

Distributed Generation Connection Guide



A GUIDE FOR CONNECTING GENERATION THAT FALLS UNDER
G59/2 TO THE DISTRIBUTION NETWORK



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**Operations Directorate
Energy Networks Association
6th Floor, Dean Bradley House
52 Horseferry Rd
London
SW1P 2AF**

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 G83/1-1, Engineering Recommendation G59/2, the Distribution Code, the Grid Code, the Connection and Use of System Code and the Balancing and Settlement Code.

Distributed Generation Connection Guide: An Introduction

Who is this Guide for?

This Guide is intended to help you, as a developer of any form of Distributed Generation, to connect your generating plant to one of the UK's electricity distribution networks. The types of generation that most frequently connect to the distribution networks include:

- renewable energy schemes;
- waste to energy schemes; and
- on-site generation and Combined Heat and Power (CHP) schemes.

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 scheme 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 two key financial incentives for Distributed Generation: Feed-in Tariffs (FITs) and Renewables Obligation Certificates (ROCs).

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 scheme up and running. These include:

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

These issues are outside the scope of this Guide.

The format of the Guide

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

- Terms which may be unfamiliar are defined or explained in boxes around the main text.
- Key points and summaries are highlighted.
- Text is **emphasized** for emphasis.

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- 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.

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.

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A. The UK Power Sector: Quick Overview

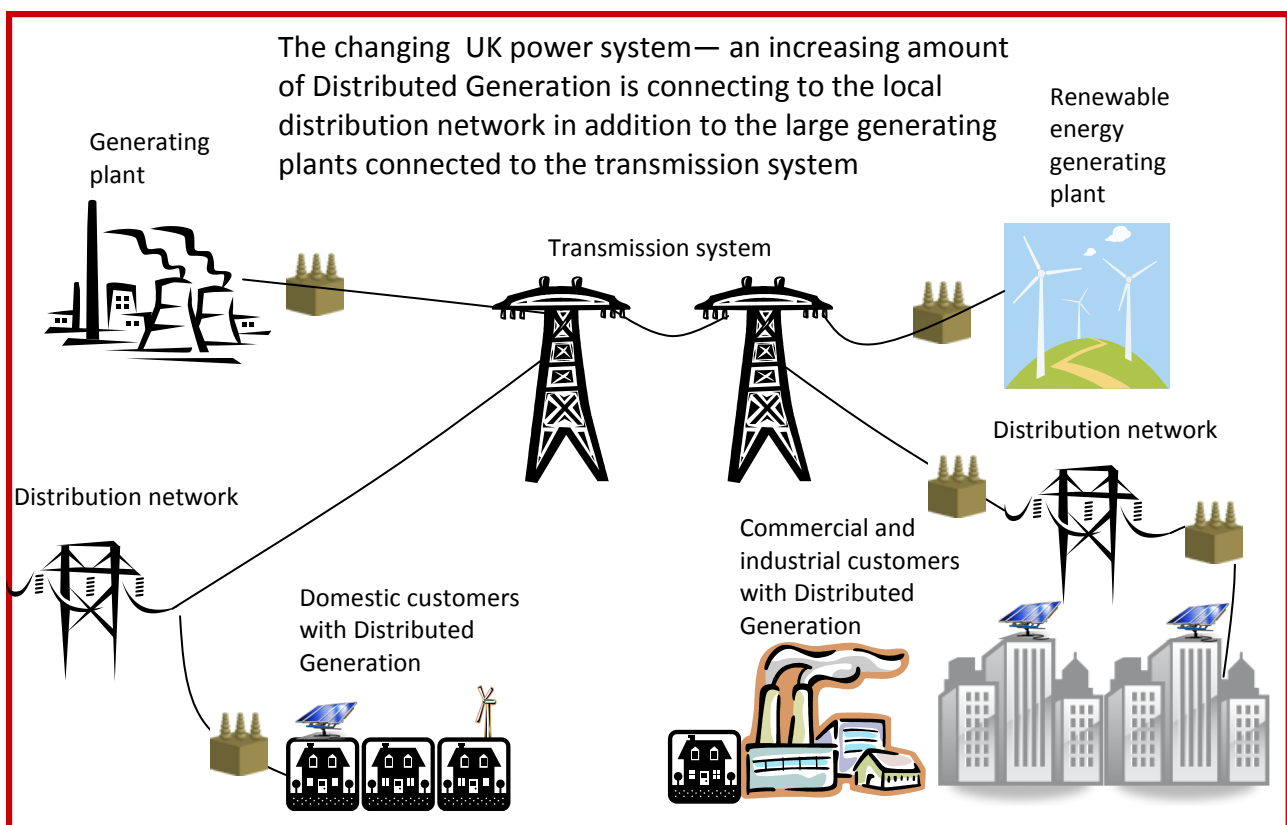
Distributed Generation (DG):

Your generation scheme is classed as Distributed Generation (DG) if it operates while electrically connected to the distribution network. The term “Embedded Generation” is sometimes used. You could consume the electricity you generate from your Distributed Generation scheme to reduce your consumption from the network. Alternatively you could export some or all of it to the Distribution Network Operator’s (DNO) network.

Distribution Network Operator (DNO): DNOs operate and maintain a public electricity distribution network. DNOs can form part of a group that undertakes other areas of business as well, e.g. electricity supply. However you will have to interface with the network operator business. You cannot choose which DNO you are connected to as it depends on where you are located geographically.

Electricity supplier: Electricity suppliers purchase electricity from Generators and sell electricity to commercial, industrial and domestic customers.

Regulator: Ofgem is the Office of Gas and Electricity Markets. Ofgem is responsible for regulating the electricity supply industry.



A. The UK Power Sector: A Guide

In this section:

- An introduction to the UK power sector
- A look at how the power sector is changing
- An overview of the commercial structure of the power sector
- A discussion on key parties and a definition of other parties that you may come across while developing your Distributed Generation scheme
- Guidance on where to find more information

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

Introduction

The power sector in the UK has been undergoing changes since the industry was privatised in the early '90s. This is due to the industry adapting to privatisation, changes in environmental awareness, technological developments and Government policy.

A key change is the movement from a relatively small number of large, centrally controlled power stations connected to the transmission system towards a greater number of generating plants connected to both the transmission and distribution systems. We illustrate the traditional and the changing power sector, and introduce the parties involved.

Apart from the physical structure of the power sector, there is also a commercial structure. The trading chain differs from the physical flow of electricity. Parties are introduced that do not necessarily own any assets but help to organise the buying and selling of electricity.

The roles of key parties are discussed, and other parties that you may come across as you develop your Distributed Generation scheme are defined.

The Changing Power Sector

Traditional power sector

The diagram below illustrates the traditional power sector. Large power stations running on coal, natural gas and nuclear power are connected directly to the transmission system. In general, the majority of the coal and gas fired power stations are located in the north of the UK, and the nuclear sites are located around the coast. However, electricity consumption is weighted towards the population centres of south-east England and the Midlands. Each region in the country is served by a distribution network, which is connected to the transmission system at one or more grid supply points. Power passes

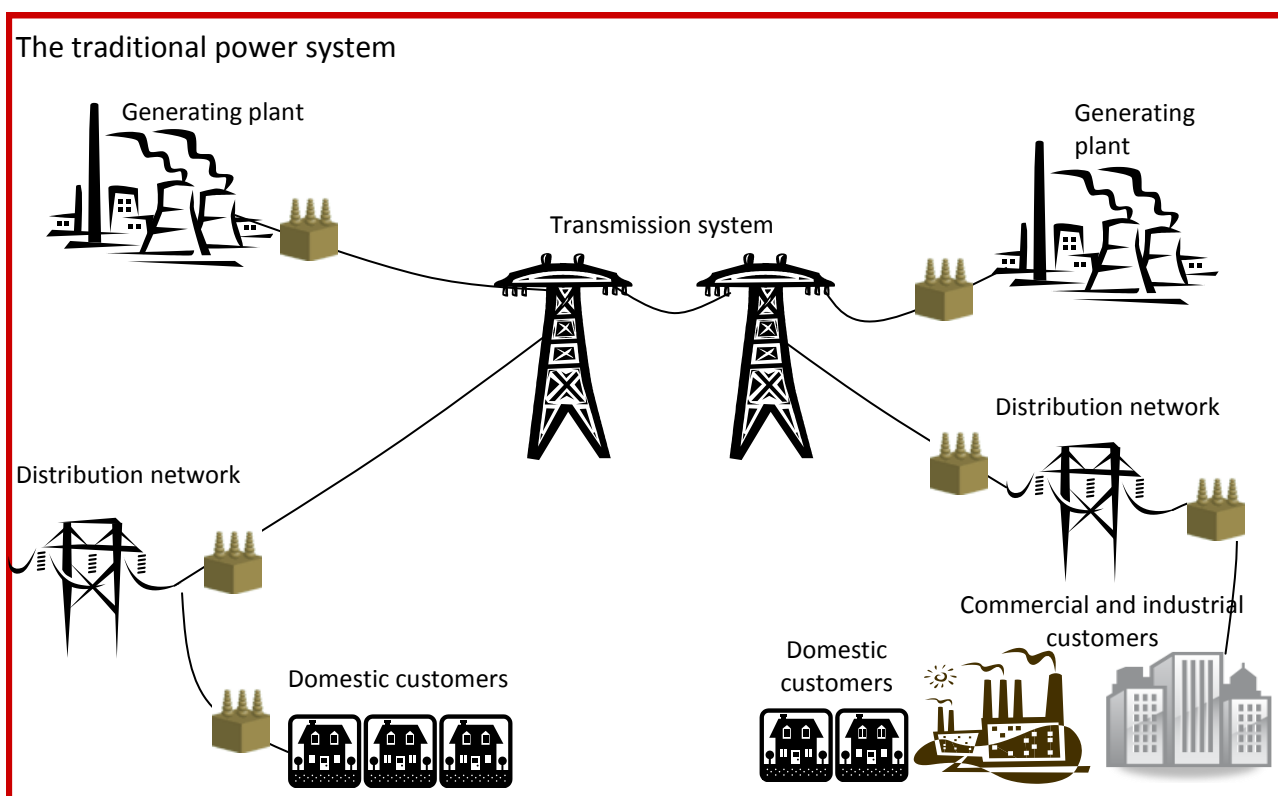
through the distribution network, from the grid supply point to the final users.

The physical components of the network are illustrated below, and they have associated parties or operators, and roles, as shown in the table.

Other roles and parties include:

- **System Operator:** The supply and demand on the physical system is balanced in real-time by the System Operator. National Grid Electricity Transmission (NGET) currently takes this role.

Components	Key Player	Role
Generating plant	Generators	Produce electricity
Transmission system	Transmission System Owners (TSOs)	Transport power from generating plants to distribution networks
Distribution network	Distribution Network Operators (DNOs)	Distribute power from the transmission system to customers



The Changing Power Sector

- **Balancing and Settlement Code Company:** The supply and demand balance of trading is managed by the Balancing and Settlement Code Company, Elexon.
- **Regulator:** As there are geographical monopolies associated with physical networks, there is a regulator to protect customers. The regulator is called Ofgem.
- **Suppliers:** Electricity suppliers purchase electricity from Generators and sell electricity to commercial, industrial and domestic customers.

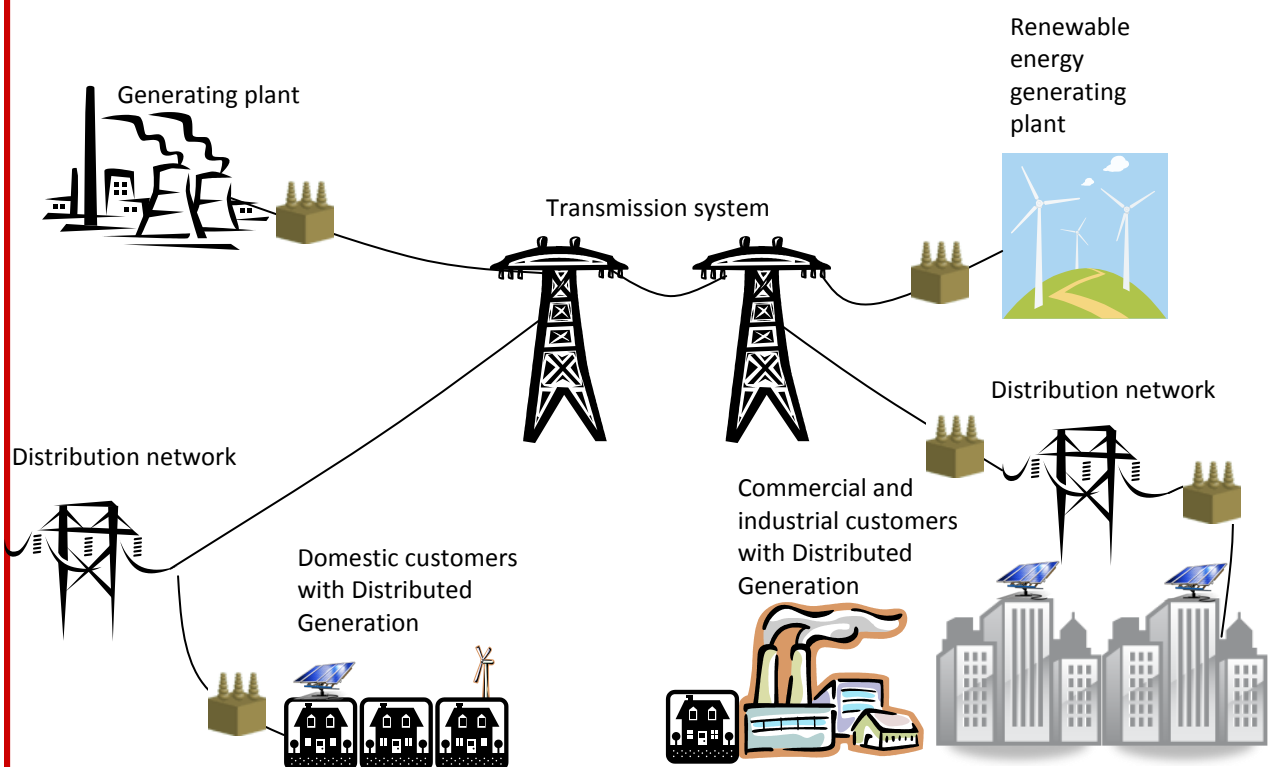
Changing power sector

In addition to the large generating plants connected to the transmission system, an increasing number of small electricity generating plants are connected throughout the distribution networks rather than to the transmission system. Generation connected to the distribution network is called Distributed Generation (DG). DG results in power flowing both from the distribution network to customers, and from customers with DG into the distribution network. The system is no longer a “waterfall” system, with power flowing from the large generating plants in one direction towards customers. Instead, it is more interactive.

We will now look at newer parties that have developed recently in the power sector.

Apart from the fourteen licensed distribution networks, which are owned and operated by the seven DNOs in Great Britain, there are new network assets being built and connected

The changing power system



The Changing Power Sector

to the existing distribution network. For example, these network extensions can be built to serve a new housing development. They can be owned and operated by Independent Distribution Network Operators (IDNOs).

As well as DG and IDNOs, another party that is relatively new to the power sector is the

Energy Service Company (ESCO). The definition of ESCO is quite broad; a company that provides customers with “energy solutions”. This could be a combination of providing soft solutions (e.g. advice) and providing assets (e.g. renewable generation).

We discuss these parties in more detail in the Key Organisations section.


Commercial Structure

The commercial structure of the industry

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.

There is a wholesale electricity market, in which suppliers buy electricity in bulk from competing electricity generators. The wholesale market is governed by British Electricity Trading Transmission Arrangements (BETTA), which was introduced in 2005.

The transmission and distribution systems are owned and operated by regulated monopoly businesses. The transmission system owners are as follows:

- National Grid Electricity Transmission (NGET) in England and Wales
-  Scottish Power in southern Scotland (SP Transmission Ltd)
- 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.

The Scottish transmission system owners are also DNOs in their respective regions. Seven DNOs operate the distribution networks in England and Wales. 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.

A description of trading

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.

If you install Distributed Generation you can use the electricity you produce on-site, thus lowering your electricity demand and bills. You can also sell electricity to customers, suppliers or, depending on the size of the generation, on the wholesale market. You will read more about power trade options in Section F. Selling Electricity.

Key Organisations

Distribution Network Operator (DNO)

A DNO is a company that:

- Owns, operates and maintains a public electricity distribution network
- Holds a Distribution Network Operator Licence

There are six DNOs in Great Britain. The regions where they operate are shown on the map below. DNOs can form part of a group that undertakes other areas of business as well, e.g. electricity supply. However, you will

have to interface with the network operator business.

Under the terms of their licence, each DNO is allowed to distribute electricity both inside and outside its legacy geographic area. 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.

Map of DNO regions in the UK



For DNO website details, please see Where to Find More Information at the end of this section.

What is Distributed Generation?

Your scheme is classed as Distributed Generation (DG) if it operates while electrically connected to the distribution network. The term “Embedded Generation” is sometimes used, but in this Guide we will use the term Distributed Generation. Your generating plant could be connected directly to the DNO’s network, or connected indirectly via a privately owned network. This is shown schematically on the next page.

You could consume the electricity you generate to reduce your consumption from the network. Alternatively you could export some or all of it to the DNO’s network.

