Connection of generation plant to distribution networks

It is possible to connect almost any generation plant to the distribution network and in order for the connection to meet the requirements of a new customer and the existing customers it is important to ensure the new connection is properly designed. In order to do this there is a need for information to be exchanged between you as the generator and the local Distribution Network Operator (DNO). The Data Registration Code of the Distribution Code sets out the obligations on the generator and DNO to exchange data as part of the design process and lists the data items that may need to be exchanged. The purpose of this application form is to simplify and clarify this data exchange process.

If the generation plant that you are applying to connect is less than 16A per phase, you will probably be able to connect it using the far simpler connection process for generation plant complying with Engineering Recommendation G83/1. This Application Form is for all other generators and is in two parts.

Part 1
This part collates the initial data that the DNO requires to assess the connection application and in some cases this information may be sufficient for the DNO 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 for the DNO to complete the connection design and make a connection offer. The DNO will advise you if you need to provide further information so that the connection design can be completed when Part 1 of the Application Form has been assessed by the DNO.

Part 2
If the DNO requires information in addition to that provided on Part 1 of the application form, the DNO will request that Part 2 of the application form is completed. Generally you will need to complete all of Part 2 of the application form appropriate to the type of generator although the DNO may indicate if not all of this information is required.

In some cases the DNO will require further information which is not included in either part of the application form to complete the connection design. The DNO will advise you if such information is required.

There is the option for you to complete Part 1 and 2 of the application form and return both of these as part of the initial data exchange. This will speed up the DNO design process as there is unlikely to be a need for additional information to be provided. However this may result in you providing information that is not required in order for the DNO to design the connection.

The application forms can be downloaded from the ENA website and when completed they should be sent to your local DNO. Their contact details can be found by following the link below:

http://2010.energynetworks.org/ena-members/

If you are unsure of who your local DNO is, please follow the link below to do a postcode search.

http://2010.energynetworks.org/whos-my-supplier/

Guidance on completing the application form

The following section provides an overview of the information required to complete each part of the application form.

Part 1
This part of the application form is in two sections. Part 1a enables you to provide:

- Contact details for you and your consultant (if you have one)
- The location of your generation plant, or power station. The term power station is used in the application form so that it is consistent with the terms used in the Distribution Code
- Details of the import and export requirements for your site. It is important to make sure that you consider the import requirements for any load that you have on your site in addition to the export from the generation plant
- Information about the fault level contribution from the generation plant at the site boundary, although you do not need to provide this information here if more detailed fault level information is provided in Part 1b of the application form.

Part 1b of the application form enables you to provide more detailed information on each of the generators you are applying to connect. Slightly more information is required if the connection is likely to be at high voltage rather than at low voltage. If the generation plant you are looking to connect is larger than 150kW you should assume that your site may be connected at high voltage and provide this additional information.

If there are any items on the application form that you are unsure about, it would be worth contacting the company you are arranging to buy your generation plant from as they should be able to provide some of the more technical information. If you are unable to provide some of the technical details for example if you have not yet decided who to buy your generation plant from, you can provide estimated data provided that you clearly indicate on the application form which data is estimated. You will need to confirm this data as soon as possible and always before the generator is commissioned.

Part 2
This part of the application form enables you to provide detailed technical information about the generation plant you are applying to connect. It is split into five sections. The first four sections relate to particular types of generating plant designs. You only need to complete the section relating to the type of generating plant that you are applying to connect i.e. Part 2a, 2b, 2c or 2d. Use one form for each type of generating plant. The fifth section enables you to provide information about any transformers that you plan to use.

As when completing Part 1, if you are unable to provide some of the technical details, if for example you have not yet decided who to buy your generation plant from, you can provide estimated data provided that you clearly indicate on the application form which data is estimated. You will need to confirm this data as soon as possible and always before the generator is commissioned.

