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Distributed Generation Connection Guide

A GUIDE FOR CONNECTING GENERATION TO THE DISTRIBUTION NETWORK **IN A SINGLE PREMISES THAT FALLS UNDER G83/2**

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In the event that there is any conflict or contradiction between this Guide and the engineering standards and codes referenced in the Guide, the terms of the referenced documents will prevail. These include inter alia Engineering Recommendation G83/2, Engineering Recommendation G59/3, the Distribution Code, the Grid Code, the Connection and Use of System Code and the Balancing and Settlement Code.

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 four separate 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 generating unit (or the aggregation of generating units 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 / **No**

Number of premises

In how many premises are you planning to install units:

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

1 / **More than 1**

Size

Is your generating unit capacity 17kW or less (single Phase) or 50kW or less (three Phase)?

No / **Yes**

- Guide for EREC G83 projects on a Single Premises
- Guide for EREC G83 projects on Multiple Premises
- Guide for EREC G59 projects for simple installations of under 50kW capacity
- Full Guide for EREC G59 Projects

Simplest process → Most complex process

Examples of Distributed Generation that is 16A 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 16A per phase, particularly if your array is about 30m^2 or less; or about 18 panels or fewer.

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

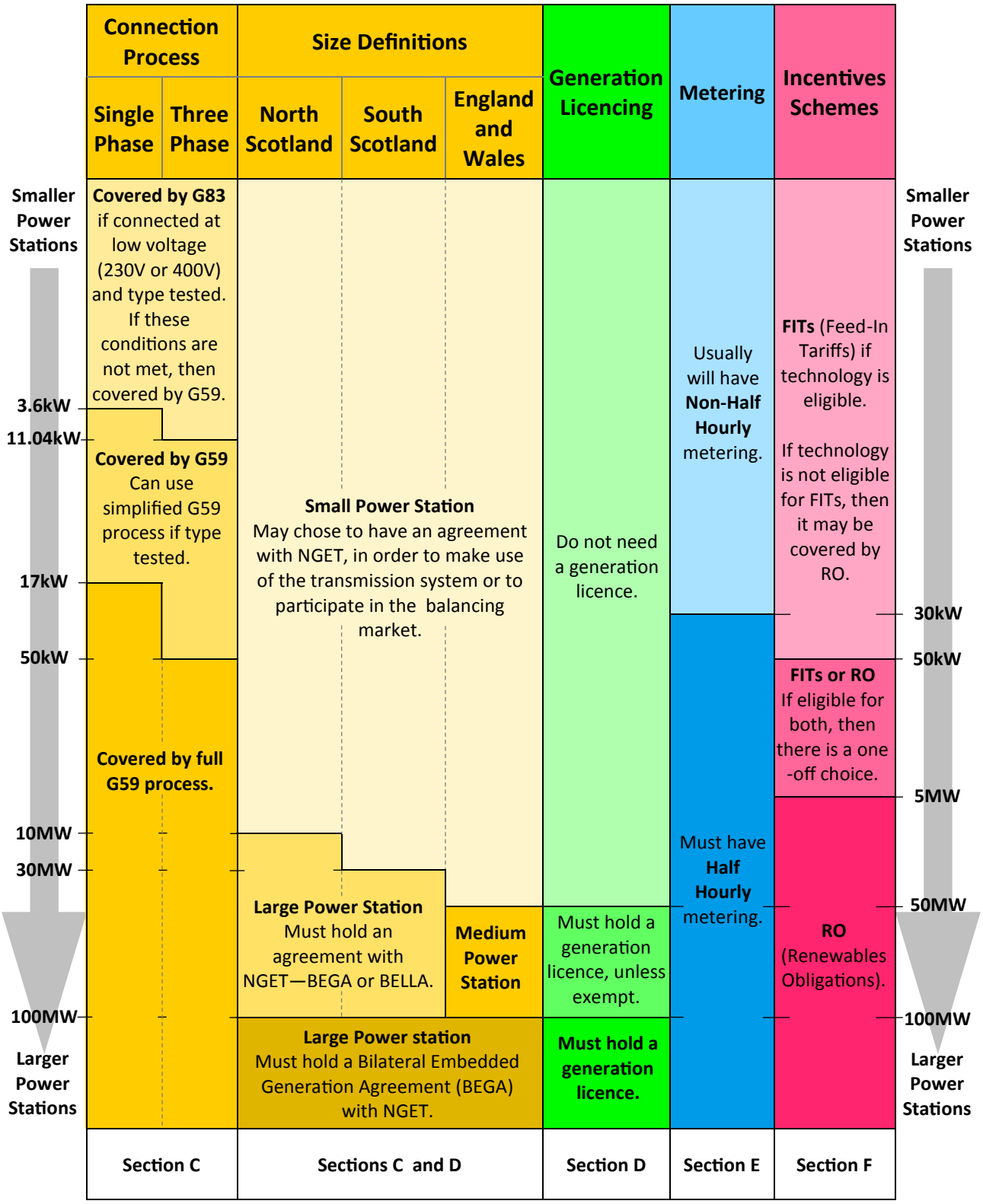
- **QR5 turbine**: Rated 6.5 kW with a rotating section of 5 m height
- **Bergey wind turbine**: Rated 10.0 kW with a diameter of 7 m

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 1m) 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. The ENA has guidance documents about these Standards on their website: www.energynetworks.org/electricity/regulation/electricity-standards-of-performance.html

DG (Distributed Generation) Forums

Ofgem holds a series of regional events ("DG forums") to explore issues and concerns around DG connections, including barriers to DG and process issues. DNOs have responded to these concerns in a number of ways, including:

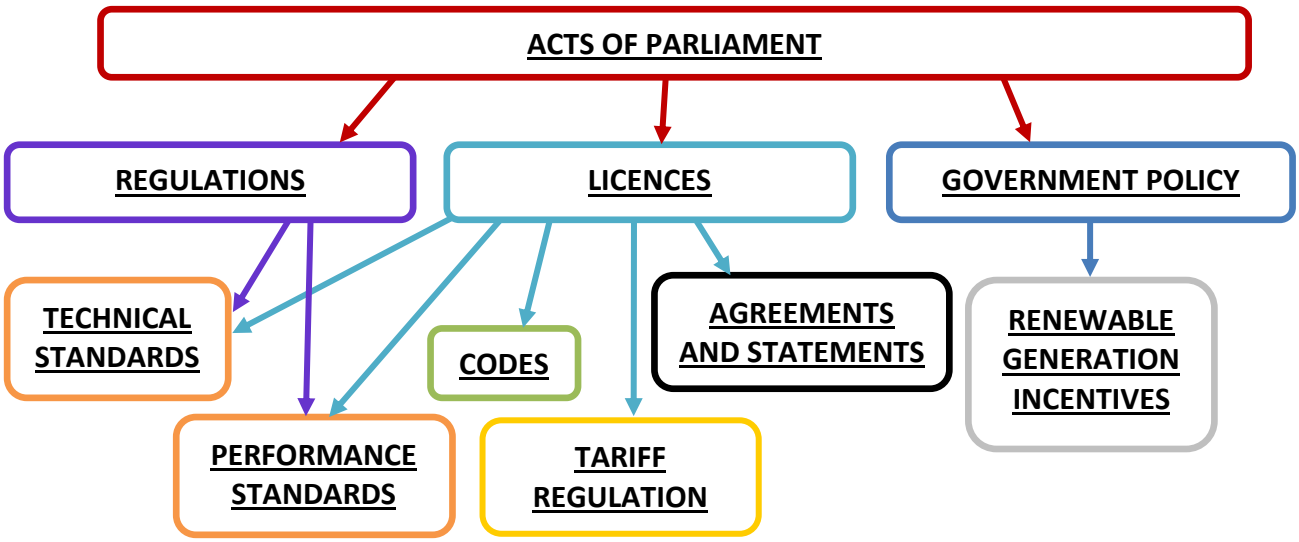
- Providing a more detailed **breakdown of costs**;
- Making improvements to the **provision of information** (e.g. web portals and capacity "heat maps", indicating areas that can more readily facilitate connections);
- Holding **stakeholder workshops** and **customer events** (e.g. some DNOs host "open surgeries" for Distributed Generation customers); and
- Utilising **new technologies and techniques** in connection offers.

The ENA has taken on running these forums on behalf of the DNOs.

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	Northern Powergrid	www.northernpowergrid.com
North West	Electricity North West	www.enwl.co.uk
Yorkshire	Northern Powergrid	www.northernpowergrid.com
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 | 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 2010 (CCS incentive)

REGULATIONS:
- Electricity Safety, Quality and Continuity Regulations 2002
- The Electricity (Applications for Licences, Modifications of an Area and Extensions and Restrictions of Licences) (No. 2) Regulations 2004
- Electricity Standards of Performance (Amendment) Regulations 2010

LICENCES:
- Generation
- Transmission
- Distribution
- Supply

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

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

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

GOVERNMENT POLICY:
- Energy White Paper 2007
- The UK Low Carbon Transition Plan 2009
- The UK Renewable Energy Strategy 2009

PERFORMANCE STANDARDS:
- Guaranteed standards and DG standards

RENEWABLE GENERATION:
- FIT and ROC programmes

TARIFF REGULATION:
- Ofgem Price Controls

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 one of the UK's electricity distribution networks. The types of generation that most frequently connect to the distribution networks include:

- renewable energy projects;
- waste to energy projects; 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 UK 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 the key financial incentive for Distributed Generation: Feed-in Tariffs (FITs).

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)
- 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.

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 subject to open governance whereby any interested and materially affected party can propose a change to the document. This includes the Connection and Use of System charging arrangements (for both distribution and transmission) and the Distribution and Grid Codes. For matters not under open governance 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 DNO - DG Steering Group, and for technical issues the ENA DNO – DG Technical Forum. Any issues you have for these forums should be raised through trade associations who are representatives.

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.

There are two main Engineering Recommendations that cover the connection of Distributed Generation to the electrical distribution network: EREC G83 (for smaller generation capacities and specific generation technologies) and EREC G59 (for all other projects). These are described further in the information boxes below.

Four Guides have been developed:

- EREC G83 compliant units in a single premises;
- EREC G83 compliant units in multiple premises within a close geographic region;
- A simplified guide for EREC G59 compliant equipment with a capacity of 50kW or less, and which has been type tested; and
- A full guide for all EREC G59 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 (i.e. EREC G83 or G59) is based on the installed capacity of the power station as a whole, how many premises equipment will be installed on, and whether each unit is type tested.

If you are adding new generating units to an existing power station, then the total power station capacity should be used to determine the connection process of the new connection application, but only the new additional equipment needs to be type tested in line with the latest EREC documents.

Engineering Recommendation G83

EREC G83 is called "Recommendations for the Connection of Type Tested Small-scale Embedded Generators (Up to 16 A per Phase) in Parallel with Low-Voltage Distribution Systems." It sets out the requirements you must meet before your generating unit can be connected to the network. The document is aimed at the manufacturers and installers of your generating unit.
EREC G83 is available on the Energy Network Association's website for a fee of £90.00, but all of the Appendices with forms required for applications are available free of charge.

Engineering Recommendation G59

EREC G59 is called "Recommendations for the Connection of Generating Plant to the Distribution Systems of Licensed Distribution Network Operators." The purpose of the document is to provide guidance to you and to DNOs on all aspects of the connection process.
EREC G59 is available on the Energy Network Association's website for a fee of £125.00, but some Appendices are available free of charge.