Key Organisations

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, retail and residential areas and leisure facilities. IDNOs differ from DNOs in that:

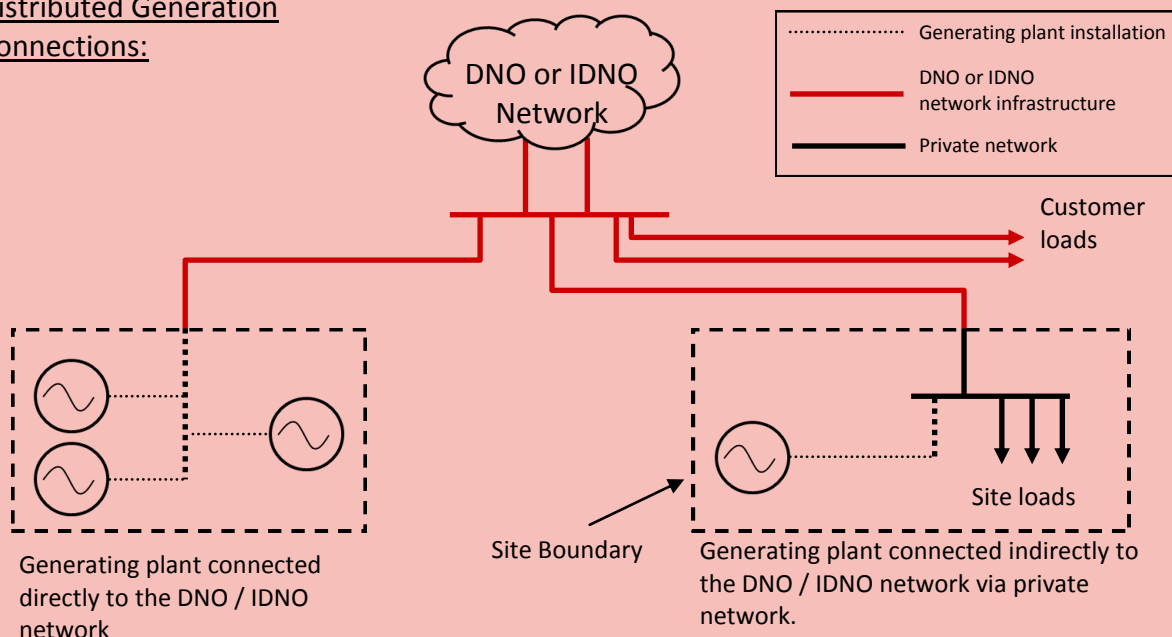
- they do not have service areas (e.g. they are not tied to a geographical location);
- although they are regulated like DNOs they have fewer licence conditions to meet.

IDNOs differ from private networks in that IDNOs, like DNOs, are licensed.

You may be connected to an IDNO's network instead of a DNO's network. Your local DNO will be able to inform you if this is the case.

Note: Throughout the Guide we refer to DNOs. However, where you are connected to an IDNO network, please read this as IDNO.

Distributed Generation Connections:



Private Networks: Your generating plant could be connected directly to a DNO's network, or connected via a privately owned network. For example, private networks can be owned by hospitals, airports, industrial sites, etc. This Guide is not intended to address connection to private networks. If you are connected to a private network, you should discuss your plans with the network owner as soon as possible.

Key Organisations

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 and operation and maintenance.

There are various models the ESCO can take. It can work on a performance contract, where it guarantees energy savings and makes 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 also develop into a household model, to provide energy efficiency savings and small scale generation for home owners, rather than just supplying electricity.

Suppliers

Supply is the retail of electricity. Suppliers buy in bulk, 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.

Other Organisations

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. For more on generating technologies, see the end of this section for links to more information.

Transmission System Owner

As mentioned, there are three transmission licence holders in Great Britain; National Grid Electricity Transmission, Scottish Power and Scottish and Southern Energy. They own and maintain the high voltage transmission system, known as the National Electricity Transmission System, referred to in this Guide as the transmission system. Transmission System Owners are responsible for making sure that transmission services are available to the System Operator.

System Operator

Electricity cannot be stored and so demand has to be balanced with generation on a second by second basis by the System Operator. National Grid Electricity Transmission (NGET) is the System Operator in Great Britain. To match generation with demand, the System Operator could ask generators to increase the output of their plant. Conversely, some large customers on certain contracts can be asked to reduce their demand.

Other Organisations

Balancing and Settlement Code company

Elexon is the company that manages the balancing and settlement of electricity trading.

Imbalance can arise from:

- Generators not providing all of the electricity that they have been contracted to provide; and
- Suppliers' contracted customers consuming more or less electricity than they have contracted for.

When this occurs, the System Operator faces additional costs because it may have to buy or sell electricity at short notice to keep the system in balance. The charges (prices) the participants face for being out of balance are based on these additional costs. The Balancing and Settlement Code (BSC) governs the operation of the balancing mechanism.

Regulator

Ofgem is the Office of Gas and Electricity Markets. Ofgem is responsible for:

- regulating prices and performance in the monopoly elements of the electricity supply industry; and
- resolving disputes between different parties when necessary.

Ofgem is also responsible for 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.

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); Electricity Networks Strategy Group website
www.ensg.gov.uk
- Guidance Note – The Electricity Trading Arrangements: A beginner’s guide; Elexon
www.elexon.co.uk

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

- Energy Networks Association —the industry body for UK energy transmission and distribution licence holders and operators. You can find DNO contact details on this website as they are members of the Energy Networks Association.
<http://2010.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 System 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 references:

- [Making ESCOs Work: Guidance and Advice on Setting Up and Delivering an ESCO](#); London Energy Partnership
www.lep.org.uk

The following websites give more information on generation technologies:

- Energy Saving Trust
<http://www.energysavingtrust.org.uk/Generate-your-own-energy>
- Carbon Trust
<http://www.carbontrust.co.uk/emerging-technologies/technology-directory/pages/default.aspx>

Where to Find More Information

Region	DNO	Website
North Scotland	SSE Power Distribution — Scottish Hydro Electric Power Distribution	www.ssepd.co.uk
South Scotland	SP Energy Networks	www.spenergynetworks.com
North East England	Northern Power Grid	www.northernpowergrid.com
North West	Electricity North West	www.enwl.co.uk
Yorkshire	Northern Power Grid	www.northernpowergrid.com
East Midlands	Western Power Distribution — East Midlands	www.westernpower.co.uk
West Midlands	Western Power Distribution — West Midlands	www.westernpower.co.uk
Eastern England	UK Power Networks — Eastern Power Networks	www.ukpowernetworks.co.uk/ products-services/networks/ index.shtml
South Wales	Western Power Distribution — South Wales	www.westernpower.co.uk
Southern England	SSE Power Distribution — Southern Electric Power Distribution	www.ssepd.co.uk
London	UK Power Networks—London Power Networks	www.ukpowernetworks.co.uk/ products-services/networks/ index.shtml
South East England	UK Power Networks — South Eastern Power Networks	www.ukpowernetworks.co.uk/ products-services/networks/ index.shtml
South West England	Western Power Distribution — South West	www.westernpower.co.uk
Cheshire, Merseyside and North Wales	SP Energy Networks — Cheshire, Merseyside and North Wales	www.spenergynetworks.com

B. The Role of Distributed Generation

In this section:

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

Introduction

From the 1950's until relatively recently, the design and operation of most electricity distribution networks in the UK has been based on a key assumption—that power always flows from higher voltage systems to lower voltage systems to the customer. The increased penetration of DG is changing this landscape.

There are three key drivers behind increasing levels of DG:

- Environmental issues;
- Technological innovation; and

- New Government Policy.

These are discussed, as well as some of the benefits and challenges of DG. The benefits and challenges are quite complex; they are evolving as DNOs' experience with DG increases. We refer to some useful documents and reports for further reading on this topic.

What is Driving Distributed Generation?

What is driving the change towards increased levels of Distributed Generation?

Traditionally, there were fewer, large generating plants, centrally controlled, which generated the majority of electricity in the UK. Now, this landscape is changing. Section A. The UK Power Sector introduced the idea of moving from the traditional power system towards a system where a greater number of generating plants are connected both to the

transmission and distribution systems.

There are three key factors driving this change. They are:

1. Environmental concerns
2. Technological innovation
3. New Government Policy

These factors are interrelated. We will look at them each briefly.

What is Driving Distributed Generation?

Environmental concerns

There has been increasing concern over greenhouse gas emissions, and the impact that they may be having. This is a global issue. Fossil fuel fired power stations, for example coal, gas and oil fired power stations, make a significant contribution to emissions.

These types of power station generate most of the electricity in the UK. As these are seen to be damaging to the environment, there is a drive to change the mix of generation technologies we have, to include more low-carbon options.

Technological innovation

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 biofuel 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 in [“Solutions for the Connection and Operation of Distributed Generation”](#).

New 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
- competitively priced;

with a diverse mix of energy sources.

Security of supply: As the UK increasingly relies on importing energy, the Government wants to make sure our resource supplies,

such as oil, gas and coal, are delivered by reliable suppliers. This also ties in with having a diverse mix of energy sources, which would make the UK less vulnerable to a restriction in one resource.

Low Carbon and Fuel diversity: Government has developed policy in response to environmental concerns regarding emissions reductions, and also to try to develop a more sustainable energy sector. Fossil fuels are limited resources; as such they will increase in price as they get more scarce, and are widely competed for. Reducing reliance on fossil fuel fired generation in favour of renewable energy sources, such as wind, solar and hydro, is a more sustainable path.

Competitively priced: these goals are all achievable, but at what cost? Government wants to ensure that policy achieves these aims but that energy prices are maintained at prices that are affordable.

Two relevant pieces of legislation have been introduced, which are:

- Climate Change Act 2008
- Energy Act 2008

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.

Benefits of Distributed Generation

There are a variety of commercial benefits to having Distributed Generation, on top of the financial revenue you could have from selling some or all of the electricity that you generate. These include:

- **Renewables Obligation Certificates (ROCs)** are an incentive for electricity generation from renewable energy. ROCs are discussed in Section F: Selling Electricity.
- Climate Change **Levy Exemption Certificates (LECs)** are an incentive for electricity generation from renewable and Good Quality Combined Heat and Power (CHP). The generator receives a LEC for each kWh of electricity generated and the LECs could be used to obtain Climate Change Levy (CCL) Exemption, and therefore avoid paying this CCL tax applied on energy supplied to industrial and business users.
- **Embedded benefits** are a number of avoided costs that result from the generating plant being connected to the distribution rather than the transmission network. These include charge avoidance of Transmission Network Use of System charges and Balancing Services Use of System charges.
- Generators whose plant 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 financially rewarded.
- **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.

As well as commercial benefits of DG, there can also be environmental benefits, such as:

- DG can be a **renewable** generating technology, e.g. wind, solar and tidal. This means the DG does not rely on fossil fuels, so it is sustainable in the long term and does not produce emissions.
- The introduction of local generation in businesses and communities can lead to **greater awareness of energy issues**.
- The use of CHP plants, where electricity is generated as a by-product of heat production, can result in **higher efficiencies** than generating electricity and heat independently.

DG can also benefit the Distribution Network Operator, for example:

- If the DG is connected close to the point of use, there is a **reduced need for the distribution and transmission infrastructure**. In some cases, DG can delay the need for reinforcement, although the DNO also needs to ensure that the network provides adequate security of supply for its users—the ability of DG to assist with this is more limited.
- 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.

Impacts of Distributed Generation

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

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

- DG changes the current flows and shape of the load cycle where they are connected. This could cause **thermal ratings to be exceeded**.
- DG can cause **system voltage to rise** beyond the acceptable limits.
- DG can contribute to **fault level**, which can raise the fault level above the rating of network equipment.
- DG could cause **reverse power flows**, e.g. power flows in the opposite direction to which the system has been designed. Reverse power flows can be limited by the design of equipment and can affect automatic voltage control systems.

- DG could **contribute to harmonics**, and raise them above the accepted limits, particularly if a significant number of DG with inverter controllers are present.
- If there are lots of single-phase generating units, they can cause **voltage unbalance** which affects power quality.
- If the output of the DG changes (e.g. from fully on to fully off) rapidly this could cause **voltage fluctuation or flicker**.

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 DG in the UK, the following documents are useful:

- [Future Network Architectures](#); BERR (Department for Business, Enterprise and Regulatory Reform); 2007
- [Review of Distributed Generation](#); DTI (Department for Trade and Industry) and Ofgem; May 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

There is a lot of development in Government policy that will impact DG. The following documents are useful references 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, please refer to the DECC website:

- www.decc.gov.uk

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

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

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

- [Overview of Embedded Generation Benefits](#); Elexon; November 2006

For more information on Climate Change Levy Renewable and Good Quality CHP Exemptions, the HM Revenue & Customs website is very useful:

http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageExcise_ShowContent&id=HMCE_CL_000290&propertyType=document

For more information on the EU ETS scheme, the DEFRA Web portal is a good entry point:

<http://www.environment-agency.gov.uk/business/topics/pollution/32232.aspx>

C. An Overview of Getting Connected: G59/2

In this section:

- An introduction to getting connected
- The main tasks in the process of getting connected
- What needs to happen after the plant has been commissioned
- Additional tasks if the generating plant is large
- Guidance on where to find more information

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

Introduction

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

This section of the Guide focuses on the information exchanges that take place between you, as the developer, and the DNO. It also presents the key actions that you have to complete to connect a generating plant. These tasks are based on the requirements set out in Engineering Recommendation (ER) G59/2, which is described in the box on the next page.

The key stages of the connection process are:

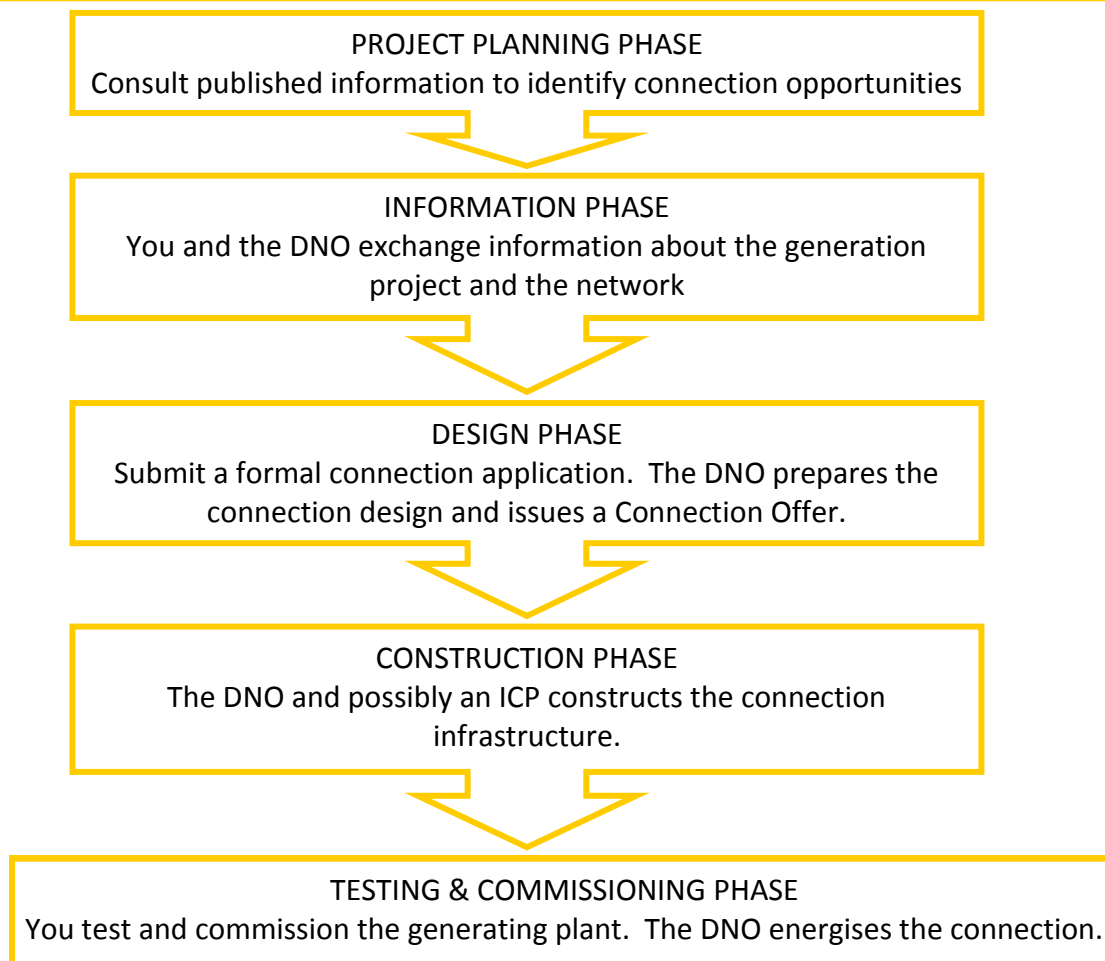
- A **Project Planning Phase**: you formulate your plans for the generation scheme, consulting published information to identify opportunities for connecting to the network.
- An **Information Phase**: you submit information about the proposed plant to the DNO, and the DNO discusses the

issues and costs involved.

- A **Design Phase**: you submit a formal connection application to the DNO. In response the DNO produces detailed connection designs and costings. Areas of Contestable work are identified.
- A **Construction Phase**: you enter into a contract with the DNO. Either the DNO, an Independent Connections Provider (ICP) or a combination of the two construct the connection infrastructure.
- A **Testing and Commissioning Phase**: you and the DNO complete the necessary agreements. You test and commission the generating plant—the DNO may wish to witness this. The DNO carries out necessary tests on the connection, and energises it.

We will discuss these phases in more detail. They are illustrated on the next page.

Introduction



What is Engineering Recommendation G59/2?

Engineering Recommendations (ER) are documents that set out standards and guidance on technical requirements. ER G59/2 is called “Recommendations for the Connection of Generating Plant to the Distribution Systems of Licensed Distribution Network Operators.” It sets out the requirements that you must meet before the local DNO will allow your generating plant to be connected to the network.

The purpose of the document is to provide guidance to you and to DNOs on all aspects of the connection process. G59/2 is available on the Energy Network Association’s website for a fee of £185.00.

What is Contestable work? And what is an Independent Connections Provider?

There are certain tasks that DNOs do themselves, so that they can maintain co-ordination and control of their networks. These are called Non-contestable work, as they are not open to competition. Conversely, when work is open to competition it is called Contestable work. Contestable work can be conducted by Independent Connections Providers (ICPs). For more on this, see the Section G. Technical and Commercial Interfaces: Competition in Connections.

Getting Connected — G59/2

Engineering Recommendation G83/1-1 (see note below) covers generating units that are rated up to and including 16 A per phase. To fall under G83/1-1, the generation equipment and installation must be approved in accordance with G83/1-1. **If a generating unit**

does not meet all of these criteria then it is covered by G59/2.

The process for connecting this plant is described here, and is based on G59/2. If you are not sure whether you are reading the right section, please see our quick check box below.