----------PART 1a----------

Applicant's Details

Company Name :	
Company registered No.	
Postal Address :	
Contact Name :	
Email Address :	
Telephone No.	
Fax No.	

Consultant's Details (if applicable)

Consultants Name :	
Postal Address:	
Contact Name :	
Email Address :	
Telephone No.	
Fax No.	

Power station location and operation

Power station name :	
Postal Address or site boundary plan (1:500) :	
Details of any existing Connection Agreements :	
Target date for provision of connection / commissioning of power station :	

----------PART 1a ----------

Connection Point (OS grid ref or description) :		
Preferred connection point voltage :		V
Single line diagram of any on-site existing or proposed electrical plant or, where available, operation diagrams	Please attach	
What security is required for the connection? (see Note A1) :		
No. of generation sets in power station :		
Are all generation sets of same design/rating?		Y/N
Will power station operate in island mode?		Y/N
Will generation plant supply electricity to on-site premises?		Y/N

Power station standby import requirements (see Note A2)

Maximum active power import		MW
Maximum reactive power import (lagging)		MVAr
Maximum reactive power export (leading)		MVAr

Power station top-up import requirements (see Note A3)

Maximum active power import		MW
Maximum reactive power import (lagging)		MVAr
Maximum reactive power export (leading)		MVAr

----------PART 1a----------

Power station export requirements (see Note A4):

Total power station output at registered capacity (net of auxiliary loads)

Registered capacity (maximum active power export)	MW
Maximum reactive power export (lagging)	MVAr
Maximum reactive power import (leading)	MVAr

Power station maximum fault current contribution (see Note A5)

Peak asymmetrical short circuit current at 10ms (i_p) for a 3φ short circuit fault at the connection point	kA
RMS value of the initial symmetrical short circuit current (I_k") for a 3φ short circuit fault at the connection point	kA
RMS value of the symmetrical short circuit current at 100ms ($I_{k(100)}$) for a 3φ short circuit fault at the connection point	kA

Power station interface arrangements (see Note A6)

Means of connection, disconnection and synchronising between the DNO and the Customer	

Note A1 – The DNO will assume a single circuit connection to the power station is required unless otherwise stated. Options include:
(a) single circuit connection
(b) manually switched alternative connection
(c) automatic switched alternative connection
(d) firm connection (secure for first circuit outage)

Note A2 – This section relates to operating conditions when the power station is importing active power, typically when it is not generating. The maximum active power import requirement and the associated maximum reactive power import and/or export requirements should be stated

Note A3 - This section relates to operating conditions when the power station is importing active power, typically when it is generating, but is not generating sufficient power to cater for all the on-site demand

Note A4 – This section relates to operating conditions when the power station is exporting active power. The active power export and associated maximum reactive power export and/or import should be stated for operation at registered capacity.

Note A5 - See Engineering Recommendation G74, ETR 120 and IEC 60909 for guidance on fault current data. Additionally, fault current contribution data may be provided in the form of detailed graphs, waveforms and/or tables. This information need not be provided where detailed fault level contribution / impedance data is provided for each Generation Set in Part 1b or Part 2 of this application form

Note A6 - The interface arrangements need to be agreed and implemented between the User and DNO before energisation. DPC7.3.1 of the Distribution Code refers.

----------PART 1b ----------

Generation set general data

Number of generation sets to which this data applies:		
Type of generation set (please tick box)	Synchronous generator	□
	Fixed speed induction generator	□
	Double fed induction generator	□
	Series converter / inverter connected generator	□
	Other (provide details)	□
Type of prime mover:		
Operating regime (see Note B1). Please tick box	Intermittent	□
	Non-intermittent	□

Generation set Active Power capability

Rated terminal voltage (generator)	V
Rated terminal current (generator)	A
Generation set registered capacity (net)	MW
Generation set apparent power rating (to be used as base for generator parameters)	MVA
Generation set rated active power (gross at generator terminals)	MW

Generation set Reactive Power capability at rated Active Power (gross, at generator terminals)