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 G83 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 G83 if:
It meets the size definition of SSEG;
It is installed in accordance with EREC G83. Your installer should be familiar with these requirements; and
It has been tested and approved according to the relevant Type Testing Annex in EREC G83.</td></tr>
<tr><td>A guide for connecting Distributed Generation that falls under EREC G83 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 simplified guide for connecting Distributed Generation that falls under EREC G59 with a capacity of less than 50kW three-phase or 17kW single-phase</td><td colspan="2">This Guide is written for installations where:
the equipment is covered under G59;
the generating capacity of the generating units is 50kW or less three phase, or 17kW or less single phase;
the equipment to be installed is EREC G59 or G83 ‘Type Tested’
In addition, this Guide is aimed at generation projects where the connection requires only a minimum amount of network extension and makes use of the Feed-in Tariff (FITs) scheme (rather than Renewable Obligation Certificates or ROCs). For information on network extension and ROCs, refer to the full G59 Guide (below).</td></tr>
<tr><td>A full guide for connecting Distributed Generation that falls under EREC G59</td><td colspan="2">This guide covers all projects that are covered by EREC G59. If a Distributed Generation project does not meet all of the criteria under EREC G83 then it is covered by EREC G59.*</td></tr>
</table>

*Connection of small scale embedded generation of above 16A per phase (including the connection of small scale embedded generation of less than 16A per phase where the aggregate capacity of installed generation is greater than 16A per phase) made before 1 December 2014 can be in accordance with either G59/2-1 or G59/3. Such connections made after 1 December 2014 must be made in accordance with G59/3.

Small-Scale Embedded Generation (SSEG)

SSEG is defined in EREC G83 as “A Generating Unit together with any associated interface equipment, if required (e.g. Inverter(s)) that can be used independently, rated up to and including 16A per phase, single or multi-phase 230/400V AC and designed to operate in parallel with a public low voltage Distribution System”. This corresponds to **3.68 kW on a single-phase supply and 11.04 kW on a three-phase supply.**

The requirements have been relaxed for small scale generation using Stirling engines. This is detailed in Guidance Note 3 in the Distribution Code, and valid until 31 December 2016. For more information see the latest version of the Distribution Code: www.dcode.org.uk

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

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.

Type tested equipment

A type tested Small-Scale Embedded Generating unit is defined in EREC G83 as one that "has been tested by the Manufacturer, component manufacturer or supplier, or a third party, to ensure that the design meets the requirements of this Engineering Recommendation". Type testing applies to the generating equipment or inverter which is connected directly to the electricity network. Using type tested equipment simplifies the connection and commissioning process.

The Engineering Recommendation annexes contain methodologies for testing equipment against a set of test conditions to demonstrate compliance with EREC G83. The manufacturer produces a Type Test Certificate to demonstrate compliance. The following generation types fall under EREC G83, as they have a type testing appendix:

- Domestic Combined Heat and Power (CHP)
- Photovoltaic (PV)
- Fuel Cells
- Hydro
- Wind
- Energy Storage Device

In the event that a new type testing annex is required, manufacturers and developers can ask the GB Distribution Code Review Panel (DCRP) to formally initiate it.
The Energy Networks Association (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. You can access the register at: www.ena-eng.org/ProductTypeTestRegister/

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 (e.g. a Photovoltaic array) to the distribution network, which operates at AC.

The term Micro Inverter is used to describe small scale 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 the power station as a whole and not the individual units.

Distributed Generation Connection Guide: Contents

Contents

A: A Guide to the UK Power Sector

In this section:

- An overview of the commercial structure of the power sector
- An introduction to the UK 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 UK power sector may be useful when discussing your Distributed Generation project. This section aims to give some background explanation about the UK 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 UK 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.

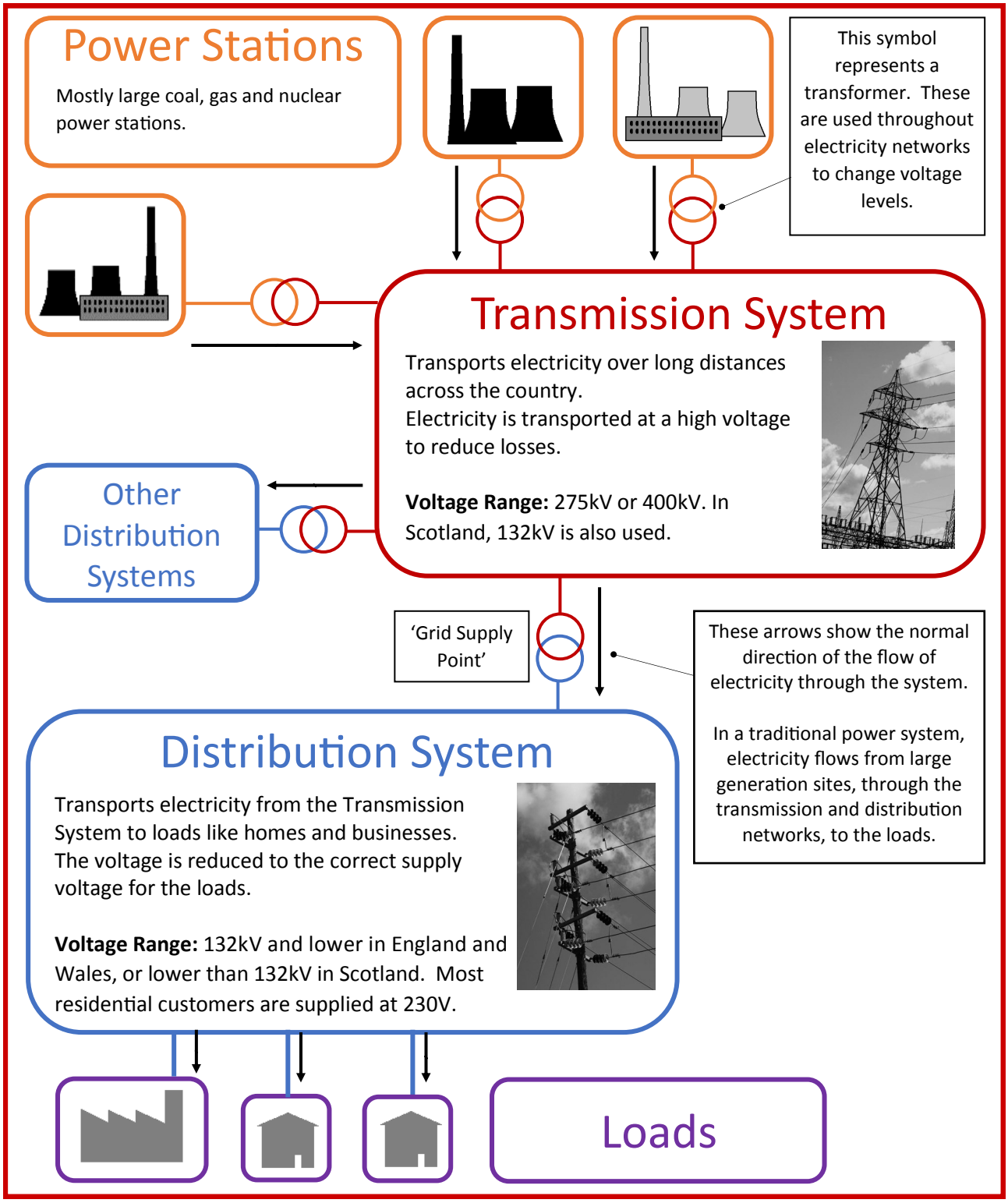
The Physical Infrastructure of the Power Sector