Quick check:

Your generating unit falls under G83/1-1 if:	<ul style="list-style-type: none">• It meets the size definition of SSEG• The generating unit has a type testing annex in G83/1-1 and is approved—i.e. it has been tested in accordance with the appropriate annex and has passed the tests — OR the generating unit does not have a type testing annex but is connected through an inverter that has been type tested in accordance with one of the annexes in G83/1-1 (this second approach is valid until 2nd March 2012)• The generating unit is installed in accordance with G83/1-1
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If you are installing:	Refer to:
A single generating unit that falls under G83/1-1	Getting connected: SSEG G83/1-1 Stage 1
Multiple generating units that fall under G83/1-1 within different customer sites and in a close geographic region	Getting connected: SSEG G83/1-1 Stage 2

What is Engineering Recommendation G83/1-1? And what is SSEG?

Engineering Recommendations (ER) are documents that set out standards and guidance on technical requirements. ER G83/1-1 is called “Recommendations for the Connection of Small-scale Embedded Generators (Up to 16 A per Phase) in Parallel with Public Low-Voltage Distribution Networks.” Some of the appendices of G83/1-1 are available for free—please see the end of this section for where to find more information. G83/1-1 is available on the Energy Network Association’s website for a fee of £90.00.

Small-Scale Embedded Generation (SSEG) is low voltage generation. SSEG is defined in G83/1-1 as “a source of electrical energy rated up to and including 16 A per phase, single or multiple phase, 230/400 V ac”. This corresponds to around 3.68 kW on a single-phase supply and 11.04 kW on a three-phase supply.

What is “approved equipment”?

An approved Small-Scale Embedded Generating unit is defined in G83/1-1 as “one that has been shown to meet the type verification tests in the appropriate annex of this Engineering Recommendation”. The annexes contain methodologies for testing certain types of SSEG against a set of test conditions to demonstrate compliance with G83/1-1. If the conditions are met, the equipment can be considered approved. The manufacturer produces a Type Test Certificate to demonstrate compliance. The equipment is then Type Verified or Certified.

Getting Connected — G59/2

Relaxation for small scale generating equipment

ER G59/2 allows for a simplified connection process for generating units that are larger than the threshold for G83/1-1, but which are still ≤ 50 kW 3-phase (or 17 kW single-phase). You still need to complete a common application form (discussed in Section D) and submit it to the DNO, and, importantly, **consent is required from the DNO** before you connect your generating unit(s).

This relaxation applies if:

- The generating unit is being connected through an inverter that has been type tested in accordance with G83/1-1; and
- The high frequency setting of the protection in the type tested inverter is set to 51.5 Hz with a time delay of no more than 0.5s.

All other requirements of G59/2 apply in full.

If the above conditions are met, the G83/1-1 connection approach of using type verified equipment can be used. This should simplify the connection process and commissioning requirements.

If the generating unit you are planning to connect is larger than the threshold for G83/1-1 but is ≤ 50 kW 3-phase (or 17 kW single-phase) and uses a type tested inverter, then you may wish to refer to the Distributed Generation Connection Guides for G83/1-1 generating units for information on this simplified process. There are two Guides for this: the G83/1-1 Stage 1 Guide describes the process for connecting a single generating unit, and G83/1-1 Stage 2 Guide describes the process for connecting multiple generating units that fall under G83/1-1 within different customer sites and in a close geographic region. Note, however, that unlike smaller units that fall under G83/1-1, which do not require consent prior to connection, if you are planning to install under the relaxed connection conditions then consent is required from the DNO prior to connection.

At the time of writing this relaxation is valid until 2nd March 2012. Any connection application made after this date will need to be discussed with the DNO.

Getting Connected — Main tasks

Project planning phase

In order to develop your plans, make use of publicly available documents about the DNO's network. These will enable you to assess the potential to connect your generation in the geographical area you're interested in. A good source of information is the DNO's Long Term Development Statement (LTDS).

Another source of information, for those whose projects may impact on the transmission system, is National Grid Electricity Transmission's seven year statement, available free of charge on their website. A key purpose of this document is to assist existing and potential users to assess opportunities to make use of the GB transmission system.

Getting Connected — Main Tasks

Extra information can be obtained by making early contact with the DNO to discuss the project. Discussions might include:

- How close your proposed generation site is to the existing distribution network
- Whether there are any other planned Distributed Generation projects in the same area
- Whether there is any information readily available on “spare” capacity in the network

At this stage, you could have feasibility studies carried out to assess possible connection lay-

outs and indicative costs. These studies can be conducted by the DNO or an external contractor, for a fee. If you do opt for feasibility studies, they should take into account the standard of security required in the connection between your generating plant and the DNO’s network.

Note: Many DNOs will provide an initial cost estimate free of charge.

The Distribution Code sets out technical requirements for connecting to the DNO’s network—it may be useful to consult it at this early stage. For more on the Distribution Code, see the box on the next page.

In summary, the key tasks in the project planning phase are to:

- **Look at publicly available network information** to identify opportunities and constraints
- **Make contact with the DNO** in an early stage to discuss your project and obtain additional information
- Decide whether you want to get **feasibility studies** done to assess possible connection layouts and indicative costs

What is a Long Term Development Statement (LTDS)?

DNOs prepare a Long Term Development Statement (LTDS) every year. The purpose of the LTDS is to make sure that network information is available in the public domain. The information should assist anyone considering opportunities (e.g. connecting generation to the distribution network) and help potential users to identify constraints in the network.

The LTDS contains information on the network, and covers areas such as:

- Development plans for the network
- Identifying parts of the network that are likely to reach certain limits within five years (e.g. thermal overloading)
- Any plans the DNO has to relieve these stressed areas

An introductory chapter is generally free of charge and available on the DNO’s website. It contains an overview of the LTDS that will allow you to understand the scope of information provided, and assess whether it will be useful to you. Prices for the detailed information of the LTDS vary; some DNOs do not charge at all; others typically charge between £25—£100. Links to the LTDSs are at the end of this section, under “Where to find more information”.

Note: The LTDS covers the primary system only, and as such does not contain detailed information on 11 kV networks.

Getting Connected — Main Tasks

Information phase

It is important that you :

- discuss your plans with the DNO at an early stage; and
- maintain close communication with them throughout the planning and construction of your generating plant.

This will help to make sure that the connection design develops in a way that fully reflects the operating characteristics of the plant.

Seek initial meetings with the DNO at an early stage in the development programme to:

- i. outline the proposed generation scheme to the DNO;
- ii. discuss the process that the DNO will wish to follow through the various stages of the connection development;
- iii. ask the DNO to prepare an indicative connection design and a cost estimate (after the DNO has undertaken any necessary studies); and
- iv. ask the DNO to clarify which work will be Contestable and which will be Non-contestable.

A key decision you have to take is whether to

- appoint an Independent Connections Provider (ICP) to do the Contestable work and the DNO to do the Non-contestable work; or
- appoint the DNO to carry out all of the work required to provide the connection.

This will affect the way the connection process proceeds.

If you do contract an ICP they will generally liaise with the DNO and arrange for the DNO to provide them with a quote for the Non-contestable work. This will enable the ICP to provide you with the total cost for the Contestable and Non-contestable work. This connection application process is often referred to as a SLC15 application. Please see the note below on Standard Licence Condition (or SLC) 15.

The Distribution Code

DNOs are obliged to maintain a Distribution Code under the terms of their licence conditions. The Distribution Code contains technical parameters and considerations relating to the connection to and use of distribution systems. Key areas that are covered by the Code include:

- General conditions
- Planning and connection
- Operation
- Data registration

There are also two guidance notes for information. The requirements in the Distribution Code are explained in more detail in G59/2, and will be enacted by the Connection Agreement.

For more information on the Distribution Code, refer to the Distribution Code website:

www.dcode.org.uk

Getting Connected — Main Tasks

The process for applying to the DNO for them to carry out all the work required to provide the connection is often referred to as a Section 16 application. Please see the note below on Section 16 of the Electricity Act. You can apply to the DNO for a quotation for all the works required to provide the connection at the same time as approaching an ICP. The process is outlined in the flowchart on page 29.

In summary, the key tasks in the information phase are to:

- **Discuss your plans** with the DNO at an early stage
- **Maintain close communication** with the DNO throughout the project
- **Seek initial meetings** with the DNO to discuss a number of points
- Consider whether you will use an **Independent Connections Provider (ICP)** to do the Contestable work

Standard Licence Condition 15

In order to maintain their licence to own, operate and maintain a distribution network, DNOs are required to comply with a set of licence conditions, called Standard Licence Conditions (SLC). SLC15 is called “Standards for the provision of Non-Contestable Connection Services”. It only applies when you are requesting Non-contestable services from the DNO (as opposed to both Contestable and Non-contestable services).

SLC15 sets standards in terms of timescales for the DNO to provide quotes, respond to design submissions and complete final works and phased energisations as Non-contestable connection services. Distribution Price Control Review 5 (DPCR5) proposes to revise and extend this Licence Condition to set out timescales for complete works, post acceptance scheduling and commence connections works.

The standards only become effective when the DNO has the required information and payment.

Section 16 of the Electricity Act

The Electricity Act (1989) is one of the primary pieces of legislation governing the power sector in the UK. Section 16 of the Act is called “Duty to supply on request” and sets out the DNO’s obligation to provide connections for electricity supply. This is the legislation that governs applications for generation connections where the DNO is requested to undertake both the Contestable and the Non-contestable work.

Getting Connected — Main Tasks

Design phase

Once you have planned the project and exchanged information about your plans with the DNO, it is time to submit a formal Connection Application to the DNO. A common application form is used by all DNOs. The process of submitting a connection application is covered in Section D. The Connection Application.

When you, or your ICP on your behalf, submit your application form you need to include technical details of the plant. The DNO needs this information to develop a detailed design for the connection, and any associated system reinforcement. The DNO will tell you what supporting information they need. Estimated data can be used, but this needs to be confirmed as soon as possible prior to commissioning the plant.

When considering the design options, there may be options that trade off the need for reinforcement (and hence reduce the capital costs) against increased operational restrictions. This is discussed more in Section G. Technical and Commercial Interfaces: Operational Issues.

Under the terms of the Distribution Licence the DNO must provide a quotation for connection within a certain number of days. For an SLC15 application, the timescales for the DNO to provide a quotation for Non-contestable work are:

- 30 working days for Low Voltage (LV) generation connections;
- 50 working days for High Voltage (HV) generation connections; and

- 3 months for Extra High Voltage (EHV) generation connections.

For definitions of LV, HV and EHV please see Section E. Costs and Charges: Ongoing Charges.

Timescales within which DNOs are required to provide quotations for Section 16 applications have recently been modified according to a DG Standards Direction. A set of DG performance standards has become effective from 1st October 2010. These state that the timescales for the DNO to provide a quotation for both Contestable and Non-Contestable work are:

- 45 working days for LV generation connections; and
- 65 working days for HV and EHV generation connections.

For a Section 16 application (e.g. the DNO undertakes both the Contestable and Non-contestable work) the DNO will prepare a quotation at your request. For a SLC15 application (e.g. the DNO undertakes the Non-contestable work and an ICP undertakes the Contestable work) the DNO will typically provide the ICP with a quotation for the Non-contestable work, and the ICP will provide with a quotation for the total work.

Current developments: A common application form has been developed by the Energy Networks Association. Please see Section D. The Connection Application for more information.

Getting Connected — Main Tasks

Preparing the detailed connection designs may or may not be a Contestable activity—this depends on the individual DNO’s policy and can be found in the DNO’s Connection Charging Methodology available on their website. If preparing the design is:

- **Non-contestable:** you will need to obtain the design from the DNO if you intend to use an ICP
- **Contestable:** the DNO will want to approve the design before construction starts

Typically design associated with extension to the network is Contestable, whereas design associated with reinforcing the existing network is Non-contestable.

You, or an ICP acting on your behalf, will receive a connection offer from the DNO. This contains the technical and commercial terms under which the DNO is prepared to carry out the Non-contestable work and, if applicable, the Contestable work. Review this carefully—you may wish to hire an independent consultant to help you. DNOs will be willing to discuss and agree the details of the offer before you reach a formal agreement. As a last resort if you cannot reach an agreement, the matter can be referred to the Energy Ombudsman, and ultimately to Ofgem. See below for a note on dealing with disputes.

If you are considering contracting an ICP to undertake the Contestable work, you may wish to invite quotations from a number of ICPs.

The connection process that you will typically follow is illustrated in the diagram on the next page.

Note: At this stage you should also think about metering equipment. It is your responsibility to provide meters, appoint a meter operator and register the metering system. There is more about metering in Section E. Costs and Charges: Ongoing Charges.

In summary, the key tasks in the design phase are to:

- **Submit a formal connection application** to the DNO with supporting technical information
- If the design is a Contestable activity, **decide who will do the design**
- **Decide if you want an ICP** to provide a quote for Contestable work
- **Receive and review quotes** from the DNO and possibly an ICP
- Enter into a **formal agreement** with the party (DNO or ICP) undertaking the work
- **Receive, review, discuss and agree on the Connection Offer** from the DNO

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, meter operator, NGET, etc. If you cannot resolve the issue with the party directly, you can contact the Energy Ombudsman:

www.energy-ombudsman.org.uk

If you are still unable to resolve the matter, as a last resort it can be referred to Ofgem, the regulator.

Getting Connected — Main Tasks



Key
 Action taken or question answered by:

- You
- The DNO
- An ICP

Getting Connected — Main Tasks

Construction phase

If you appoint an ICP to construct the Contestable work, clear communication lines should be established between you, the ICP and the DNO to:

- manage the interface between their work; and
- make sure that the work carried out meets the required standards.

The DNO will communicate with you about any reinforcements they need to carry out remotely from the site of your plant. This is to make sure that you both agree on a coordinated programme for completion of the reinforcements and the commissioning.

While the construction of the connection is ongoing, you need to focus on a number of other tasks. These tasks include the following:

- Complete the construction of the generating plant. Your installation should meet [IEE wiring regulations](#)—make sure you are using an approved contractor.
- Make sure that appropriate provisions for wayleaves are incorporated in any lease option required—see Section D. The Connection Application, for more information on wayleaves.
- Appoint a Meter Operator—more on this in the Section E. Costs and Charges.

- Finalise negotiations with a Supplier who will purchase your energy and provide top-up and standby supplies.

You need to enter into a number of agreements with the DNO before the generating plant can start operating. These can include:

- A **Connection Agreement**
- An **Adoption Agreement**
- An agreement covering the **arrangements for operating the interface** between the distribution network and your generating plant. This may be contained in a Schedule to the Connection Agreement, or in a separate agreement such as a **Site Responsibility Schedule**

In summary, the key tasks in the construction phase are to:

- **Communicate with the DNO** about reinforcements they may be making to the distribution network
- **Focus on other activities** such as completing construction of the plant and appointing a Meter Operator
- **Enter into agreements** with the DNO before the plant starts operating

Adoption Agreements

If an Independent Connections Provider (ICP) has constructed some of the connection infrastructure, an Adoption Agreement is required to define the terms under which the DNO will take these connection assets into their control and ownership. This is normally sent out with the formal connection offer in the design phase. The agreement includes details of the responsibilities of all three parties (you, the DNO and the ICP) concerning the construction of Contestable work.

Getting Connected — Main Tasks

Testing and commissioning phase

The steps described so far indicate the key actions required to get to the point where there is a physical connection between the generating plant and the DNO network. The connection, if built by an ICP, needs to be tested and commissioned by the DNO to confirm its integrity and safety. It can then be energised.

For generating plant covered by G59/2, it is your obligation to undertake full commissioning tests which the DNO may choose to witness. This is because certain protection device settings need to be set on site. According to G59/2 you need to provide the DNO with detailed information about testing and commissioning **at least 15 working days** before the proposed commissioning date. This will give the DNO time to make decisions about witnessing commissioning and inspecting the installation. Commissioning test requirements are discussed in G59/2.

Careful liaison with the DNO will be required during the process of commissioning the connection. This will relate to the programme for commissioning the rest of the generating plant. In particular the DNO will want assurance on the state of readiness of your plant on your side of the connection.

You may want to make sure supplies to your auxiliary plant are available via the connection. In this case, you will require that the connection is ready *before* the generating plant is commissioned. All of these issues require detailed coordination between you and the DNO in the final testing and commissioning stages.

After you have signed the Connection Agreement you need to submit the final, confirmed parameters of the plant to the DNO. This is called “Registered Data” in the Distribution Code, which is the document that sets out this requirement. Note that if this data is different to the data that was used to design the connection, the DNO will want to review the connection design. This may have an impact on your connection.

If you have made arrangements with a supplier to buy electricity that you export, it is your responsibility to keep them informed of the proposed commissioning programme. In particular they should know the date you expect imports and exports across the connection to start. The supplier can advise you on making contact with the relevant electricity market authorities (e.g. Elexon). Apart from Renewables Obligation Certificates and Feed-in Tariffs, trading electricity is beyond the scope of this Guide. However, we

Connection Agreements

The Connection Agreement covers the conditions under which your generating plant is allowed to:

- i. be physically connected to the DNO network; and
- ii. remain connected and energised while the network is operating normally.

For example, they set out technical and safety requirements. These agreements are likely to be standard documents with scheme-specific annexes. They will probably be prepared by the DNO for you to discuss, agree and sign.

Getting Connected — Main Tasks

have referenced some useful documents on this topic at the end of this section.

Commercial arrangements need to be in place for the purchasing and sale of energy during the commissioning process. These arrangements include making sure the correct metering is installed and working before you start importing and exporting energy at the site.

In summary, the key tasks in the testing and commissioning phase are to:

- **Provide the DNO with detailed information** about testing and commissioning at least 15 working days before the proposed commissioning date
- Make sure you have **careful liaison and detailed co-ordination with the DNO** leading up to and during commissioning
- **Negotiate and sign Agreements** that are required
- **Submit Registered Data** to the DNO
- Put **commercial arrangements** in place and **keep the Supplier informed** on the commissioning progress

Getting Connected — After Commissioning

After commissioning

G59/2 sets out a number of requirements on you following the commissioning of your generating plant. These include the following tasks:

- Send a completed commissioning form to the DNO **within 30 days** of completing the commission tests.
- Make a written record of protection settings and test results. Send this to the DNO, and keep a copy available for any inspections.
- Test the interface protection and generating plant. The frequency of these tests should be agreed in discussions with the DNO.

Distribution Price Control Review: Ofgem administers a price control regime which allows DNOs to earn a fair rate of return while limiting costs passed on to customers. Price control periods are generally five years. Distribution Price Control Review 5 (DPCR5) is expected to run from April 2010 to 2015. For more information see the [Price Control section](#) of the Ofgem website.

