, and also to deal with other operational constraints of the Transmission System.

Capacity: The capacity of a generating units is the maximum power that can be produced if the units are running normally at full power.

Capacity Market: A market that aims to ensure security of electricity supply by providing a payment for reliable sources of capacity.

Climate Change Levy (CCL): Part of a range of taxation measures designed to help the UK meet its legally binding commitment to reduce greenhouse gas emissions. This levy / tax is chargeable on the industrial and commercial supply of taxable commodities for lighting, heating and power by consumers in the following sectors of business: industry, commerce, agriculture, public administration and other services.

Contracts for Difference (CfD): A Contract for Difference is a contract between a generator and the Low Carbon Contracts Company (LCCC, the CFD counterparty), which is government owned. The Feed-in Tariff with Contracts for Difference is a low-carbon generation incentive mechanism.

Distributed Generation (DG): A generating unit which is connected to a distribution network rather than to the transmission system. Distributed Generation is generally smaller than generating units connected to the transmission system as the maximum operating voltage of distribution networks is 132 kV in England and Wales and 33 kV in Scotland.

Distribution Network (System): The distribution system is the network that comprises the equipment between the transmission system and the customer's service switch. In England and Wales the distribution systems are the lines with a voltage less than or equal to 132 kV. In Scotland the distribution network is composed of lines with an operating voltage of less than 132 kV.

Distribution Network Operator (DNO): A holder of a Distribution Licence, the DNO owns, operates and maintains a Distribution network and is responsible for confirming requirements for the connection of Distributed Generation to that network.

Embedded Generation: Another term used for Distributed Generation (DG) - see above.

Energy Service Company (ESCO): A Government paper defines ESCOs as "a company that provides a customer with energy solutions" rather than simply being an electricity or gas supplier.

EU Emissions Trading System (ETS): Formerly referred to as the EU Emissions Trading Scheme, the EU Emissions Trading System (EU ETS) is one of the key policies introduced by the European Union to help meet its greenhouse gas emissions reduction target. It is a Europe-wide cap and trade scheme that started in 2005. The EU ETS covers electricity generation and the main energy-intensive industries.

Extension: It is sometimes necessary to extend the DNO's distribution network in order to provide a connection for a new user (demand or generation customer).

Glossary of Terms

Generating Unit: Any apparatus which produces electricity.

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

Grid Supply Point (GSP): Any point at which electricity is delivered from the National Electricity Transmission System to the DNO's Distribution system.

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.

Low Voltage (LV): A voltage normally exceeding 50 V AC between conductors and earth or 120 V DC between conductors but not exceeding 1000 V AC or 1500 V DC between conductors or 600 V AC or 900 V DC between conductors and earth.

National Electricity Transmission System Operator (NETSO): Operates the electricity transmission system in England, Wales and Scotland (see System Operator).

National Grid Electricity System Operator (NGESO): Operates the transmission system in England, Wales and Scotland (takes the role of the NETSO). NGESO is a member of the National Grid group of companies.

National Grid Electricity Transmission (NGET): Owns the electricity transmission network in England and Wales. NGET is a member of the National Grid group of companies.

Ofgem: The Office of Gas and Electricity Markets.

Reinforcement: Reinforcement work is usually required to increase the electrical capacity of those parts of the network which are affected by the introduction of new generation or demand. Other work might include upgrading the switchgear at a substation some distance from the proposed generation project, due to the increase in fault level caused by the connection of generating units.

Renewable Obligation Certificates (ROCs): A green certificate issued to an accredited generator for eligible renewable energy generated within the UK and supplied to customers within the UK by a licensed electricity supplier. ROCs are issued for each MWh of eligible renewable output generated, the amount of ROCs received depend on the technology of the generating station.

Retail Price Index (RPI): General purpose measure of inflation used in the UK.

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.

Supplier (Electricity Supplier): Electricity suppliers purchase electricity (on the market or in contracts) and sell electricity to customers (commercial, industrial and domestic).

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

Transmission Network (System): A system of lines and equipment owned by the holder of a Transmission Licence and operated by the GB SO, which interconnects Power Stations and substations. In England and Wales the transmission system is the equipment principally rated above 132 kV while in Scotland they are those principally at or above 132 kV.

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.

Use of System (UoS): The use of a transmission or distribution system by a generator, supplier, customer or an interconnected party for the purposes of transporting electricity.

References

Standards and other documents:

Balancing and Settlement Code (BSC) is available free of charge on Elexon's website

Connection and Use of System Code (CUSC) is available free of charge on National Grid's website

Distribution Code of Great Britain—available free of charge on the Distribution Code website

Engineering Recommendation G59, relating to the connection of generating equipment to the distribution systems of licensed Distribution Network Operators. This is not applicable to generation connecting after the 27th April 2019.

Engineering Recommendation G81 is called "Framework for design and planning, materials specification, installation and records low voltage housing development installations and associated new HV/LV distribution substations". It can be found free of charge on the Energy Network Association's website

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 on or after 27 April 2019— available free of charge on the DCode and ENA websites

Engineering Recommendation G99: Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019— available free of charge on the DCode and ENA websites

Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002, Section 22: Statutory Instrument Number 2665, available free of charge

Grid Code of Great Britain — available free of charge on National Grid's website

IET Wiring Regulations (British Standard 7671) are available to buy on the IET website

Metering Codes of Practice

Requirements for Generators is available free of charge on the EUR-Lex website

Requirements for micro-generating plants to be connected in parallel with public low-voltage distribution networks (BS EN 50438) is available to buy on the BSI website

Statutory Instrument 2001 No. 3270, The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001

Statutory Instrument 2008 No. 2376, The Electricity (Applications for Licences, Modifications of an Area and Extensions and Restrictions of Licences) Regulations 2008

References

Useful websites:

Agency for the Cooperation of Energy Regulators (ACER)	www.acer.europa.eu
Association of Meter Operators	www.meteroperators.org.uk
British Hydropower Association	www.british-hydro.org
Renewable UK	http://www.renewableuk.com/
Carbon Trust	www.carbontrust.com
The Council of European Energy Regulators (CEER)	www.ceer.eu
The Association for Decentralised Energy (combined heat and power)	www.theade.co.uk
Department for Business, Energy & Industrial Strategy	https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy
Distribution Connection and Use of System Agreement (DCUSA) website	www.dcusa.co.uk
Electricity Networks Strategy Group	https://www.gov.uk/government/groups/electricity-networks-strategy-group
Elexon	www.elexon.co.uk
Energy Networks Association	www.energynetworks.org
Energy Saving Trust	www.energysavingtrust.org.uk/Generate-your-own-energy
Energy UK	www.energy-uk.org.uk
ENTSO-E	www.entsoe.eu
Lloyds Register	www.lr.org/sectors/utilities/schemes/ners.aspx
Microgeneration Certification Scheme	www.microgenerationcertification.org
National Grid	www.nationalgrid.com/uk/Electricity/
Ofgem	www.ofgem.gov.uk
Renewable Energy Association	www.r-e-a.net

References

Relevant reports and guides:

Electricity Trading Arrangements: A Beginner's Guide; Elexon

Embedded Generation and Embedded Benefits; Elexon; November 2013

The Electricity Networks Innovation Strategy; Energy Networks Association; 2018

The Open Networks project; Energy Networks Association

The Clean Growth Strategy; BEIS; 2017

Upgrading our energy system: smart systems and flexibility plan; BEIS; 2017

Revisions

Version Number	Date	Details of Changes
1.0	July 2019	The G83/G98 guides have been replaced with a G98 guide and minor revisions have been made. Changes include: • General Updates • Inclusion of V2G • Update of the FIT's