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.



The Physical Infrastructure of the Power Sector

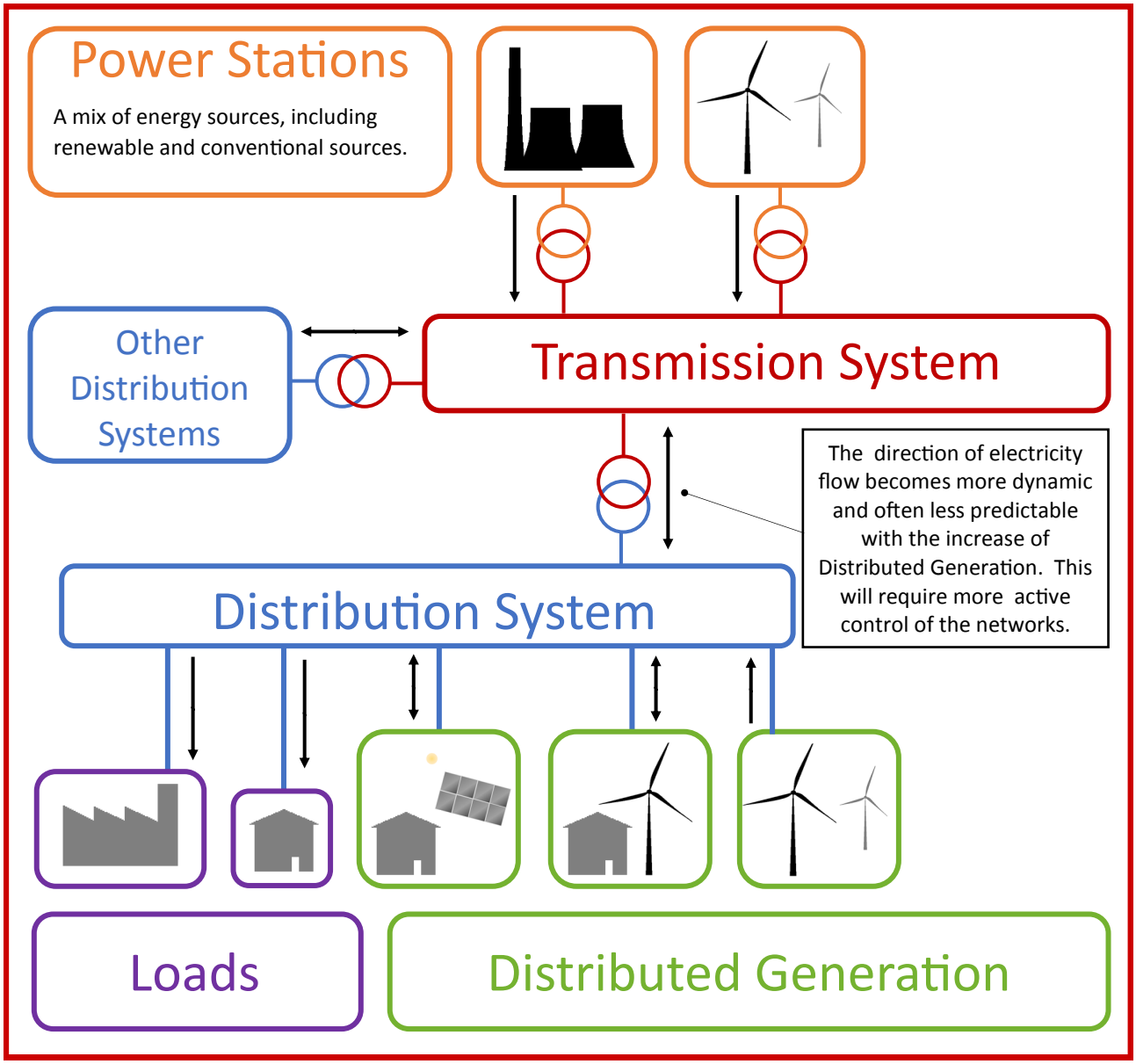
Changing electricity system

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.

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
- **Scottish Power (SP Transmission Ltd)** in southern Scotland
- **Scottish and Southern Energy (SSE)** in northern Scotland (Scottish Hydro Electric Transmission Ltd, or SHETL)

NGET is also the System Operator for the whole of Great Britain.