Ongoing responsibilities: Although the focus of this Guide is to inform you about the process of connecting your generation to the distribution network, once it's connected you have a responsibility to keep it maintained by someone who is competent to do so. You also need to comply with Health and Safety requirements. Appendix 13.8 in ER G59/2 is called "Main Statutory Obligations" and summarises the main obligations on generators.

Getting Connected — Large Plants

The Distribution Code defines three categories of generating plant size; small, medium and large. The definitions of these categories of plant are given in the table on the next page. To connect a large generating plant the connection process is the same as the one described so far. However, there are more complexities with a plant of this size due to involvement with the electricity market and the increased likelihood that the plant will impact on the distribution and transmission systems. This means you are likely to be involved with a number of other processes.

The main issues you will be involved with in addition to your relationship with the DNO include:

- **Generation licence:** currently all generation with an export capacity of greater than 100 MW require a generation licence. Plants between 50 MW and 100 MW may be given an exemption. For more information on Generation Licences, please see Section D: The Connection Application.
- **Balancing and Settlement Code (BSC) participation:** If you have a generation licence you are required to become a party to the BSC. Otherwise, whether you participate in the BSC depends on how you want to trade electricity. You need to consider this carefully.
- **Connection and Use of System Code (CUSC):** If you have a generation licence you will need to become a party to the CUSC. Non-licensed generators can

choose to sign the CUSC to benefit from certain trading arrangements. You can see which sections, if any, of the CUSC apply to you in Section 1 of the CUSC, "[Applicability of Sections and related Agreements Structure](#)".


- **Compliance with the Grid Code:** Medium power stations have to comply with sections of the Grid Code. The Distribution Code describes which sections apply. Large power stations are bound by all of the Grid Code. For definitions of Medium and Large generating plants see the table on the next page.
- **Agreements with National Grid Electricity Transmission (NGET):** For Large generators with a licence or Large generators who are exempt from having a generation licence there are various agreements you have to enter into with NGET. Generators who are developing Small and Medium generating units may choose to enter into these agreements to benefit from trading opportunities. These agreements are discussed in more detail in the Section D. The Connection Application: Generation Licensing.

For more information on all of these issues, please see Section D. The Connection Application and websites of the following organisations:

- [Elexon](#)
- [National Grid](#)
- [The Office of Public Sector Information](#)

Getting Connected — Large Plants

Small, Medium and Large power stations as described in the Distribution Code:



	Registered Capacity		
	Small	Medium	Large
National Grid Electricity Transmission (England and Wales)	< 50 MW	50 — <100 MW	≥ 100 MW
Scottish Power Transmission Ltd (southern Scotland)	< 30 MW		≥ 30 MW
Scottish Hydro-Electric Transmission Ltd (northern Scotland)	< 10 MW		≥ 10 MW

Health and Safety considerations: Safety is very important in the design of generation connections, and there are a number of sources of information and help available to assist with safety engineering. The safety requirements for DG connections are set out in ER G59/2. This document references the Regulations and Acts that informs these requirements, such as 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 DG connections on the following websites:

- The Electrical Safety Council (ESC)
www.esc.org.uk
- The Energy Networks Association—Safety, health and environment and Safe and Well:
<http://energynetworks.squarespace.com/she/>
<http://energynetworks.squarespace.com/safe-and-well/>

Where to Find More Information

You are required to comply with a number of technical codes and standards within the electricity industry. Before and during your discussions with the DNO you should make sure that you are familiar with the contents of the following key documents, **to the extent that they apply to your specific generating scheme:**

- the [Grid Code](#) of Great Britain — available free of charge on NGET's website
- the [Distribution Code](#) of Great Britain—available free of charge on the Distribution Code website

Where to Find More Information

- [Engineering Recommendation G59/2](#), relating to the connection of generating plant to the distribution systems of licensed Distribution Network Operators—available to buy on the Energy Networks Association website

In addition to these documents, [Engineering Recommendation G81](#) contains a number of principles related to DG connections. 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.

Other useful documents and links

- Independent Connections Providers (ICPs): see the [Lloyds Register](#) website information on the National Electricity Registration Scheme (NERS)
- [National Grid Electricity Transmission Seven Year Statement](#)
- [Metering Codes of Practice](#)
- Elexon publish [Simple Guides to the BSC](#) which may be of interest, and [Electricity Trading Arrangements: A Beginner’s Guide](#) for more information on trading electricity.
- The [Connection and Use of System Code \(CUSC\)](#) is available free of charge on NGET’s website
- NGET also has information on their website about [Connections and Agreements](#)
- The [Balancing and Settlement Code \(BSC\)](#) is available free of charge on Elexon’s website
- The [IEE Wiring Regulations](#) (British Standard 7671) are available to buy on the IET website

Long Term Development Statements (LTDS)

DNO	Link to LTDS
Electricity North West	http://www.enwl.co.uk/about-us/long-term-development-statement
Northern Power Grid	http://www.northernpowergrid.com/downloads/financialinfo/longtermdev.cfm
SP Energy Networks	http://www.scottishpower.com/OtherDocuments.htm
SSE	http://www.ssepd.co.uk/LTDSs/
UK Power Networks	http://www.ukpowernetworks.co.uk/products-services/networks/knowledge-centre/long-term-development-statement.shtml
Western Power Distribution	http://www.westernpower.co.uk/About-our-Network/Long-Term-Development.aspx

D. The Connection Application: Connection Application Process—G59/2

In this section:

- Details of the key stages in the process of making a connection application and receiving a response from the DNO
- Details of the information that you will need to provide to the DNO and the studies that they will need to carry out to assess your application
- Information about what a Connection Offer typically contains

Introduction

This section of the Guide describes how to make a connection application to a DNO. It focuses on some specific actions that you will need to take as part of the overall process of “Getting Connected”, which is described in Section C of the Guide. Details of the connection application itself are provided, with reference to the Common Application Form which has been developed by the Energy Networks Association on behalf of the DNOs.

The timescales involved in making a connection application are described, as well as the obligations of the DNO to respond to your application. Issues associated with the costs of connections are also discussed.

This section of the Guide is mainly intended for developers of generating plants which are covered by Engineering Recommendation G59/2.

The connections procedure, as well as the assessment of the likely impact of your scheme on the distribution network as a whole, is more complex for generation of this size, and requires careful study by the DNO. This section therefore includes details of the sort of technical studies which DNOs need to carry out, and the likely requirements they will have for data from you about the proposed generation scheme.

Key stages in making your Connection Application

1. Contact your DNO and arrange a preliminary meeting to discuss your generation scheme
2. Submit a request for details of the circuit capacity, flows and loads in the vicinity of your site (This stage is optional)
3. Review this information and consider the size and configuration of your scheme accordingly
4. Submit a formal connection application, using the Common Application Form
5. Receive a connection offer and review, with external advice/assistance if necessary
6. Negotiate final connection terms with the DNO, and start negotiating a Connection Agreement

Initial Discussions with the DNO

To make applying for a connection as straightforward as possible, you are advised to contact your DNO at an early stage in the connection process. You should explain to them in as much detail as you can the plans that you have in mind, so that they can give you an early indication of the likely technical challenges and/or significant cost items which may be required to make your connection possible. If you think you will have import requirements, these should be discussed with the DNO as well as your export capacity requirements.

It is likely that the DNO will invite you for an initial discussion, which is usually free of charge. This is the chance for both parties to share information which will be helpful in putting the connection application together. Before you have this discussion, though, it's helpful if you have done some background work to investigate the network in the region of your power plant, and to be able to provide technical information about your generating plant.

Information about the Network

At an early stage in the planning of your generation project you may wish to obtain details from the DNO of the distribution network in the vicinity of your proposed plant. General information about the long term development plans for the distribution network is available in the Long Term Development Statement which is produced by each DNO in accordance with the conditions of its Licence, and which is available from the DNO.

To obtain more specific information, however, you can make a request to the DNO for an estimate of the present and future circuit capacity, forecast power flows and loadings on the relevant parts of the distribution network. A new licence requirement arising from Distribution Price Control Review 5 (DPCR5) requires DNOs to adopt a strategy for information provision to support you during the connection decision process.

The information that the DNO will provide should be sufficient to enable you to identify and evaluate the opportunities for connecting to and using the relevant parts of the DNO's network. It may also, if you so request, include a commentary on the DNO's views

regarding the suitability of the relevant part of the distribution network to accommodate new connections and the export of power from the proposed generating plant.

You may also wish to request the DNO or a third party (e.g. an engineering consultant) to carry out feasibility studies to identify budgetary connection costs for your proposed scheme. The reliability of these estimates will be significantly influenced by the quality of the information that you can provide at this time to enable a reasonable assessment of the likely connection configuration and capacity to be carried out. You should expect to be invoiced for the costs of these studies, which are likely to increase if multiple options for the generation scheme are to be considered.

Requesting information: This stage is not compulsory—you can proceed with your application form without carrying out this background work. It is up to each developer to decide whether requesting this sort of information is going to be helpful to the overall development of their connection, or whether simply to proceed with the formal application.

The Common Connection Application Form

The Energy Networks Association has developed a Common Connection Application Form on behalf of DNOs. The application form is split into two parts, as explained opposite.

Part 1 of the application form requests some initial data that the DNO requires to assess your application. In some cases this information may be sufficient for them to complete the connection design and make a connection offer. In this case there will be no need for you to provide additional information. However, for some generating plant connection applications, depending on the size of the generating plant and the proposed point of connection, this initial information may not be sufficient and you will need to complete Part 2 of the application

form. If you do not complete this initially, the DNO may ask you to do it later.

You can find the application form on the [Energy Networks Association \(ENA\) website](http://Energy Networks Association (ENA) website) and DNOs' websites. When completed this should be sent to your DNO. Your DNO's contact details can be found at: 2010.energynetworks.org/members-and-associates/

Part 1

Section 1a is for:

- information about the **Owner/Operator** of the power plant and their consultant's details if applicable;
- details about the power plant itself, including its location and basic information about export and import arrangements; and
- more specific aspects of the generating plant, including its export and import capacities and potential fault level contribution.

Section 1b requests some information specific to the generation sets that you are planning to use.

Part 2

This part of the form requests more detailed information that is specific to the generation technology that you are planning to use. The information required here is quite detailed, and you may require assistance from the proposed suppliers of your generation equipment to fill in all of the details. This section also requests details of the transformers that you will be using at the generation site.

Estimated data: If actual data is not available at the time of completing an application form, you may provide a reasonable estimate of the actual data. You should indicate if data is estimated. Where estimated data is submitted to the DNO, and the final data is significantly different from the estimated data, this may affect the validity of the Connection Offer. It is therefore important that the information you provide is as complete and accurate as possible.

Network Studies

Once you have filled in and submitted the Connection Application Form, the DNO will carry out a range of studies to explore the impact of your generating plant on the network and to design your connection. The sorts of studies the DNO will perform typically include:

- **load flow studies**, to work out where the power from your generating plant will flow on the distribution network and to check that currents and voltages will stay within equipment ratings and statutory operating limits;
- **contingency analysis**, to decide how to configure your connection so that you can continue to generate if there is a failure on one network component (e.g. a fault on a cable circuit);
- **fault level studies**, to calculate how much current would flow out of your generating plant in short circuit conditions and to make sure that the system could safely interrupt the higher fault currents on the system once your plant is operational;
- in some circumstances, **transient stability studies** may be necessary to determine whether there are going to be specific protection requirements associated with your plant;

- studies of disturbances such as **harmonics** and **voltage flicker** - correcting problems such as this could involve the connection of additional equipment and possibly increase connection costs.

The number and complexity of studies that have to be undertaken will vary depending on a number of factors, including:

- the size of your generating plant;
- the level of security you want for your connection;
- how complicated the network is around your plant;
- the existing use of the network around your plant.

Data Requirements

The Common Application Form contains a comprehensive list of data requirements to assist the DNO with carrying out system studies as part of the connection design process. You should do your best to provide as much of this information as possible. If you have difficulty obtaining any of it, or are not

sure what a particular data item refers to, you can discuss this with your DNO, who will try to help, or you can engage an adviser such as an engineering consultant to assist you. The supplier of the generating plant may also be able to help.

Data Requirements

The data requirements in the application form are based on the requirements of the Distribution Data Registration Code, which is part of the Distribution Code. This splits the data requirements from DG into three categories: Standard Planning Data, Detailed Planning Data and Operational Data. In general, Standard Planning Data is requested using the Application Form and you will be advised by the DNO if there is a need to provide further, more detailed data.

An important point about providing data to your DNO: Your DNO will need to have a complete set of technical data about your generating units and your proposed connection arrangements before they can carry out the studies necessary to give you a connection quotation. Also, the clock only starts ticking on the period within which the DNO is obliged by its Licence to give you a connection offer **once the information to be supplied by you is complete**. So give your DNO as much accurate information as possible, as soon as you can!

The Connection Application Timeline

The timeline shown on the next page is an **indicative** guide as to how long it might take you to have a connection offer agreed with your DNO. The box at the bottom of the page summarises the licence obligations of the DNO to give you a connection offer within a particular time, *once you have provided all the necessary data supporting your application*. There are two parts to the information required in the Common Application Form, and both could be required before the DNO is considered to have started processing your application.

The licence timescales shown below are the only formal obligation; the other times shown could vary depending on, for example:

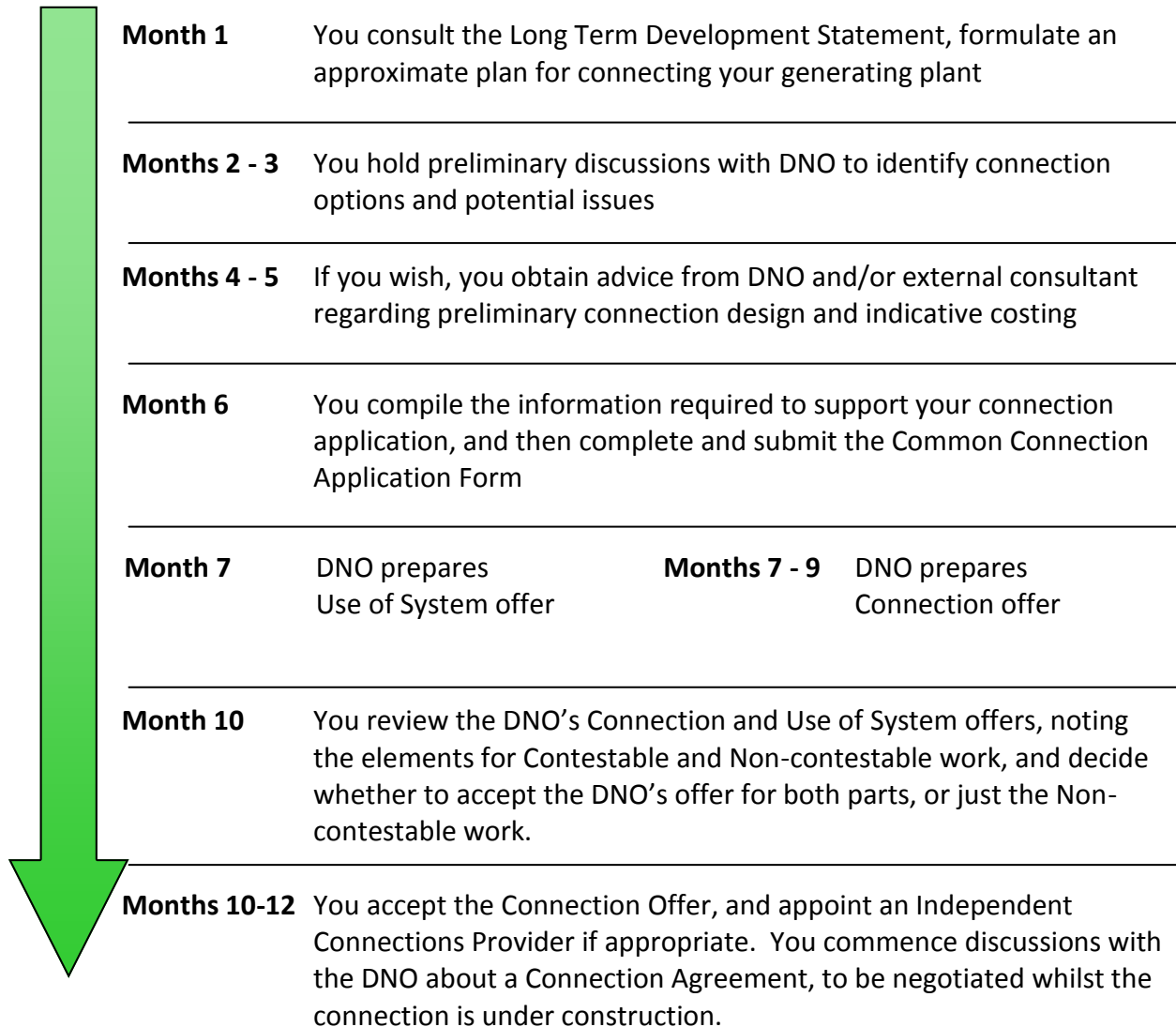
- how quickly you are able to do the background work before opening discussions with your DNO;
- how complex your connection is; and
- any technical or planning issues that the DNO identifies affecting the local network near your site, or further afield.

How quickly must the DNO give me a connection offer?

The Standard Conditions of the Electricity Distribution Licence require DNOs to offer terms for connection and use of system “as soon as is reasonably practicable” after receiving a request. If you have only asked for Use of System, the DNO must provide an offer within 28 days. If you have requested both Connection and Use of System, the DNO must give you an offer within three months. These times only apply once the DNO has all the information from you that it can reasonably ask for.

For more information about the information needed by DNOs at different stages in the connection process, see the Distribution Data Registration Code in the Distribution Code. This is available from www.dcode.org.uk

The Connection Application Timeline



Notes on the timeline:

Some of the stages shown in the timeline are optional, for example, consulting the Long Term Development Statement and obtaining advice regarding preliminary connection designs. If you do not undertake these activities, but are happy to lodge a formal connection application after an initial discussion with your DNO, the time to complete this process will be reduced.

It is also possible to combine some of the stages of activity, so that for example you begin compiling the information to support your connection application whilst in the early stages of discussions with the DNO. This would reduce the elapsed time in the connection process from what is shown above.

If your generation scheme might have an impact on the transmission network, the above timescale could be significantly extended, due to the need to obtain a Statement of Works from NGET regarding any required transmission system modifications. You should discuss the likelihood of a Statement of Works being required with your DNO at an early stage.