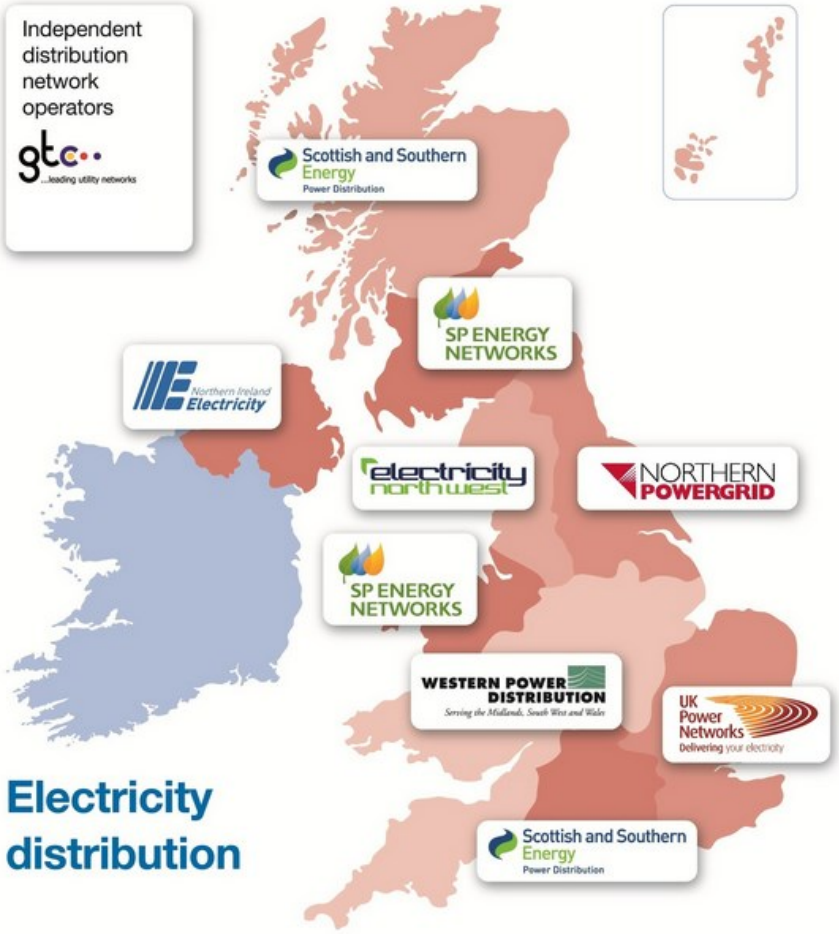
Distribution Network Operator (DNO)

A DNO owns, operates and maintains public electricity distribution networks in one or more regions in the UK. 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.

Map of DNO regions in the UK:

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



Key Organisations

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)

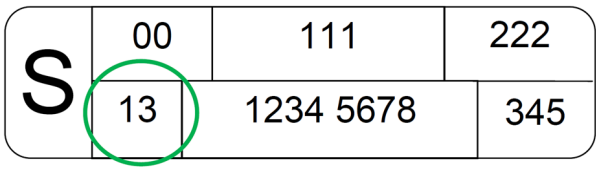
An IDNO designs, builds, owns and operates a distribution network, which is an extension of an existing DNO network. They typically build network for new developments such as business parks and residential areas. IDNOs differ from DNOs in that:

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

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 the previous page.

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	Envoy (Independent Power Networks)
25	No area—IDNO	ESP Electricity
26	No area—IDNO	Energetics (Energetics Electricity Ltd)
27	No area—IDNO	GTC (The Electricity Network Company)
28	No area—IDNO	EDF IDNO (UK Power Networks (IDNO) Ltd)

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.

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.

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, e.g. 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.

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. National Grid Electricity Transmission (NGET) is the System Operator in Great Britain.

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).

Key Organisations

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.

Network Innovation Projects

New challenges and applications in energy networks have motivated many projects that aim to innovate the way networks operate and develop new technologies and techniques. Ofgem has introduced the Low Carbon Networks Fund (LCNF), which aims to drive innovation in electricity distribution networks. It will provide up to £500 million of funding over five years (from 2009). Some examples of LCNF projects are:

- **Application of Storage and Demand Side Management**—Investigates the benefits of integrating storage and Demand Side Management technologies in the operation and development of active distribution networks.
- **My Electric Avenue**—Investigates ways to manage the additional demand on distribution networks from the anticipated increased uptake of electric vehicles.
- **Active Network Management —** Aims to maximise the utilisation of the distribution network capacity based on real-time measurements and management of generation.
- **Smart Grid Design**—Investigates alternative network designs and operational arrangements both under existing demand patterns and with a view to accommodating Distributed Generation.

Ofgem has also introduced the Network Innovation Allowance (NIA) and Network Innovation Competitions (NICs) to incentivise innovation amongst the Transmission Owners.

The NIA is an allowance for the Transmission Owners in order to fund smaller scale innovation projects, while NICs are a series of competitions where companies compete for funding for larger scale projects.
Learning from these projects is to be shared amongst all DNOs and TOs for the benefit of the power sector as a whole.

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

http://www.smarternetworks.org/

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

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: http://www.ofgem.gov.uk/Networks/ElecDist/Policy/IDNOs/Pages/IDNOs.aspx

- Ofgem—The Regulator: www.ofgem.gov.uk

- National Grid Electricity Transmission (NGET)—The Great Britain 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: http://www.energysavingtrust.org.uk/Generate-your-own-energy

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 is generated by power stations fuelled by fossil fuels, for example coal, gas and oil. The burning of these fuels make 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 13.

What is Driving Distributed Generation?

Government policy

The Department of Energy and Climate Change (DECC) was set up in 2008 to oversee energy policy and climate change mitigation policy. The UK energy supply is one of DECC's key policy areas. DECC 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, DECC 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

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**.

Benefits of Distributed Generation

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 Renewable Obligations Certificates (ROCs). 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 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 NGET to provide **Ancillary Services**, for which they will be paid.

- **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.