The Connection Offer

The Connection Offer that you will receive from your DNO should contain a number of key pieces of information. These include:

- details of the equipment and works needed to connect your generating plant to the distribution network;
- information about any works needed to extend or reinforce the DNO's network as a result of connecting your generating plant to the system;
- information about the metering which the DNO may want to install at your site to measure energy exports for operational purposes;
- any special metering, communications or data processing equipment that may be needed at your site to ensure that you and the DNO can comply with any requirements under the Balancing and

Settlement Code (which you'll need to comply with if you have a Generation Licence. See Section D. The Connection Application: Generation Licensing for more information)

The offer will contain the technical and commercial terms which will apply for the DNO to construct the connection and provide Use of System services to the developer. The offer will differentiate between Contestable work and Non-contestable work, if you requested this information.

The offer will also contain details of the costs which will apply if the DNO undertakes the Non-contestable and Contestable work. Further information about the way these costs are worked out is given in Section E. Costs and Charges.

Wayleaves for New Connections

Obtaining Wayleaves, or the right of way for new lines and cables to connect your generating plant to the distribution network, can be time consuming. Wayleaves are generally obtained by the DNO, although they could in some situations be obtained by an ICP.

To understand the wayleave requirements for your connection you should:

- discuss at an early stage with your DNO whether there is a possibility that obtaining the necessary wayleaves could prove contentious
- consider asking the DNO to investigate this in any feasibility studies you may ask them to undertake
- ask the DNO to indicate in the Connection Offer whether your

connection costs or timing could be affected by wayleaving and/or planning consent issues, and to itemise the costs included in the quotation for these components

- ask the DNO to consider alternative routes for cables and/or overhead lines, if this could result in simpler planning and wayleaving processes, and to indicate the different connection costs and timescales that may result – for example, cabling along a public highway, whilst being potentially more expensive than an overhead line, may have fewer wayleaving complications than the overhead line option. Similarly, if the DNO can avoid routes with complex rail or motorway crossings then obtaining wayleaves and developing the connection will prove easier and less costly

Interactive Connection Applications

Sometimes the DNO may be considering your Connection Application alongside others which would have an impact on the same part of the distribution network. In this case all the relevant applications are referred to as “interactive”, and are treated according to a common set of principles being adopted by all the DNOs. These principles normally apply to generation connections above 1 MVA capacity, connected at 11 kV and above. DNOs will, though, apply the same principles in other cases as required.

Connection Applications are defined as “interactive” if offers are made which:

- make use of the same part of the current or planned future network; or

- have an operational effect on that network; and
- would affect the terms under which connection can be offered to one of the parties if another accepts its Connection Offer.

The DNO will tell you in writing if your connection application is interactive with one or more others. The Connection Offer will also specify that it is interactive with other applications.

The DNO will use the date and time that your Connection Application was made to put your Connection Offer in order with those made to other applicants.

Accepting a Connection Offer

You will have a defined period specified in your Connection Offer within which to accept the offer. This will typically be in the range 30 -90 days, but is likely to be nearer 30 days if your Connection Application was defined as “interactive”. Make sure you are aware how long your acceptance period is, as this can vary across DNOs.

If yours was the first of a number of “interactive” applications, you will have priority over subsequent applicants who may

receive offers during this time, and this will be explained in your Connection Offer.

If you were a later applicant, your offer will indicate that for some of the validity period of the offer it is dependent on the decision of the prior applicant(s) on whether to proceed with their connection(s).

Connection Offers will also specify the date on which they become unconditional (because the previous Connection Offer(s) have lapsed).

Where can I find out more about Connection Offers and Interactive Applications?

All the DNOs publish documents called their “Statement of Methodology and Basis of Charges for Connection” (which you may sometimes hear referred to as their “Licence Condition 4 Statement” from the early DNO licence conditions). This sets out in detail:

- the way that each DNO handles Connection Applications;
- how it goes about issuing Connection Offers; and
- the arrangements it makes for dealing with Interactive Applications.

These documents are available from each of the DNOs’ websites.

D. The Connection Application: Generation Licensing

In this section:

- An introduction to generation licensing
- A guide to licence requirements for generators in Scotland, England and Wales, and who is exempt from needing a licence.
- Information about how to apply for a licence.
- A guide to the interactions you may need to have with National Grid Electricity Transmission (NGET)
- Contact details if you need more information

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

Introduction

Depending on the size of your generating plant, you may need to apply for a Generation Licence. This section of the Guide explains how to determine whether your generating plant requires a licence, and the process for obtaining a licence if you need one.

There are a number of issues regarding generation licensing which affect the relationships that you will have with other electricity sector organisations. In particular, if your generating plant exports more than 100 MW, and therefore automatically requires

a licence, you will need to talk with Elexon and NGET about the implications of trading electricity in accordance with the Balancing and Settlement Code. This section of the Guide explains more about the relationship between developers of DG and NGET and highlights the different agreements that you could be required to enter into at the transmission level.

Full details are provided about the sources of further information that you will need to help you with the licence application process.

Who Requires a Generation Licence?

Currently all generation with an export capacity of greater than 100 MW require a Generation Licence. Plants between 50 MW and 100 MW capacity may be given an exemption from the requirement to hold a licence, subject to applying to the Secretary of

State for Energy and Climate Change for an exemption, and being granted one. You will not require a Generation Licence if your plant:

- does not export more than 10 MW;
- does not export more than 50 MW,

Who Requires a Generation Licence?

provided your plant has a declared net capacity of less than 100 MW (where in simple terms declared net capacity is the maximum output of the generating plant less the capacity consumed by the plant, see the box on the right for further details); and

- was connected to the network before 30th September 2000, and does not export more than 100 MW, or has never been subject to central despatch.

You can check the details of whether your Generating Plant is exempt from the need for a Generation Licence and find a full definition of declared net capacity by looking at the UK government document [Statutory Instrument 2001 No. 3270, The Electricity \(Class Exemptions from the Requirement for a Licence\) Order 2001](#).

Requirements of a Generation Licence

The conditions which are included in a Generation Licence include a number of requirements affecting the interaction of your generating plant with the transmission and distribution systems. So, for example, if you have a Generation Licence you will have to:

- comply with the sections of the Grid Code that apply to you;
- comply with the Distribution Code;
- comply with the Balancing and Settlement Code (BSC) and become a party to the Balancing and Settlement Code Framework Agreement;
- offer terms for providing Ancillary Services to the system operator, if asked to do so;
- provide information to Ofgem as required;
- avoid discriminating between potential buyers of the electricity from your plant; and
- advise the System Operator about the planned availability of your generating plant in accordance with the requirements of the Grid Code.

Applying for a Generation Licence

To apply for a Generation Licence, you should look up the UK government document, [Statutory Instrument 2008 No. 2376, The Electricity \(Applications for Licences, Modifications of an Area and Extensions and Restrictions of Licences\) Regulations 2008](#).

This contains detailed information about how to make the application, including information about the costs of a Generation Licence.

Your application should be sent to Ofgem and needs to include the following key items of information:

- the name, address and full contact details of the company making the application;
- the date from which the licence is required;

Applying for a Generation Licence

- company registration details, including names of directors.

This information should be provided in a form similar to that shown in the Statutory Instrument. In its current form the Generation Licence application doesn't require you to provide specific information about the generating plant itself. These details will be needed, however, at the point when you apply to become a party to the Balancing and Settlement Code (BSC).

To summarise, it's important early on in the connection application process to work out whether you will need a Generation Licence or not. This depends on the **size** of, and level of export from, your power plant. The licence application process is clearly defined in the legislative documents referenced at the end of this section. If you need help filling in the application, you should consult a legal or technical adviser who is familiar with generation project development.

National Grid Electricity Transmission Interfaces

If the generating plant that you're planning to connect is classed as a large power station, you will need to enter into an agreement with NGET, the operator of the GB transmission system. This is because large power stations can have an impact on the system at higher voltage levels than the distribution network. Power exports from large generating plants could affect flows on the transmission system; in addition, large power plants can contribute to the balancing of the system as a whole. Because of this, if you're developing a large power station, you'll need to enter into a range of contracts with NGET and other parties.

The difference between the licence exemption limits described earlier and the technical definitions of Large Power Stations gives rise to two different agreements which could apply to developers of DG. These are:

- the **Bilateral Embedded Generation Agreement (BEGA)** - an agreement between developers of large power stations (see note on next page) and NGET. They are required under the terms of the BEGA to comply with the

Connection and Use of System Code (CUSC), the Grid Code and the Balancing & Settlement Code. The BEGA gives the generator the right to export onto the GB transmission system and to operate in the energy balancing market.

Developers of small and medium power stations have the option to enter into a BEGA if they wish to take part in the wholesale electricity market;

- the **Bilateral Embedded Licence Exemptable Large Power Station Agreement (BELLA)** applies to those large power stations that are exempt from holding a generation licence. This agreement is only available to Large Power Stations in Scotland, which could be below the 100 MW threshold at which holding a Generation Licence is mandatory. Generators who hold a BELLA must comply with the CUSC and the Grid Code. They may not operate in the electricity balancing market, however, and are not therefore required to comply with the Balancing and Settlement Code (BSC).




National Grid Electricity Transmission Interfaces

If you have a BEGA with NGET, you are considered to be a user of the transmission system and are therefore liable to pay Transmission Network Use of System Charges.

If you do not have a BEGA you are not considered to be a user of the transmission system and you are not liable to pay Transmission Network Use of System Charges. However, you are not entitled to “use” the transmission system. In some circumstances this could limit the operation of a distributed generator not holding a BEGA.

You do not need to enter into an agreement with NGET if:

- 
- you are developing a power station that has a capacity less than that of a large power station (see below, and note the variation for England & Wales and Scotland); and
 - you do not require access to the transmission system.

However, certain elements of the Grid Code will still apply. The sections that apply are set out in the Distribution Code. The Guide to the Distribution Code contains figures that illustrate the Grid Code and Distribution Code boundaries.

Statement of Works

A Statement of Works sets out what, if any, work needs to be carried out on the transmission system as a result of initial assessments of your proposed project by NGET. If you are a:

- Large generator: Discussions you have with NGET on agreements will also include identifying the need for studies and the possibility of reinforcement charges.
- Small or Medium generator: The DNO may need to submit a request to NGET for Statement of Works.



What is a Large Power Station?

The definition of a large generating plant varies between England & Wales and Scotland, due to the different transmission voltage levels and system characteristics in these regions. The Grid Code definitions of Large Power Stations are as follows:

- In the National Grid Electricity Transmission system, plants with a registered capacity ≥ 100 MW
- In the SP Transmission system, plants with a registered capacity ≥ 30 MW
- In the Scottish Hydroelectric Transmission system, plants with a registered capacity ≥ 10 MW

Where can I find out about NGET Transmission Charges?

Full details of NGET’s Transmission Network Use of System Charges are available from:

<http://www.nationalgrid.com/uk/Electricity/Charges/chargingstatementsapproval>

National Grid Electricity Transmission Interfaces

The Statement of Works process can lead to additional costs if work is required, and may impose timescale constraints on your project, which need to be carefully considered. For more information on the Statement of Works process, please refer to Section E. Costs and Charges: Connection Costs.

In summary, the interface that you will have with NGET depends on where your generating plant is located, its size and level of export. If you are developing a Large Power Station, even if it is connected to the distribution network, you are considered to be a user of the transmission system and will need to discuss which agreements you will require and possible network charges with NGET. You may also be subject to charges for reinforcement work required on the transmission system to accommodate your project, depending on the outcome of studies undertaken by NGET.

Where to Find More Information

The following UK Statutory Instruments are relevant:

- For full details on Generation Licence exemptions: [Statutory Instrument 2001 No. 3270, The Electricity \(Class Exemptions from the Requirement for a Licence\) Order 2001](#).
- To apply for a Generation Licence, you should look up the UK government document, [Statutory Instrument 2008 No. 2376, The Electricity \(Applications for Licences, Modifications of an Area and Extensions and Restrictions of Licences\) Regulations 2008](#)

We have referred to the following Codes in this section:

- The [Grid Code](#) and [Connection and Use of System Code \(CUSC\)](#) are available on NGET's website
- The [Distribution Code](#) is available on the Distribution Code website
- The [Balancing and Settlement Code \(BSC\)](#) is available on Elexon's website

NGET publishes information for developers of DG at:

<http://www.nationalgrid.com/uk/Electricity/GettingConnected/NewConnections/DistributionConnections/>

E. Cost and Charges: Connection Costs

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
- National Grid Electricity Transmission (NGET) connection charges and Statement of Works

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

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 scheme to the distribution network.
- **Use of System charges:** these are ongoing charges, which primarily cover the cost of reinforcement and operation and maintenance costs.

This section focuses on connection costs. Information on Use of System and other charges can be found in the Section E. Costs and Charges: Ongoing Costs.

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 (i.e. how they calculate their charges);
- The DNO's connection charging statement (i.e. what the charges are);
- An indication of the costs of providing a connection quotation / 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.

Connection Charges—Infrastructure

Basis of DNO connection charges

Depending on the location and size of your generating plant the DNO may have to:

- Modify an existing part of the network to accommodate your scheme; or
- Provide an entirely new connection.

This will result in some initial costs, which will be charged to you upfront as part of the connection charge. Components of these initial asset costs are discussed further.

Extension costs and reinforcement costs

The connection provides an electrical path between your generation installation and the DNO's network. The work required to provide this path can be broken down into two categories:

1. **New infrastructure** (or extension) must be installed to provide an extension of the existing network. This is from the point of connection on the existing network up to the new point of supply.
2. Some **reinforcement** of the existing network infrastructure may be required to accommodate your planned generation capacity.

These are illustrated in the figure below and the point of connection is defined in the Glossary.

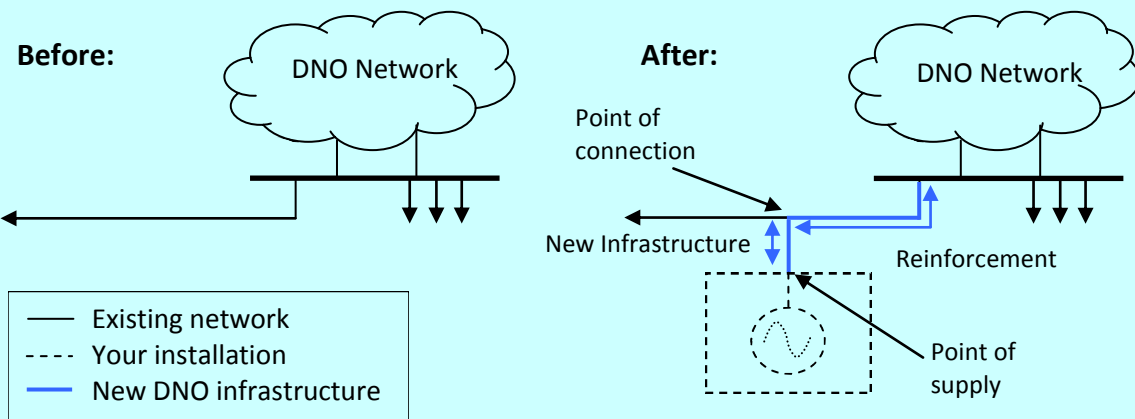
Reinforcement work is usually required to increase the electrical capacity of those parts of the network which form part of the electrical path from the generating plant to the network. However, some reinforcement work does not fit this description, for example:

- It may be necessary to install switchgear at a substation some distance from your scheme. This could be due to the increase in fault level caused by the connection of your generating plant, or to create a new protection zone.
- Equipment such as reactors or static VAR compensators may be needed for times when the voltage may rise, e.g. when your generating plant is exporting at times of light demand.

The asset costs that you are charged for include:

- Any extension to the network
- A **portion** of reinforcement costs

Extension and reinforcement



Connection Charges—Infrastructure

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

portion of reinforcement costs you will be charged for. These are available on DNO websites.

Connection Charges—Other Elements

Elements of charges

As well as charges for the connection infrastructure, there are other elements that are covered in the connection charge. These can include some of the following:

- Connection application
- Assessment and design
- Design approval (where the design has been undertaken by an ICP)
- Determining or providing information on point of connection
- System / feasibility / fault level studies
- Provision of Wayleaves
- Additional meetings with the DNO or site visits
- Administration
- Substation locks and notices
- Inspecting and monitoring Contestable work
- Witnessing tests
- NGET fees e.g. application for Statement of Works

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

Assessment and Design fees: At the time of writing DNOs cannot make an up-front charge for provision of a formal quotation for a new connection under Section 16 of the Electricity Act. However they may require the payment of up-front charges for budget estimates, feasibility studies and other enquiries. DECC are working with Ofgem to create a framework that would allow DNOs to charge up-front fees in the case of formal quotations, however the timeframe for this is still unclear.

What is fault level? How does DG affect fault level?

Fault level is a measure of the current which would occur in the event of a solid 3-phase short circuit at a certain point on a distribution (or transmission) network. Fault level is normally expressed in thousands of Amps (kA) or the equivalent apparent power (MVA). It is not very useful to give a single value because fault levels can change over time. This can be due to changes in the network configuration to allow routine maintenance or isolate faults. Maximum and minimum values are usually specified for the fault level which may occur in the DNO network at a certain point. The rating of existing circuit breakers and circuits place an upper limit on the range of fault levels that can be permitted in a particular part of the network.

Your generating plant can contribute to fault current, so it increases the fault level on the network. If connecting your generating plant increases the fault level above the capability of the DNO equipment, you may have to contribute to reinforcements.

Connection Charges—Other Elements

Indicative costs and examples

Equipment costs and charges for services vary across DNOs; it may be misleading to give you 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**.

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
- the breakdown of Contestable and Non-contestable work.

The Statement of methodology and charges for connection document also gives examples of various connections and their associated cost breakdown. It is updated annually.

What is a budget estimate?

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

Budget or Indicative estimate	Firm or 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—some risk involved using this for budgeting your project	Provides formal contract offer
Not open for acceptance	Open to acceptance, subject to terms and conditions

The DG performance standard, introduced by the DG standards directive, defines time periods within which DNOs should respond to a request for a budget estimate. This applies to Section 16 Applications (i.e. if you are applying to the DNO to undertake both the Contestable and Non-contestable elements of the connection work). The timescales for the DNO to provide a budget estimate are:

- 10 working days for connections of less than 1 MVA; and
- 20 working days for connections of 1 MVA or more.