Impacts of Distributed Generation

- There are a number of **power quality** limits that can be affected by Distributed Generation, including:
  - **Contributions to harmonics**, particularly if a significant number 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 benefits and challenges of Distributed Generation are complex, and the industry's understanding of them is evolving as experience increases. For more information on some issues surrounding increasing levels of Distributed Generation in the UK, the following documents are useful:

- Review of Distributed Generation; Department for Trade and Industry, Ofgem; May 2007
- Future Network Architectures; Department for Business, Enterprise and Regulatory Reform; 2007
- Solutions for the Connection and Operation of Distributed Generation; Distributed Generation Co-ordinating Group Technical Steering Committee report; DTI and Renewable Energy Programme; July 2003

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

- The UK Low Carbon Transition Plan—National strategy for climate and energy; Government; 2009
- The UK Renewable Energy Strategy; Government; 2009

For the most up to date information on relevant Government policy, refer to the DECC website: www.decc.gov.uk

For more information on commercial benefits available to Distributed Generation the following report, although out of date, gives a good overview:

- The Tradable Value of Distributed Generation; Department for Trade and Industry; 2005

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

- Embedded Generation and Embedded Benefits; Elexon; November 2013

For more information on Climate Change Levy Renewable and Good Quality CHP Exemptions, refer to HM Revenue & Customs website

For more information on the EU ETS scheme, the Environment Agency website is a good source.

C. An Overview of Getting Connected

In this section:

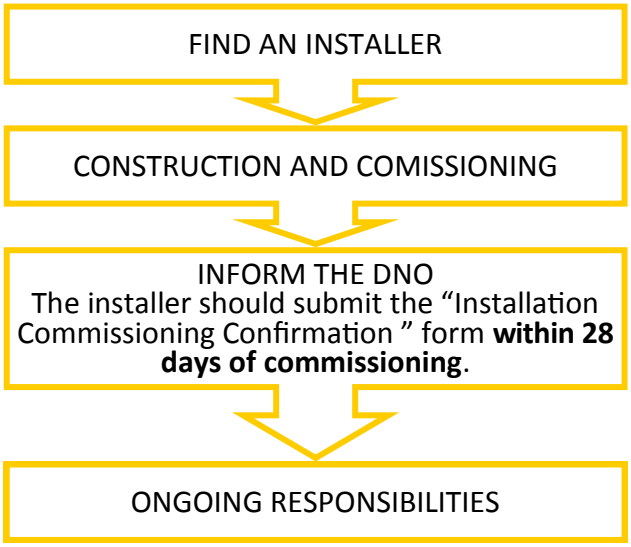
- An introduction to getting connected
- The main tasks in the process of connecting one or more units within a single customer's installation, and who can help you
- Guidance on where to find more information

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

Introduction

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

The diagram opposite presents the key actions that you have to complete to connect one or more units of small-scale generation in a single premises. These tasks are based on the requirements set out in EREC G83, and are described in more detail in this section.



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.

In rare cases, such as where there are many generating units in a small area, the DNO may feel it is necessary to for you to disconnect your generating unit in order to maintain the power quality on the network. This will be a temporary measure until the problem is resolved. As long as your equipment and its installation complies with G83, then the DNO will be responsible for resolving the problem at their own expense. The timescales for this will depend on the nature and complexity of work to be done.

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?"). 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 Energy and Climate Change (DECC). 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).

Construction and Commissioning

Your installer should be aware of the requirements to ensure that construction and commissioning is in line with EREC G83. These requirements are described in Section 7 of EREC G83, which states that the equipment must be installed within the manufacturers' instructions, and that no modifications should be made.

During the commissioning, your installer will check that your equipment is working as it should. EREC G83 specifies that the installation must act as required in the event of your mains power being interrupted.

Informing the DNO

Once your installation and commissioning 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 should notify the DNO **within 28 days** of commissioning the generating unit, and provide them with information on the installation. This information is captured on an "**installation commissioning confirmation**" form, which is given in Appendix 3 of EREC G83. This is available free of charge 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 your generation to the distribution network, you should be aware that once it is connected you have some responsibilities. This includes the responsibility to keep it maintained by someone who is competent to do so.

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, e.g. the DNO, supplier, etc. DNOs have their complaints process set out on their websites. 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.

Getting Connected — IDNO's Networks

The process for connecting your Distributed Generation to an IDNO's network follows EREC G83 or G59, 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. The most significant of these is that the IDNO has a relationship with their DNO. This relationship will not involve you directly, but may restrict what the IDNO can readily allow to connect to their network. This is not likely to affect a generation project that is compliant with G83.

To determine whether you are connected to a DNO or IDNO network, refer to the guidance on page 11.

Where to Find More Information

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

- **Engineering Recommendation G83**: Recommendations for the Connection of Type Tested Small-scale Embedded Generators (Up to 16 A per Phase) in Parallel with Low-Voltage Distribution Systems — a technical document, with references to other relevant sources of detailed technical information. Key appendices of G83 are available free of charge on the ENA's Website
- **Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002, Section 22**: Statutory Instrument Number 2665, available free of charge.

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

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 G83. 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: http://www.energynetworks.org/electricity/she/overview.html

D. The Connection Application: Connection Notification

In this section:

- What the installer of your generating unit needs to do to notify the DNO that your generation has been installed and commissioned in accordance with EREC G83
- Details of the information that you will need to provide to the DNO.

Introduction

Under the provisions of the Electricity Safety, Quality and Continuity regulations (ESQCR) you only need to inform the DNO that you have installed your generating unit. You do not need to contact the DNO in advance if the total capacity of all your generating units combined is 16 Amps or less per phase at low voltage.

This section of the Guide summarises the information which you will need to provide to your DNO and gives information about the forms that are used for providing the necessary technical details.

The Commissioning Pro-forma

You do not need to talk to your DNO before your generation equipment is up and running. Your installer needs to inform the DNO and provide a number of pieces of information **within 28 days of the date of commissioning**. This information is defined in a Commissioning Pro-forma, which is provided in Appendix 3 of EREC G83, available free of charge on the Energy Networks Association website.