Connection Charges—Other Elements

Estimating costs and getting a quotation

You can obtain indicative costs for works and equipment from DNO documents, as discussed. 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:

- Normally they only cover the cost of the infrastructure on the DNO's side of the point of supply. There can be significant costs associated with the infrastructure on your side of the point of supply.
- DNOs use reasonable endeavours to identify remote reinforcement costs associated with the proposed connection at this stage. However, it is possible that not all of the reinforcement costs will be included at this time.

For more on budget estimates, see the box on the previous page.

You should consider the costs on both sides of the point of supply when evaluating your connection options. For example, the DNO might indicate that the connection costs would be lower if they were to provide a supply at 33 kV instead of 11 kV. But this option might require you to install and operate a 33 kV/11 kV transformer, in which you would have to weigh the cost of the transformer against the lower DNO costs.

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, e.g. in project value or duration. The staged payments cover committed expenditure by the DNO.

Transmission Connection Charges

NGET transmission system connection charges for large generation

The DNO has to inform NGET about certain DG schemes, as DG of a certain size may have an affect on the transmission system. NGET may need to carry out studies to assess whether the impact of your scheme on the transmission network is significant.

If you are a large or exemptible large generator (see note on next page) you will need to enter into various agreements with NGET. You will need to notify NGET of your

project and have discussions with them. Part of these discussions will include the need for studies and the possibility of reinforcement charges.

Statement of Works

If you want to connect the following generating plants the DNO will need to submit a request to NGET for a Statement of Works:

- A **medium** power station that is **exempt** from holding a generation licence, and does not intend to have a bilateral

Transmission Connection Charges

agreement with NGET (see Section D. The Connection Application: Generation Licensing for more on bilateral agreements)

- A **small** power station that the DNO “reasonably believes” may have a significant impact on the transmission system.

For a reminder on the definitions of small, medium and large power stations, please see the table on the next page.

A Statement of Works sets out what, if any, work needs to be carried out on the transmission system as a result of initial assessments by NGET. If you are not sure whether the DNO will need to request a Statement of Works for your project, you should discuss this with your DNO.

If the DNO does need to request a Statement of Works, NGET will undertake initial studies to assess the impact of your generation on the transmission system.

If your project does not have a significant impact, the process is complete. You will be required to pay the application fee for the request for Statement of Works. This fee depends on your geographical location, and can be found in [NGET’s Statement of Use of System Charges](#).

If your project does have a significant impact, NGET may need to:

1. Conduct works on the transmission system. (Further information on possible financial liabilities associated with transmission works is given in the box on the next page.)
2. Conduct works on a grid supply point
3. Set specific requirements at your connection site

The Statement of Works details the above, as well as stating the cost of any works and the deadline for response. As a result of the Statement of Works, NGET may impose conditions on the DNO regarding the Distributed Generation connection. These conditions are captured in the Connection Agreement between you and the DNO, and any bilateral agreement you may have with NGET.

Timescales for this process are prescribed in the CUSC. These need careful consideration as they may impose timescale constraints on your project. You need to time the application to meet your project timelines.

For more information, please refer to the [NGET website](#) and [Section 6.5 of the CUSC](#).

Exemptible generation: Exemptible generation is generating plant for which the generator is not obliged to hold a generation licence under the terms of Statutory Instrument 2001 No. 3270, The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001. Generation licence exemptions are discussed in Section D. The Connection Application: Generation Licensing.

Transmission Connection Charges



Small, Medium and Large generating plants as described in the Distribution Code:

	Registered Capacity		
	Small	Medium	Large
National Grid Electricity Transmission (England and Wales)	< 50 MW	50 — <100 MW	≥ 100 MW
Scottish Power Transmission Ltd (southern Scotland)	< 30 MW		≥ 30 MW
Scottish Hydro-Electric Transmission Ltd (northern Scotland)	< 10 MW		≥ 10 MW

Financial liabilities associated with Transmission Works: The DNO may be required to secure financial sums payable to NGET for transmission works that would not be required if your generation project does not proceed (“final sums liabilities”). The DNO would pass these liabilities on to you as the project developer. Under NGET’s new scheme for connecting generation, the Connect and Manage scheme, the way in which these liabilities are shared between network users changes slightly. You should discuss this issue with your DNO.

E. Cost and Charges: Ongoing Charges

In this section:

- An introduction to ongoing charges
- Generation Distribution Use of System charges—how they vary and what they cover
- Metering charges and the parties involved
- Top-up and stand-by charges
- Charges for using the National Grid Electricity Transmission (NGET) transmission system

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

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 costs of work and equipment associated with connecting your generating scheme to the distribution network. This includes a portion of reinforcement costs.
- **Use of System charges:** these are ongoing charges, which primarily cover operation and maintenance costs and include a portion of reinforcement costs.

This section discusses Use of System charges, as well as other ongoing charges that may apply to you. Ongoing charges are associated with some of the running costs of your generating plant.

Depending on the nature of your scheme these can include:

- Generation Distribution Use of System (UoS) charges
- Metering charges
- Top-up and standby charges
- Charges for the use of the NGET transmission system

We will discuss these charges in more detail.

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.

Use of System Charges

In April 2005, the connection charging philosophy for generation changed and shallower connection charges were introduced. Connection charges now include the cost of 'sole use' asset, plus a portion of the cost of any wider network reinforcement that may be required. Connection costs and network reinforcement are discussed in Section E. Costs and Charges: Connection Costs. Use of System (UoS) charges cover the cost of any reinforcement to the network that might be necessary that is not covered by the connection charge. They also cover operation, repair and maintenance.

All generators with plant connected at LV and HV are subject to UoS charges under the Common Distribution Charging Methodology (CDCM). These charges are currently negative for generation (i.e. credits). Please see the table below for definitions of the terms LV, HV and EHV.

Generators whose plant was connected at EHV before April 2005 are not currently subject to charges, but this is under review and likely to change. Generators whose plant was connected at EHV after April 2005 are subject to charges in accordance with the relevant DNO's use of system charging methodology. It is expected that a common EHV Distribution Charging Methodology

(EDCM) will replace DNOs' individual EHV charging methodologies from April 2011.

DNOs are obliged to publish documents about their UoS charges. These cover their UoS charging methodology and a statement of what the charges are for both generation and demand customers. You can find these on DNOs' websites.

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 DNOs' websites.

Definitions of LV, HV and EHV

Term	Voltage level
LV (Low Voltage)	400/230 V in practice, less than 1 kV in general.
HV (High Voltage)	In general this covers the range from 1 kV—22 kV. In practice, this means 6.6, 11 or 20 kV.
EHV (Extra High Voltage)	In general this covers connection to the distribution network at or above 22 kV. In practice this means 33 or 66 kV, or 132 kV (England and Wales only). Some DNOs also define customers connected to primary substations at or above certain voltage levels as EHV. See the definition of EHV for your local DNO.

Metering Requirements, Parties and Charges

Metering requirements

You may require separate meters for measuring your import and export. There are two categories of meter:

- Half Hourly (HH)
- Non-Half Hourly (NHH)

They are described in the box below.

The type of meter will affect:

- the meter charges you pay; and
- what category of UoS charges apply.

Section L of the Balancing and Settlement Code (BSC) dictates the type of meter you will require. It refers to a “Small Scale Third Party Generating Plant Limit”, below which you are classified as a Small Scale Third Party Generating Plant. This limit is currently set at 30 kW. If your generating capacity is less than this limit, you can have a NHH meter. If your generating capacity is greater than this limit, you have to have a HH meter. HH meters

have significant costs associated with them, but you can choose to have a HH meter if you have a Small Scale Third Party Generating Plant.

Parties involved

NHH meters are the responsibility of the supplier. They will appoint the following Supplier Agents:

- Meter Operator: installs and maintains the meter
- Data Collector: retrieves the data recorded by the meter and calculates your actual or estimated volume of energy consumption
- Data Aggregator: sums up volumes of energy consumed for each supplier and sends the information to a central system for balancing and settlement

You can contact your current electricity supplier to discuss the provision of meters.

What is the difference between Half Hourly (HH) meters and Non-Half Hourly (NHH) meters?

Meters record the flow of electricity. There are two main categories of meters; Half Hourly (HH) and Non-Half Hourly (NHH). HH meters are for larger customers; if your generation peak power is greater than 30 kW you have to use a HH meter.

NHH meters record total power consumption, but do not record the times the power is consumed. Typically the recorded data would be collected a few times a year, e.g. every quarter. In contrast, HH meters measure and record power consumption for each half hour period. The data they record is typically collected remotely every day, for example by a telephone line.

Recorded data from meters is used to determine charges and rewards. For example, to calculate:

- Imbalance charges for balancing and settlement
- Distribution or Transmission UoS charges
- Renewables Obligations Certificate rewards

Metering Requirements, Parties and Charges

Alternatively you can contract directly with a Meter Operator for the provision of meters.

If you are required to use HH metering, it is your responsibility to appoint a Meter Operator. You will have to enter into a Meter Operator contract with a meter supplier. The contracts normally last for five years, and the Meter Operator will:

- Provide, install and maintain your meter; and
- Collect data from your meter via a communications link such as a telephone line or GSM (Global System for Mobile communication).

The provision of meters is open to competition. Details of Meter Operators and their contact details can be found on the Association of Meter Operators website:

www.meteroperators.org.uk

There are Codes of Practice which detail technical requirements for Metering Systems. These can be found on Elexon's website:

www.elexon.co.uk/Pages/codesofpractices.aspx

Charges

The cost of Meter Operator agreements and the costs associated with the communication to collect data from your meter can be in the order of several hundred pounds a year. You should consider obtaining quotations from a number of Meter Operators.

Note: in practice suppliers may pay the owner of Distributed Generation a fixed amount (e.g. £/year) instead of installing meters and making payments based on units exported. This is something you can discuss with your supplier.

Top-up and Standby charges

You may require top-up and standby electricity supplies to supplement the output from your generating plant:

- **Top-up supplies** cover any routine shortfall between the output of your generating plant and the demand on your site, and are generally used frequently (electricity supply on a regular basis).
- **Standby supplies** cover your demand in exceptional circumstances, such as generation outages (electricity supply on an intermittent basis). Even if you have no on-site demand or customers, standby supplies are usually required to

cover the load associated with auxiliary plant during start-up.

Top-up and standby supplies can be purchased from any electricity supplier, other DG, or directly through market mechanisms such as the UK Power Exchange or the Balancing Mechanism.

Charges applied by NGET

Transmission Network Use of System charges

Similarly to the UoS charges applied by DNOs to generators or demand customers who use their distribution system, NGET makes Transmission Network Use of System (TNUoS) charges. NGET publishes a Statement of the Use of System Charging Methodology on their website. According to this statement, you will be eligible for TNUoS charges if you are required to hold a generation license and you have a Bilateral Embedded Generator Agreement (BEGA). Please see Section D. The Connection Application: Generation Licensing for more information on agreements with NGET.

The TNUoS charges vary by geographic region. To see what the charges are in your area, refer to the Statement of Use of System Charges on the NGET website. Note that charges can be positive and negative, and that small generators whose plant is connected at 132 kV in Scotland are eligible for a reduction in TNUoS charges.



Balancing Services Use of System charges

NGET is also allowed to make charges for balancing service activities; for the role they play in operating the transmission system and balancing the system in real-time. These charges are called Balancing Services Use of System (BSUoS) charges.

The Use of System Charging Methodology states that all CUSC parties are liable for BSUoS charges. Please refer to this document for more information.

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

In this section:

- An introduction to the Feed-in Tariff Incentive
- The structure of the tariff
- Eligibility and Accreditation
- Technical considerations
- Guidance on where to find more information

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

Introduction

In April 2010 the Government introduced a new financial incentive to support small-scale renewable energy generators. The scheme is called a Feed-in Tariff (FIT). The existing Renewables Obligation (RO) encourages renewable generation as part of the wider electricity market, but it is a complex scheme more suitable for professionals in the energy sector.

The Feed-in Tariff (FIT) targets distributed and small-scale renewable energy generation for installations of up to 5 MW. Since the introduction of the scheme, the following arrangements have been in place:

- Renewable Energy (RE) generation < 50 kW : hydro, solar PV, wind and anaerobic digestion projects were automatically transferred from Renewables Obligation Certificates (ROCs) to FITs.
- Between 50 kW and 5 MW: existing projects remained in the Renewables

Obligation and new projects have a one-off choice between FITs and ROCs.

- Above 5 MW: All projects remain in the Renewables Obligation.

The FITs structure should provide the right level of simplicity and certainty to encourage non-energy professionals to invest in small-scale generation. FITs are available for the following generation technologies:

- Anaerobic digestion
- Hydro
- Solar PV
- Wind

A number of domestic Combined Heat and Power (CHP) plants are also supported through FITs under a Micro CHP pilot scheme.

The tariff structure should give you an incentive to consume the electricity you generate and become more energy efficient.

Tariff Structure

The tariff structure provides three strands of benefits from FITs if you use your electricity on site:

- Generation tariff: A fixed price for each unit of electricity generated - this price will remain constant throughout the lifetime of the installation's eligibility for FITs payments (See below for generation tariffs).
- Export tariff: A guaranteed price for each unit of electricity exported to the grid.
- Benefits from reducing your import from the grid by using your own electricity and the resulting decrease in your bill.

Technology and scale (Total Installed Capacity)	Generation tariff for installations registered in FIT Year 1 (p/kWh)		Generation tariff for installations registered in FIT Year 2	Tariff lifetime (Years)
	Year 1 (1/4/2010—31/3/2011)	Year 2 (1/4/2011—31/3/2012)	Year 2 (1/4/2011—31/3/2012)	
Anaerobic digestion ≤ 500 kW (see page 65)	11.5	12.1	12.1	20
Anaerobic digestion > 500 kW	9.0	9.4	9.4	20
Hydro ≤ 15 kW	19.9	20.9	20.9	20
Hydro > 15 kW but ≤ 100 kW	17.8	18.7	18.7	20
Hydro > 100 kW but ≤ 2 MW	11.0	11.5	11.5	20
Hydro > 2 MW but ≤ 5 MW	4.5	4.7	4.7	20
Micro CHP ≤ 2 kW (see note on page 66)	10.0	10.5	10.5	10
PV ≤ 4 kW new build	36.1	37.8	37.8	25
PV ≤ 4 kW retrofit	41.3	43.3	43.3	25
PV > 4 kW but ≤ 10 kW	36.1	37.8	37.8	25
PV > 10 kW but ≤ 100 kW (see page 65)	31.4	32.9	32.9	25
PV > 100 kW but ≤ 5 MW (see page 65)	29.3	30.7	30.7	25
PV Stand alone system (see page 65)	29.3	30.7	30.7	25
Wind ≤ 1.5 kW	34.5	36.2	36.2	20
Wind > 1.5 kW but ≤ 15 kW	26.7	28.0	28.0	20
Wind > 15 kW but ≤ 100 kW	24.1	25.3	25.3	20
Wind > 100 kW but ≤ 500 kW	18.8	19.7	19.7	20
Wind > 500 kW but ≤ 1.5 MW	9.4	9.9	9.9	20
Wind > 1.5 MW but ≤ 5 MW	4.5	4.7	4.7	20
Existing microgenerators transferred from RO	9.0	9.4	9.4	To 2027

Tariff Structure

Tariffs are linked to the Retail Price Index (RPI) and they are adjusted annually for inflation. The tariffs in Year 2 (01/04/2011—31/03/2012) have been adjusted by the 2010 RPI of 4.8%. This applies to both:

- the generation tariffs, which are shown in the table on the previous page; and
- the export tariff, which has increased from 3p/kWh in Year 1 (2010/11) to 3.1p/kWh in Year 2 (2011/12).

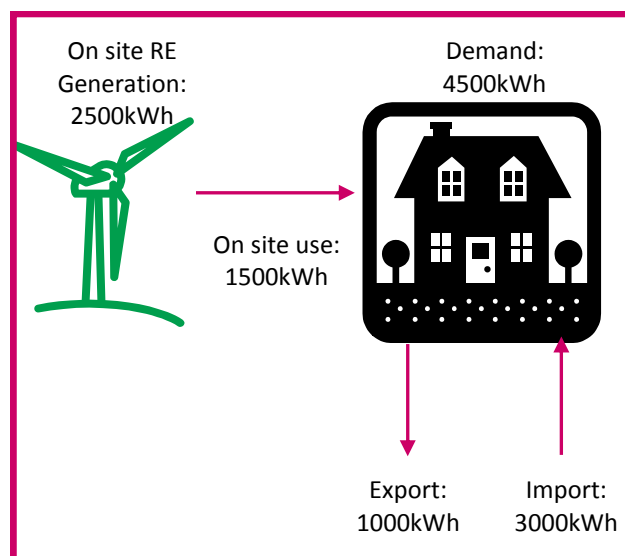
You will receive generation tariffs (FITs) for a fixed number of years and a guaranteed export price. The export price is 3.1p/kWh during Year 2 of the scheme (2011/2012) and generation tariffs vary according to the generation technology and size of your plant. You will also have the option to negotiate export tariffs on an open market. The generation tariffs were designed to allow you to achieve an annual rate of return between 5 and 8%. They are summarised in the table on the previous page.

After the first two years of the scheme, the generation tariffs “degress” each year. Degression is the percentage by which the levels will decrease each year **for new projects**. The generation tariff you are eligible for at the start of your project will last the lifetime of your scheme (adjusted annually for inflation).

The Government will review the generation tariffs regularly to account for cost reduction and enlarged scale of production. The degression in generation tariffs will only affect new installations, and you will keep whichever FIT you had at the time of full accreditation.

FITs—An example

The following example illustrates the possible benefits that you could achieve by accessing FITs. The numbers used in this example are indicative.



In the example:

Assuming an import tariff of 10p/kWh

Without on-site generation:

You will pay 4500 kWh x 10p/kWh = £450 per year

With a 1 kW Bergey wind turbine:

- You will pay 3000 kWh x 10p/kWh = £300 for the electricity imported from the grid; (import tariff: 10p/kWh);
- You will save 1500 kWh x 10p/kWh = £150 on the electricity you generate and use on-site (import tariff: 10p/kWh);
- You will earn 2500 kWh x 36.2p/kWh = £905 for all the electricity you generate on site (FIT for wind turbine < 1.5kW of 36.2kWh); and
- You will earn 1000 kWh x 3.1p/kWh = £31 for the electricity you export to the grid (export tariff of 3.1p/kWh).

In a year you will make £636. Your net benefit, relative to the scenario without on-site generation, will be £1,086.

kWh is a unit of energy.

Energy (kWh) = power (kW) x time (hours)

Eligibility and Accreditation

Renewable Energy generators with plant 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 SSEG that is wind, solar PV, hydro 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 plants, all plant between 50 kW and 5 MW and as a transitional arrangement for micro hydro (see note on next page) the following process (“ROO-FIT”) applies:

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.

What is the 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 enhance 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

Feed-in Tariff Review

As the department responsible for Renewable Energy policy, the Department of Energy and Climate Change (DECC) is conducting the first review of the FIT scheme. This review was announced in February 2011. The aim of the review is to:

- Determine how to achieve efficiency savings set out in the Spending Review October 2010 (£40 million savings required from the FIT scheme in 2014/15);
- Reflect on how the scheme has worked so far; and
- Determine whether any changes are needed.

The comprehensive FIT review will take place over summer 2011, with the aim of completing the review by the end of 2011. It is expected that the outcomes of the comprehensive FIT review will be implemented in April 2012.

However, two areas of the FIT scheme have undergone a “fast-track” review, affecting

some Anaerobic digestion and PV FITs.

The FIT generation tariff for PV installations will be reduced to:

- 19.0p/kWh in the range > 50 kW but ≤ 150 kW
- 15.0p/kWh in the range > 150 kW but ≤ 250 kW
- 8.5p/kWh in the range > 250 kW but ≤ 5 MW and stand-alone installations

The FIT generation tariff for Anaerobic Digestion installations ≤ 500 kW will be increased to:

- 14.0p/kWh for ≤ 250 kW
- 13.0p/kWh in the range > 250 kW but ≤ 500 kW

These tariff changes are due to be implemented from 1st August 2011. The changes will not affect any installations that are already registered on the FIT accreditation register.

For the most up to date information on the FIT review, see DECC’s webpage on [Feed-in Tariffs](#).

Accreditation arrangements for Anaerobic Digestion and Hydro: Anaerobic Digestion installations of any size are to be accredited by the Renewables Obligation (RO) Order Feed-in Tariff (“ROO-FIT”) process, rather than the MCS accreditation process (“MCS-FIT”). 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>

The Feed-in Tariff (Specified Maximum Capacity and Functions) (Amendment) Order 2011 introduces some modifications to the FITs Order 2010. This is to reflect clarifications and refinements to the FITs Order 2010 now that the FITs scheme has been running for some time. The Amendment Order includes a transitional arrangement for Hydro generating schemes that are less than 50 kW (micro hydro). If they are commissioned between 1st April 2010 and 1st October 2011 then they can be accredited by the Renewables Obligation mechanism for accreditation (“ROO-FIT”), rather than MCS accreditation (“MCS-FIT”). Any micro hydro commissioned after 1st October 2011 must be accredited via the MCS.

Technical Considerations

You will need to measure three electrical flows to get the most out of the FIT scheme:

- The amount of electricity your Renewable Energy plant is producing - the basis of your “generation financial stream”
- The amount of electricity you export to the network - the basis of your “export financial stream”
- The amount of electricity you import from the network—the basis of your supplier electricity bill.

If you have two types of RE generation, you will need to measure the amount of electricity produced by each of the plants separately, as each technology will receive its own generation tariff.

For your generation financial stream, your generating units must be metered.

For your export payments, there are currently two options:

1. 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.
2. Alternatively you could record your export to the network with a meter (called an export meter). Smart meters will have the capability to record generation and export.

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

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/Sell-your-own-energy/Feed-in-Tariff-Clean-Energy-Cashback-scheme
- Carbon Trust — Initial port of call for information for businesses
<http://www.carbontrust.co.uk/policy-legislation/energy-supply/renewable-energy/pages/feed-in-tariff.aspx>
- Department of Energy and Climate Change (DECC) — Policy setting
http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/feedin_tariff/feedin_tariff.aspx
- Ofgem—FIT administrator
<http://www.ofgem.gov.uk/Sustainability/Environment/fits/Pages/fits.aspx>

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

F. Selling Electricity: Renewables Obligation Certificates

In this section:

- An introduction to Renewable Electricity incentives
- Presentation of Renewables Obligation Certificates (ROCs)
- Revenue stream
- Eligibility and Accreditation
- Transitional arrangements
- Guidance on where to find more information

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

Introduction

The UK Government aims to increase the contribution of Renewable Energy (RE) to the national energy supply. Since 2002, the Government has been introducing renewable electricity incentives to boost the penetration of renewable electricity into the market.

This section of the Guide focuses on the Renewables Obligation and the Renewables Obligation (Scotland), relevant to Renewable Energy generators whose plant:

- has a declared net capacity that exceeds 50 kW; or
- has a declared net capacity less than 50 kW (“microgeneration”) but is not eligible for FITs due to the type of generation technology.

The Renewables Obligation Orders place an obligation on licensed electricity suppliers in England, Wales and Scotland to source an increasing proportion of electricity from renewable sources. In 2011-12 electricity suppliers will have to present 0.124

Renewables Obligation Certificates (ROCs) per MWh of electricity sold. For more on ROCs see the box on the next page.

There are various other power trading options for Distributed Generation, including:

- Selling your electricity on the wholesale market or to an electricity supplier
- Levy Exemption Certificates (LECs)
- Embedded benefits
- Ancillary services
- EU Emissions Trading System (ETS)

These have been discussed briefly in Section B. The Role of Distributed Generation: Benefits of Distributed Generation, which also points to further reading on these topics. Beyond that, they are outside of the scope of this Guide.

Renewables Obligation Certificates (ROCs)

The Certificates you will receive for the Renewable Energy generated are based on three principles:

- **Banding:** different levels of financial support for different technologies.
- **Stabilisation of your revenue:** a headroom system (see note below) aims to stabilise the ROC price. From 1st April 2011 the headroom is 10%.
- **Premium subsidy:** the Renewables Obligation favours the installation of Renewable Energy plants as it allows you to receive a premium subsidy on top of the revenue you receive from selling your electricity in the wholesale market.



Banding is shown in the table on the next page. Where a range of ROCs per MWh is shown, e.g. with tidal and wave, this is typically due to variation between England & Wales and Scotland.

How much are my ROCs worth?

Electricity suppliers have to produce ROCs to prove that they source a certain proportion of their energy from renewable sources. When they fail to produce enough certificates, the electricity suppliers have to pay fines. But you have the option of selling your ROCs on an open market to electricity suppliers willing to avoid these fines. The price of your ROCs will fluctuate according to the demand for certificates and the level of the fines (called the buy-out price).

In 2010-2011 the buy-out price was £36.99/MWh and in 2011-2012 it will be £38.69/MWh. Ofgem adjusts the buy-out price annually, based on the Retail Price Index. The Government is consulting on mechanisms to stabilise the ROC price sold on the open market, and avoid their price crashing due to an excess of ROCs compared with demand. On 1st April 2011 the Government increased headroom from 8% to 10% to limit the risk of a ROC price crash.

What is a Renewables Obligation Certificate (ROC)?

A Renewables Obligation Certificate (ROC) is a green certificate issued to an accredited generator for eligible renewable electricity generated within the UK and supplied to customers within the UK by a licensed electricity supplier. The number of ROCs issued for each megawatt hour (MWh) of eligible renewable output generated depends on the generating technology. This is called banding, and is shown in the table on the next page.

What is headroom?

Headroom works by providing a set margin between predicted Renewable Energy generation (predicted volume of ROCs) and the level of the Obligation (demand for ROCs, linked with the level of sales of each supplier). It helps to reduce the likelihood that generation will exceed the Obligation in any given year, the result of which would be a crash in ROC value.

Revenue Considerations

If you are eligible to receive ROCs you will have two main financial streams:

- The product of the electricity you produce and sell either directly to a supplier (via a Power Purchase Agreement) or to the open electricity market

- The price of your ROCs you sell either directly to electricity suppliers or to an open market.

Projects accredited after 26 June 2008 will receive this financial support for a 20-year period, up to the end date of the Renewables Obligation mechanism, which is 2037.

ROCs banding:

Generation type	Number of ROCs per MWh generated
Tidal	2—5
Geothermal	2
PV (Photovoltaic)	2
Microgeneration (≤ 50 kW)	2
Dedicated energy crops or biomass with CHP	2
Anaerobic digestion	2
Advanced pyrolysis or gasification	2
Wave	2—3
Off-shore wind	1.5—2
Co-firing of energy crops with CHP	1.5
Dedicated Biomass	1.5
Standard pyrolysis or gasification	1
Geopressure	1
Co-firing of Biomass or energy crops with CHP	1
Energy from waste with CHP	1
Hydro-electric	1
On-shore wind	1
Co-firing of energy crops	1
Co-firing of biomass	0.5
Electricity from sewage gas	0.5
Electricity from landfill gas	0.25

Revenue Considerations

Additional capacity to your existing plant will benefit from 20 years of support from the date you were first accredited up to the 2037 end date of the scheme. The Government is considering the support period for refurbished and replaced Renewable Energy plants.

The number of ROCs you will receive per MWh generated depends on the technology and the accreditation date of the plant. The Government will review the ROC bands regularly, to target the subsidies to the less established technologies. However, based on

the grandfathering rule, you will keep whichever ROC banding you had at the time you got your full accreditation. The banding is shown in the table on the previous page. A first review of ROC banding has started, but changes are not due to be implemented until April 2013.

Note: Grandfathering is a principle where support levels are guaranteed for projects for their lifetime in a scheme, regardless of future reviews or changes, to provide certainty for investors.

Eligibility and Accreditation

The Renewables Obligation mechanism is more suitable for Renewable Energy generators with plant greater than 5 MW capacity and experience in energy or green certificates trading. This Guide does not describe in detail which renewable electricity stations can benefit from the Renewables Obligation scheme. For information on this, please see references at the end of the section, and Ofgem's publication [Renewables Obligation: Guidance for Generators](#).

Renewables Obligation accreditation

Ofgem is responsible for accrediting your renewable power station. They produce useful guides explaining the steps you have to follow (See [Renewables Obligation: Guidance for generators](#) published on the Ofgem Website). In summary, the steps are as follows:

1. Open an account on the "Renewables and CHP register" web program administered by Ofgem: <https://www.renewablesandchp.ofgem.gov.uk/>
2. Ofgem grants preliminary accreditation.

3. After the commissioning of the plant, Ofgem will review the eventual changes in your generating plant, and grant you your final Renewables Obligation accreditation.
4. After the accreditation, you will receive your ROCs based on the output of your Renewable Energy plant.
5. You will have to submit signed declarations annually to maintain your Renewables Obligation Accreditation.

Note: Generators whose plant has a declared net capacity of 50 kW or less can nominate an agent to deal with the administration (completing the application for accreditation, submitting data and signing declarations on your behalf). Agents can also claim ROCs on your behalf.

Transitional Arrangements

The Government has recently changed the legislation on Renewable Energy incentives. But it will respect the rule of grandfathering, assuring the level and conditions of incentives you receive remain constant.

The table below summarises the transitional arrangements and how you will be affected depending on when your installation is complete.

Summary of transitional arrangements:

	Capacity <50kW and eligible for FITs	50kW - 5MW and eligible for FITs	> 5MW or < 5MW but ineligible for FITs due to generating technology
Installations fully accredited under the Renewables Obligation before 15/07/2009	Automatic transfer to FITs	Remain in the Renewables Obligation	Remain in the Renewables Obligation
Installations completed between 15/07/2009 and 31/03/2010	FITs from the introduction of the scheme	One-off Choice between FITs and ROCs	Remain in the Renewables Obligation
Installations completed after 01/04/2010	FITs	One-off Choice between FITs and ROCs	Remain in the Renewables Obligation

Where to Find More Information

The legislation on financial incentives for Renewable Energy projects is evolving, and the Government is often consulting on this subject. For the latest information, please refer to:

- DECC website

http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renew_obs/renew_obs.aspx

The Government regularly reviews “The Renewables Obligation Order”. This is a legal document that details the renewable power stations that can benefit from the RO Scheme. Please refer to this statutory document for full details concerning England and Wales. Please refer to “The Renewables Obligation Order (Scotland)” for the Scottish legislation.



Ofgem is responsible for the Renewables Obligation scheme management, and for granting the accreditations. They publish guides detailing the steps to follow to obtain the Renewables Obligation accreditation and receive your ROCs:

<http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Pages/RenewablObl.aspx>

G. Technical and Commercial Interfaces: Competition in Connections

In this section:

- An introduction to competition in connections
- DNO and Independent Connections Provider (ICP) connections
- Contestable and Non-contestable work
- The National Electricity Registration Scheme (NERS)

Introduction

In getting a connection, you have two options:

1. Ask the DNO to undertake all the work necessary to provide the connection
2. Contract an Independent Connections Provider (ICP) to provide and install certain aspects of the connection infrastructure

If you contract an ICP you will need the DNO to agree to adopt the infrastructure. With a DNO connection you will have a contractual relationship with the DNO; with the ICP option you will have a contractual relationship with the ICP.

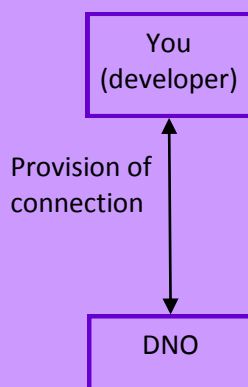
The ICP option:

- results in an additional relationship between the ICP and DNO; and
- Gives you access to a wider range of potential contractors, which could potentially result in lower costs and may give you greater control over construction timescales.

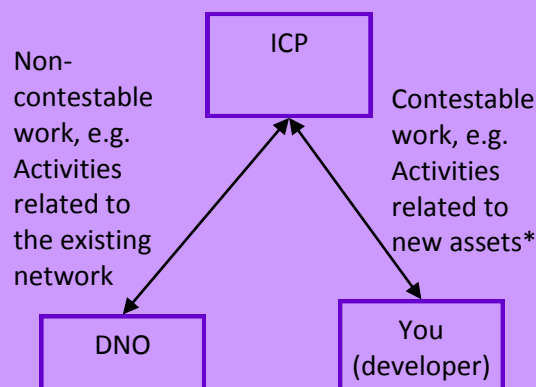
You should weigh the potential benefits against the time and effort involved in managing this additional relationship.

Contractual relationships in the connection process:

DNO Connection



ICP Connection



*Where the DNO agrees that these are Contestable activities

DNO and ICP Connections

DNO connections

If you wish, the DNO will arrange to undertake all the necessary connection works. Some DNOs refer to this as a “statutory” or Section 16 connection. You will be charged the cost of these works as discussed in Costs and Charges: Connection charges.

In practice, the DNO will undertake the design work and specification of the connection infrastructure, but the installation work will often be undertaken by another organisation under contract to the DNO. This organisation may be the DNO’s own connection business, or it may be an external contractor.

ICP connections

Instead of getting the DNO to undertake the connection works, you can opt to contract with an ICP to carry out some of the work. This option to contract with third parties to do

connection work is known as “Competition in Connections”. You can make use of competition in connections to make sure that you get connection work done at competitive prices and to timescales within your own influence. DNOs discuss competition in connections on their websites.

The DNOs usually take over the ownership, operation and maintenance of connection infrastructure installed by ICPs. As a result of this, they require the work to be carried out to an acceptable standard. Connection work constructed by ICPs is subject to inspection and approval by the DNO.

Note: DNOs charge for ICP design approval, which should be taken into account as it could affect the economics of using an ICP.

Contestable and Non-contestable Work

Contestable work and Non-contestable work

There are certain tasks that DNOs do themselves, so that they can maintain co-ordination and control of their network. This part of the connection work is called Non-contestable work as it is not open to competition. Conversely, the part of the work that is open to competition is referred to as Contestable work.

Each DNO provides its own definition of Contestable and Non-contestable work in their Connection Charging Methodology, available on their website. Although the definitions may vary, they are broadly similar. The table on the next page shows which activities are typically Non-contestable and which are Contestable. Note that activities to

do with the existing network are Non-contestable.

In addition to paying the ICP for carrying out the Contestable work, you will be charged for:

- the costs incurred by the DNO in carrying out the Non-contestable work; and
- the inspection and approval by the DNO of the work carried out by the ICP.

These charges are discussed in Costs and Charges: Connection costs.

National Electricity Registration Scheme

Accredited ICPs

Lloyds register operates the National Electricity Registration Scheme (NERS) on behalf of DNOs. Under NERS, ICPs are assessed and accredited for various items of Contestable work. For example, they may only be accredited for work up to a certain voltage level.

DNOs stipulate that all or most items of Contestable work need to be carried out by accredited ICPs. A list of accredited ICPs can be found on the Lloyds register website:

www.lloydsregister.co.uk/ners

Typical outline of Non-contestable and Contestable activities

	Non-contestable activities	Contestable activities
Activities to do with the existing network	<ul style="list-style-type: none"> Deciding on the point of connection to the existing network Live electrical work to connect the new extension to the existing network Design and construction of reinforcement upstream of point of connection 	
Activities to do with new assets	<ul style="list-style-type: none"> Obtaining any necessary consents and wayleaves involving exercising statutory powers Design approval Inspection, monitoring and testing of Contestable work. 	<ul style="list-style-type: none"> Obtaining wayleaves that do not require the DNO to exercise its statutory powers Detailed design for on-site works downstream of the point of connection to the existing network Project managing the connection Providing materials to DNOs' specification Cable trenching, installing ducts and other preparation of the site Carrying out substation building and civil work on-site Constructing the extension Recording of work and cable routes and equipment on site and the provision of this information to the DNO Installing metering and making internal wiring live (this is undertaken by your supplier rather than an ICP)

National Electricity Registration Scheme

Some items of Contestable work may not have to be carried out by an accredited ICP, for example cable trenching work on site.

Consult your DNO's Connection Charging Methodology for details on which parties can undertake items of work.

Practicalities of ICP Connections

If you want to get Independent Connections Provider (ICP) quotations for connection work, you first need to establish:

- the scope of the work that is Contestable;
- the relevant standards for the specification of work, materials and equipment; and
- details of approved contractors.