Your installer should prepare all of the details requested in the Commissioning Pro-forma and submit all this with the form to confirm that your equipment has been commissioned.

The information required includes:

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

Other Requirements

The declaration that your installer signs on the Commissioning Pro-forma requires them to confirm that they've installed your generating unit in accordance with EREC G83. 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. You should check that your installer is aware of all these requirements.

E. Cost and 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 may be negative (i.e. credits). You can find out more about the Common Distribution Charging Methodology (CDCM) by looking at Distribution Charging on the Ofgem website, Structure of Charges 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 G83 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).

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, e.g. 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.

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

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

In this section:

- An introduction to the Feed-in Tariff Incentive
- Eligibility and Accreditation
- 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 lists the current tariff levels. It will also explain how to get accredited with FITs.

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 (See page 58 for generation tariffs).
- **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 shown in the tables on page 58. These are the most recent tariff levels at the time of printing, but the levels are reviewed periodically. The most recent FIT payment rates are publish by Ofgem, and you can access them on their webpage.

The tariff level that your generator 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 (tariff lifetimes are given in the table on page 58).

Tariff Structure

FITs for PV generation

The FITs for PV are structured in a slightly different way:

- They have an accelerated digression mechanism—PV generation tariffs will change every 3 months, subject to the rate of deployment; and

- The tariff period has reduced from 25 years to 20 years for all PV installations.

The installations are also 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 on page 58. Refer to the DECC 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 4.64p/kWh, but this is subject to regular reviews. Refer to the DECC 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.

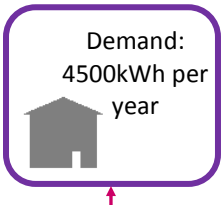
For your export payments, you may choose to measure your export to the grid via a meter (often called an export meter). However, the Government is allowing an interim measure of estimating export, subject to conditions. For example, the Energy Savings Trust website states that domestic FIT installations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

FIT Example

The **example** tariff levels are:
Import tariff: 10p/kWh,
Generation tariff: 21.65p/kWh

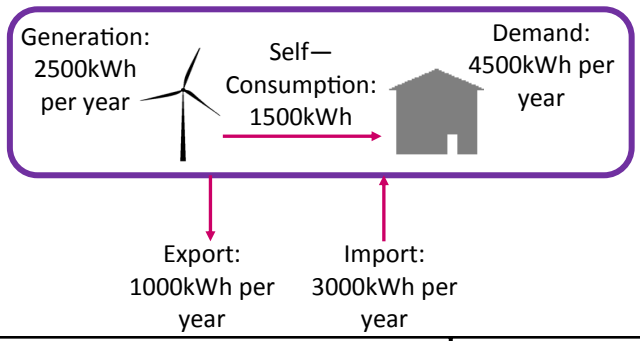
Before Installation



Import: 4500kWh per year

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

After Installation of Distributed Generation



Income per year:
Generation: 2500kWh x 21.65p/kWh = £541.25
Export: 1000kWh x 4.64p/kWh = £46.40
This is a **total income of £587.65**

Cost of Import per year:
3000kWh x 10p/kWh = £300
This is a **saving of £150** due to avoided import.

Total net benefit: £587.65 + £150 = **£737.65 per year**

Tariff Levels

Tariff level for Non-PV Generation

Technology and scale (Total Installed Capacity)	Generation tariff (p/kWh)	Tariff lifetime (Years)
Anaerobic digestion at 250 kW or less	15.16	20
Anaerobic digestion between 250 kW and 500 kW	14.02	20
Anaerobic digestion between 500 kW and 5 MW	9.24	20
Hydro genoration at 15 kW or less	21.65	20
Hydro generation between 15 kW and 100 kW	20.21	20
Hydro generation between 100 kW and 500 kW	15.98	20
Hydro generation between 500 kW and 2 MW	12.48	20
Hydro generation between 2 MW and 5 MW	3.23	20
Micro CHP at 2 kW or less (see note on page 60)	12.89	10
Wind generation at 1.5 kW or less	21.65	20
Wind generation between 1.5 kW and 15 kW	21.65	20
Wind generation between 15 kW and 100 kW	21.65	20
Wind generation between 100 kW and 500 kW	18.04	20
Wind generation between 500 kW and 1.5 MW	9.79	20
Wind generation between 1.5 MW and 5 MW	4.15	20
Existing micro generators transferred from RO	10.21	To 2027

Tariff level for PV Generation

Scale of PV installation (Total Installed Capacity)	PV Generation tariff (p/kWh) , valid from 1st October 2013 to 1st January 2014		
	Lower rate	Middle rate	Higher rate
4 kW or less, new build	6.85	13.41	14.90
4 kW or less, retrofit	6.85	13.41	14.90
Between 4 kW and 10 kW	6.85	12.15	13.50
Between 10 kW and 50 kW	6.85	11.31	12.57
Between 50 kW and 100 kW	6.85	9.99	11.10
Between 100 kW and 150 kW	6.85	9.99	11.10
Between 150 kW and 250 kW	6.85	9.56	10.62
Between 250 kW and 5 MW	6.85		
Stand alone system	6.85		

The use of the different rates depends on the criteria explained on page 57.

Where the Multi-Installation Tariff does not apply:

Energy Efficiency Requirements Met?	
Yes	Higher rate
No	Lower rate
Does not apply	Higher rate

Where the Multi-Installation Tariff does apply:

Energy Efficiency Requirements Met?	
Yes	Middle rate
No	Lower rate
Does not apply	Middle rate

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 generation that is wind, solar PV, or 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.

For anaerobic digestion and hydro generators, the following "ROO-FIT" process applies (see note on next page):

1. Install your generating unit;
2. Apply for accreditation through Ofgem's Renewable and CHP register (see Section F. Selling Electricity—Renewables Obligation Certificates—Accreditation);
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 45011 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

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:

http://www.ofgem.gov.uk/Sustainability/Environment/fits/Apply/Pages/Apply.aspx

Preliminary accreditation has been introduced for installations registering under the ROO-FIT process. This allows the tariff level to be fixed for a period of time, from the time of your preliminary accreditation application. For more information on the ROO-FIT process, refer to the Ofgem website (link above).