The DNO defines the scope of Contestable work, although they may be open to negotiation on some points. This is normally provided in the connection quotation, if you have required this information at the application stage. The DNO will have preferred design standards and preferred specifications for materials and equipment. However, you should be aware that statutory requirements for connection works are set out in the Distribution Code. These requirements are based on national and international standards. DNOs are entitled to seek clear confirmation and proof that these standards are met. They may charge for additional operating costs imposed by equipment that is otherwise unique on their systems.

On making a request for a connection quotation, you should indicate to your DNO if you're interested in obtaining ICP bids for Contestable work, and ask for the quotation to show charges for Contestable work and Non-contestable work separately. You could take this opportunity to ask the DNO for details of approved contractors and for their preferred design standards and equipment specifications.

If you decide to contract with an ICP it is your responsibility to ensure that the ICP's work is acceptable to the DNO under the terms of the Adoption Agreement (discussed in Section G. Technical and Commercial Interfaces: Contracts with the DNO). So before contracting with an ICP, you should ensure that their bid:

- covers all the necessary items of work; and
- provides for materials and equipment which comply with the requirements of the Adoption Agreement.

You should keep the DNO fully informed of the source and specification of equipment to be procured or installed. It may be prudent to set up a design review to enable the DNO to formally review and approve the contractor's proposed scope of supply.

G. Technical and Commercial Interfaces: Contracts and Agreements

In this section:

- An introduction to contracts required with the DNO
- Connection Agreements and Adoption Agreements
- Agreements with other parties

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

Introduction

Before you can start operating your generating plant, you may need to enter into a number of agreements with the DNO, including:

- A **Connection Agreement**
- An **Adoption Agreement**, where you have contracted an Independent Connections Provider (ICP)

These contractual relationships will be discussed in this section. The Adoption Agreement can take one of several forms (e.g. bipartite, tripartite). This is discussed further on the next page.

The terms are defined briefly in the box on the next page.

Connection and Adoption Agreements

Connection Agreements

You will be required to enter into a Connection Agreement with your DNO. The Connection Agreement covers the conditions under which your plant is entitled to be:

- Physically connected to the DNO's network; and
- Remain connected and energised during normal operation of the network.

Examples of some of the areas covered in the Connection Agreement include:

- identifying who is responsible for plant maintenance and recording failures;
- key technical data such as import and export capacities; and
- arrangements for communication links between you and the DNO.

Connection and Adoption Agreements

The Connection Agreement is likely to take the form of a standard document with scheme specific annexes. A first draft will probably be prepared by the DNO for discussion, agreement and signature.

The Connection Agreement will set out obligations on the DNO regarding the connection. It also sets out requirements on you to:

- Pay the connection charges
- Comply with the Distribution Code

DNOs discuss the Connection Agreement in their Connection Charging Methodology, available on their website. There is also more about the Connection Agreement in ER G59/2.

Adoption Agreements

If you use an ICP to construct the Contestable work you will have to enter into an Adoption Agreement. These take one of several forms:

- a tripartite agreement between you, the DNO and the ICP;
- a bipartite agreement between you and

the DNO;

- a bipartite agreement between the DNO and the ICP; and
- a multipartite agreement between you, the DNO, the ICP and any relevant third party land owners.

DNOs discuss the Adoption Agreement in their Connection Charging Methodology, which are available on their websites. You should consult this document to find out which form of agreement your DNO specifies.

The Adoption Agreement covers the arrangements for the DNO to take over responsibility for the infrastructure installed by the ICP. That includes arrangements to ensure that the work meets the DNOs' requirements. The Adoption Agreement is additional to any other contracts you may have with the ICP.

Agreements at a glance

Connection offer: A formal offer from the DNO containing terms, conditions and charges for the DNO to make the connection. This could be issued either to you or the Independent Connections Provider (ICP) where applicable.

Connection Agreement: An agreement between you and the DNO detailing terms and conditions for becoming and remaining connected to the DNO's network.

Adoption Agreement: If you have contracted an Independent Connections Provider (ICP), you will need to enter into this agreement. There are several forms this agreement can take—consult your DNO's Connection Charging Methodology to find out which form your DNO specifies. The Adoption Agreement sets out the terms and conditions for the DNO to adopt assets which have been constructed by an ICP.

Agreements with Other Parties

As well as entering into agreements with the DNO, you may need to enter into agreements with other parties. These other agreements include:

- Terms for Use of System are either covered by
 - i. entering into the multiparty agreement, Distribution Connection and Use of System Agreement (DCUSA). More information on this can be found on the DCUSA website: www.dcusa.co.uk
 - ii. the agreement you will have with your supplier, who will be a party to the DCUSA. It is likely that the terms for Use of System will be covered in this way.
- Agreements with National Grid Electricity Transmission (NGET) — Bilateral Embedded Generation Agreement (BEGA) or Bilateral Embedded Licence Exemptable Large Power Station Agreement (BELLA) (see Section D. The Connection Application: Generation Licensing)
- An agreement for electricity supply with a supplier
- A Power Purchase Agreement or an agreement with your supplier for selling your exported electricity
- Metering Agreements (discussed in Section E. Costs and Charges: Ongoing charges)

G. Technical and Commercial Interfaces: Operational Issues

In this section:

- An introduction to some operational issues
- Distribution Operating Code requirements
- DNO control schemes

Introduction

Although the focus of this Guide is on the connection process for DG, we will also touch on some operational issues. Once your generating plant has been connected, you still have some ongoing responsibilities around running your plant. These are outlined in a section of the Distribution Code, which is discussed in more detail in this section. For example, you may need to provide the DNO with forecasts of your generating plant's output, or exchange information with them if an unusual event occurs. There are different requirements for different categories of DG.

The day-to-day running of your generating plant may also be impacted by control schemes which your DNO may apply. If your DNO does apply an operational control scheme this will be detailed in your Connection Agreement, so that is the first place you should look. These schemes are only discussed briefly, so we will point you in the direction of reports which you can refer to for more background information.

Distribution Operating Code

The Distribution Operation Code

The Distribution Operation Code (DOC) is a section of the Distribution Code. The DOC sets out:

- operating procedures at the interface between the DNO and users of the distribution network; and
- requirements for certain users of the distribution network to provide data to the DNO on load forecasts and/or generation output.

The DOC covers ten different aspects of information exchange or procedures. They can apply to a variety of Distributed Generation (DG) categories; some will apply to all DG, others only to DG of a certain size. For full information on the DOC, please refer to the Distribution Code, which is available free of charge on the Distribution Code website:

www.dcode.org.uk

The areas covered are summarised in the following table, as well as who they apply to.

Distribution Operating Code

DOC Section	Applies to:	Brief Overview
DOC1	DG with output greater than 1 MW where the DNO considers it appropriate	Demand forecasting: DG has to provide generation output forecasts to the DNO.
DOC2	DG with output greater than 5 MW or greater than 1 MW of renewable generation in Scotland where the DNO considers it appropriate.	Operational planning: DG has to provide their outage programme to the DNO, and the DNO provides DG with information on possible constraints on their system which may affect the DG.
DOC5	All DG Medium DG that doesn't have an embedded generation agreement	Testing and monitoring: the DNO may need to test the quality of supply or the active / reactive power transfer at your point of connection. If they need to do this they will advise you about it, and you will be able to know the results. Up to twice a year, National Grid Electricity Transmission (NGET) may ask the DNO to ask DG for a statement of compliance with the relevant Grid Code conditions.
DOC6	Not applicable to DG	Demand control
DOC7	DG connected at HV	Operational Liaison: the DNO and DG may need to exchange operational information or information about events. In order to do this, an effective means of communication needs to be established. The DNO needs to be regularly updated with your contact information.
DOC8	All DG (excluding offshore)	Safety co-ordination: requirements to ensure the safety of people who may be working on the boundary between the DNO and DG.
DOC9	All DG (excluding offshore)	Contingency planning: sets out the co-ordination that is needed between all users under abnormal conditions.
DOC10	DG connected at HV	Operational event reporting and information supply: DG may have to report significant events, and where necessary conduct joint investigations with the DNO.
DOC11	All DG (excluding offshore)	Numbering and nomenclature of electrical apparatus at ownership boundaries: if the DNO or DG installs or changes apparatus at an ownership boundary the owner of the apparatus must be notified about the numbering and nomenclature.
DOC12	DG connected at HV	System tests: if anyone intends to undertake system tests which will effect other users, they need to follow this procedure.

Note: There is no DOC 3 or 4.

The Distribution Code refers to DG as Embedded Generation

DNO Control Schemes

When distribution networks were built, they had not been designed to connect lots of DG. Instead, the power system was designed to transmit bulk power from a number of large power stations to the distribution network, and then in turn distribute power from bulk supply points to demand customers.

There has also been significant growth in electricity customers, both demand and generation. Some distribution networks in densely populated areas are reaching the limits of their thermal and fault level capacity to accommodate more generation.

So there are two reasons why reinforcements may be required to connect DG:

- Networks were not designed for power flowing from the customer “up” the network, so equipment may need to be changed.
- Some parts of networks are reaching their limit of the capacity available for more customers.

Reinforcement has associated costs, as discussed in Section E. Costs and Charges: Connection charges and Costs and Charges: Ongoing charges.

A possible alternative to reinforcement could be a DNO control scheme for DG. For example, DG can remain connected under normal operating conditions but under certain operating conditions their output may be constrained. It should also be noted that constraining the generating plants’ output can affect the economics of a project.

For more on this topic, you may wish to refer to the following reports:

- DTI (Department for Trade and Industry, now BERR) “Solutions for the Connection and Operation of Distributed Generation” by the Distributed Generation Co-ordination Group.
- Engineering Technical Report (ETR) 124: Guidelines for actively managing power flows associated with the connection of a single distributed generation plant.
- Engineering Technical Report (ETR) 126: Guidelines for actively managing voltage levels associated with the connection of a single distributed generation plant.

Note: ETRs 124 and 126 are available to buy on the Energy Networks Association website.

Glossary of Terms

Adoption Agreement: An agreement between a developer of Distributed Generation (DG) and a Distribution Network Operator (DNO) and / or an Independent Connections Provider (ICP) concerning the transfer into DNO ownership of infrastructure supplied and installed by an Independent Connections Provider (ICP).

Ancillary Services: Services such as the provision of reactive power support and black start capability by a Generator to NGET as part of an Ancillary Services Agreement with NGET.

Auxiliary Plant: Any item of plant and/or apparatus not directly a part of the boiler plant or Generating Unit, but required for the boiler plant's or Generating Unit's functional operation.

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, in so doing, may anticipate that more energy will be 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: See Registered Capacity.

Central Dispatch: The process of scheduling and issuing direct instruction for despatch of available generation sets and interconnector transfers by the Transmission System Operator under the conditions of the transmission licence.

Connection Agreement: An agreement setting covering the conditions under which your generating plant is allowed to be physically connected to the DNO network and remain connected and energised while the network is operating normally.

Contestable: That part of the connection works which is open to competition.

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.

Connection and Use of System Code (CUSC): Contractual framework for connection to and use of the National Electricity Transmission System.

Declared Net Capacity (DNC): The maximum power available for export on a continuous basis minus any power imported by the station from the network to run its own plant.

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

Glossary of Terms



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 plant 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.

Embedded Benefits: If a generating unit is considered to be 'embedded' in the distribution network, it will be viewed as reducing the demand for power from the transmission system and the resulting losses. Suppliers can see their charges for use of the distribution system reduced as a result. Generators can, in some instances, negotiate to be paid a percentage of this benefit.

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.

Exemption Order (Generation License): Certain generation plants that are not obliged to hold a generation licence under the terms of Statutory Instrument 2001 No. 3270, The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001.



Extra High Voltage (EHV): This term is not defined in the Distribution Code, which only defines High Voltage (HV) and Low Voltage (LV). In general EHV covers connection to the distribution network at or above 22kV, or at a primary substation at or above a certain voltage level. In practice this means 33 or 66kV, or 132 kV (England and Wales only). Refer to your DNO's definition.

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).

Fault Level: Prospective current that would flow into a short circuit at a stated point in the system.

Generation Licence: A licence granted or to be granted under section 6(1)(a) of the Act - Statutory Instrument 2008 No. 2376. This licence is obtained from Ofgem.

Generating Plant: A power station including any generating unit.

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

Glossary of Terms

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

Grid Code: The code which the GB System Operator (NGET) is required to prepare under its Transmission Licence and have approved by the Authority (Ofgem) as from time to time revised with the approval of, or by the direction of, the Authority.

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

Harmonics: A component of a periodic wave with a frequency that is a multiple of the frequency of the original wave.

High Voltage (HV): A voltage exceeding 1000 V AC or 1500 V DC between conductors, or 600 V AC or 900 V DC between conductors and earth. In general DNOs consider that HV are voltages in the range of 1 kV to 22 kV.

Independent Connections Provider (ICP): Companies that have been thoroughly assessed and granted the necessary accreditation to provide new connections in competition with the DNOs.

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.

Interface Protection: The electrical protection required to ensure that the generation is disconnected for any event that could impair the integrity or degrade the safety of the Distribution Network.

Large Power Station: A power station which is connected to a system in:

- NGET's Transmission Area with a Registered Capacity of 100 MW or more;
- SP Transmission Limited's Transmission Area with a Registered Capacity of 30MW or more; or
- Scottish Hydro-Electric Transmission Limited's Transmission Area with a Registered Capacity of 10MW or more.

Levy Exemption Certificates (LECs): These exemptions favour energy efficient technologies or sustainable power plants; good quality Combined Heat and Power (CHP) and renewable electricity could be granted, under certain conditions, Levy Exemption Certificates (LECs) for each kWh of electricity generated and the LECs could be used to obtain Climate Change Levy (CCL) Exemption, and therefore avoid paying the CCL tax applied on energy supplied to industrial and business users. Directly related to the Climate Change Levy (CCL) as some supplies are excluded or exempt from the levy while others have a reduced or half-rate.

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.

Medium Power Station: A power station with a registered capacity of 50 MW or more but less than 100 MW in England and Wales (by definition, there are no medium power stations in Scotland).

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

Glossary of Terms

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.

Point of Connection: The point at which the network Extension is to be connected to the Distribution System.

Protection Settings: The provisions for detecting abnormal conditions in a System and initiating fault clearance or actuating signals or indications.

Registered Capacity: The normal full load capacity of a generation set as declared by the generator less the MW consumed when producing the same. For a customer with own generation this will relate to the level of output he expects to export to the DNO's Distribution System.

Registered Data: Data referred to in the schedules to the Distribution Data Registration Code.

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 scheme, due to the increase in fault level caused by the connection of a generating plant.

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.

Reverse Power Flows: Power flows in the opposite direction to those associated with the consumption of electricity by users.

Site Responsibility Schedule: A schedule defining the ownership, operation and maintenance responsibility of Plant and Apparatus at the Connection Point of the DNO.

Small Power Station: A power station, typically connected to a distribution system, which is connected to a system in:

- NGET's Transmission Area with a Registered Capacity of less than 50MW;
- SP Transmission Limited's Transmission Area with a Registered Capacity of less than 30MW;
- Scottish Hydro-Electric Transmission Limited's Transmission Area with a Registered Capacity of less than 10 MW.

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).

Glossary of Terms

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

System Voltage: The voltage at which an electrical network is operated.

Thermal Rating: The current-carrying capacity of a cable, an overhead line or any other item of electrical infrastructure, which is determined by the heating effect arising from electrical losses.



Transmission System (Network): A system of lines and plant 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.

UK Power Exchange: Market and clearing services for the UK Wholesale Power Market are provided by NASDAQ OMX Commodities (NOMXC) and Nord Pool Spot AS (NPS), which operates under the name N2EX. N2, the UK market offering, will initially be a marketplace for Physical UK Power contracts and launch a platform for financial futures contracts further into 2009: a physical market and a futures market. From the outset N2 will operate as a physical power exchange providing platforms for the trading of UK Power contracts. This can be divided into three product areas: the Spot Market, the Prompt Market and the Day Ahead Auction Market (DAM).

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.

Voltage Flicker: Voltage flicker is a deviation in system voltage, where power is not completely lost. Flicker may be defined as the sensation experienced by the human eye when illumination levels change as a result of the change in voltage.

Voltage Fluctuation: Fluctuations in the supply voltage that can be caused by a fluctuating load, and which in turn cause flicker.

Voltage Unbalance: Occurs where there exists a difference in voltage magnitude between phases and/or a shift in the phase separation from 120° (for a three-phase system).

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 G83/1-1](#): Recommendations for the Connection of Small-scale Embedded Generators (Up to 16 A per Phase) in Parallel with Public 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 G59/2](#), relating to the connection of generating plant to the distribution systems of licensed Distribution Network Operators—available to buy on the Energy Networks Association website.

[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.

[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.

[IEE 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 Electricity Producers	www.aepuk.com
Association of Meter Operators	www.meteroperators.org.uk
British Hydropower Association	www.british-hydro.org
Renewable UK	www.bwea.com
Carbon Trust	http://www.carbontrust.co.uk/emerging-technologies/technology-directory/pages/default.aspx
Combined Heat and Power Association	www.chpa.co.uk
Department for Energy and Climate Change	www.decc.gov.uk
Distribution Connection and Use of System Agreement (DCUSA) website	www.dcusa.co.uk
Electricity Networks Strategy Group	www.ensg.gov.uk
Elexon	www.elexon.co.uk
Energy Networks Association	http://2010.energynetworks.org
Energy Saving Trust	http://www.energysavingtrust.org.uk/Generate-your-own-energy
Lloyds Register	http://www.lloydsregister.co.uk/ners.html
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

[Solutions for the Connection and Operation of Distributed Generation](#); Distributed Generation Coordinating Group Technical Steering Committee report; DTI and Renewable Energy Programme; July 2003

[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	<p>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).</p> <p>Key changes include division of Guide into three Guides for different DG 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).</p>
2	October 2010	<p>Minor edits to the Guides:</p> <ul style="list-style-type: none"> • 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	<p>Minor edits to the Guides to reflect the changes in ownership of networks from EDF Energy to UK Power Networks.</p>
3.1	April 2011	<p>Edits to the Guides to reflect the issuance of a Guidance Note from the Distribution Code Review Panel on:</p> <ul style="list-style-type: none"> • 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. <p>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.</p>
3.2	June 2011	<p>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.</p>

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 Power Grid. At the request of Ofgem, inclusion of URL links to DNOs' Long Term Development Statements (LTDS).