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.

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 of Energy and Climate Change (DECC) — Policy setting
www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/feedin_tariff/feedin_tariff.aspx

- 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

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: The National Electricity Transmission System Operator (NETSO) 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 NETSO 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 equipment is the maximum power that can be produced if the equipment is running normally at full power.

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.

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 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 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).

Generating Unit: Any apparatus which produces electricity. This is a synonym of a Generation Set as defined in the Distribution Code.
Generator: A person who generates electricity under licence or exemption under the Electricity Act 1989.

Glossary of Terms

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 Transmission (NGET): Owns the electricity transmission network in England and Wales, and operates the transmission system in England, Wales and Scotland (takes the role of the NETSO). 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 equipment.

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.

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

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 in accordance to ensure that it meets the requirements of EREC G83 or G59. Using type tested equipment simplifies the connection and commissioning process.

Glossary of Terms

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 NGET's website

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

Engineering Recommendation G83: Recommendations for the Connection of Type Tested Small-scale Embedded Generators (Up to 16 A per Phase) in Parallel with Low-Voltage Distribution Networks—a technical document, with references to other relevant sources of detailed technical information. Some appendices are available free of charge.

Engineering Recommendation G59, relating to the connection of generating units to the distribution systems of licensed Distribution Network Operators—available to buy on the Energy Networks Association website.

Engineering Recommendation G81 contains a number of principles related to Distributed Generation connections. It can be found free of charge on the ENA's website. It 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.

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 NGET's website.

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

Metering Codes of Practice

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:

Association of Meter Operators	www.meteroperators.org.uk
British Hydropower Association	www.british-hydro.org
Renewable UK	www.bwea.com
Carbon Trust	www.carbontrust.com
Combined Heat and Power Association	www.chpa.co.uk
Department for Energy and Climate Change	www.gov.uk/government/organisations/department-of-energy-climate-change
Distribution Connection and Use of System Agreement (DCUSA) website	www.dcusa.co.uk
Electricity Networks Strategy Group	www.decc.gov.uk/en/content/cms/meeting_energy/network/ensg/ensg.aspx
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
Lloyds Register	http://www.lloydsregister.co.uk/schemes/NERS/
Microgeneration Certification Scheme	www.microgenerationcertification.org
National Grid Electricity Transmission (NGET)	www.nationalgrid.com/uk/Electricity/
Ofgem	www.ofgem.gov.uk
Renewable Energy Association	www.r-e-a.net

References

Relevant reports and guides:

A Guide: Sale of Power Opportunities for Distributed Generators; DTI (Department for Trade and Industry); Electricity Networks Strategy Group website

Electricity Trading Arrangements: A Beginner's Guide; Elexon

Future Network Architectures; BERR (Department for Business, Enterprise and Regulatory Reform); 2007

Making ESCOs Work: Guidance and Advice on Setting Up and Delivering an ESCO; London Energy Partnership

Overview of Embedded Generation Benefits; Elexon; November 2006

Review of Distributed Generation; DTI (Department for Trade and Industry) and OFGEM; May 2007

The UK Low Carbon Transition Plan—National strategy for climate and energy; Government; 2009

The UK Renewable Energy Strategy; Government; 2009

The Tradable Value of Distributed Generation; DTI (Department for Trade and Industry); 2005

Revisions

Version Number	Date	Details of Changes
1	June 2010	A major revision of the Technical Guide for the Connection of Generation to the Distribution Network, DTI document reference K/EL/00318/REP (URN 03/1631). Key changes include division of Guide into three Guides for different Distributed Generation applications (G83 Stage 1, G83 Stage 2 and G59/2); revision of the style of the Guide to "plain English"; and inclusion of chapters on the role of Distributed Generation, Technical and Commercial Interfaces and Selling Electricity (FITs and ROCs).
2	October 2010	Minor edits to the Guides: • Addressing issues raised in HSE response to the consultation direction (8 July 2010); • Changes to timescales associated with a Section 16 connection applications arising from DNO advice; • Alteration to the text on Assessment and Design Fees and reference to the Statement of Methodology and Charges for Connection; and • Inclusion of a note about dealing with disputes.
3	November 2010	Minor edits to the Guides to reflect the changes in ownership of networks from EDF Energy to UK Power Networks.
3.1	April 2011	Edits to the Guides to reflect the issuance of a Guidance Note from the Distribution Code Review Panel on: • the application of G83/1-1 to small scale wind, and other small scale generation technologies that do not have a type testing annex in G83/1-1; and • a relaxation of G59/2 to small scale generating equipment greater than 16 Amps per phase and up to 50 kW 3-phase (17 kW single-phase) provided that certain conditions are met. Edits to clarify the applicability of G83/1-1 Stage 2 to multiple generating units within different customer sites and in a close geographic region.
3.2	June 2011	Minor edits to the Guides to reflect the changes in ownership of networks from E.On Central Networks to Western Power Distribution. Update of Feed-in Tariff and Renewables Obligation sections to reflect recent changes, e.g. tariff increases and scheme review details.

Revisions

Version Number	Date	Details of Changes
3.3	November 2011	Minor edits to the Guides to reflect rebranding of C E Electric to Northern Powergrid.
3.4	January 2013	Edits to the Guides to reflect updates to G83, with the publication of Engineering Recommendation G83, and outcomes from the Feed-in Tariff reviews (Phase 1, Phase 2A, Phase 2B).
4.0	March 2014	Considerable revisions and updates throughout the Guides, to reflect changes in the Distributed Generation landscape since the Guides were revised in 2010, as well as feedback received from stakeholders during a workshop. Both content and structural changes have been made, including the introduction of: • A Guide for G59 generation at 50kW or less; and • A "summary" version of each Guide, containing the minimum, essential information from each chapter.