Maximum reactive power export (lagging). For HV connected generators only	MVAr
Maximum reactive power import (leading). For HV connected generators only	MVAr

----------PART 1b ----------

Generation set maximum fault current contribution (see Note B2)

Peak asymmetrical short circuit current at 10ms (i_p) for a 3φ short circuit fault at the generation set terminals (HV connected generators only)	kA
RMS value of the initial symmetrical short circuit current (I_k") for a 3φ short circuit fault at the generation set terminals (HV connected only)	kA
RMS value of the symmetrical short circuit current at 100ms ($I_{k(100)}$) for a 3φ short circuit fault at the generation set terminals	kA

Note B1 – Intermittent and Non-intermittent Generation is defined in Engineering Recommendation P2/6 as follows:
Intermittent Generation: Generation plant where the energy source for the prime mover can not be made available on demand.
Non-intermittent Generation: Generation plant where the energy source for the prime mover can be made available on demand.

Note B2 - See Engineering Recommendation G74, ETR 120 and IEC 60909 for guidance on fault current data. Additionally, fault current contribution data may be provided in the form of detailed graphs, waveforms and/or tables.

----------PART 2a----------

Generation set model data: Synchronous generation sets (or equivalent synchronous generation sets)

Generation set identifier:	
Type of generation set (wound rotor, salient pole or asynchronous equivalent). See Note C1	
Positive sequence (armature) resistance (HV connected generators only)	per unit
Inertia constant (generation set and prime mover). (HV connected generators only)	MWsec/MVA
Direct axis reactances:	
Sub-transient (X''_d) – unsaturated / saturated	per unit
Transient (X'_d) – unsaturated / saturated (HV connected generators only)	per unit
Synchronous (X_d) – unsaturated / saturated (HV connected generators only)	per unit
Time constants:	
State whether time constants are open or short circuit (HV connected only)	
D-axis sub-transient – unsaturated / saturated (HV connected generators only)	s
D-axis transient – unsaturated / saturated (HV connected generators only)	s

Note C1 – Asynchronous generators may be represented by an equivalent synchronous generator data set

----------PART 2b ----------

Generation set model data: Fixed speed induction generation sets (see Notes D1 and D2)

Magnetising reactance (HV connected generators only)	per unit
Stator resistance (HV connected generators only)	per unit
Stator reactance (HV connected generators only)	per unit
Inner cage or running rotor resistance (HV connected generators only)	per unit
Outer cage or standstill rotor reactance (HV connected generators only)	per unit
State whether data is inner-outer cage or running-standstill (HV generators connected only)	
Slip at rated output (HV connected generators only)	%

Total effective inertia constant (generator and prime mover). HV connected generators only	MWsec/MVA
Shunt capacitance connected in parallel at % of rated output:	
Starting	kVAr or graph
20%	kVAr or graph
40%	kVAr or graph
60%	kVAr or graph
80%	kVAr or graph
100%	kVAr or graph
Active power and reactive power import during start-up	MW-MVAr / time graphs
Active power and reactive power import during switching operations e.g. '6 to 4 pole' change-over (HV connected generators only)	MW-MVAr / time graphs
Under voltage protection setting & time delay	puV, s

Note D1 – Asynchronous generators may be represented by an equivalent synchronous data set

Note D2 – You will need to provide the above data for each asynchronous generation set based on the number of pole sets (i.e. two data sets for dual speed 4/6 pole machines)

----------PART 2c----------

Generation set model data: Doubly fed induction generation sets

Generation set maximum fault current contribution data (see Note E1)	
Magnetising reactance (HV connected generators only)	per unit
Stator resistance (HV connected generators only)	per unit
Stator reactance (HV connected generators only)	per unit
Running rotor resistance (HV connected generators only)	per unit
Running rotor reactance (HV connected generators only)	per unit
Standstill rotor resistance (HV connected generators only)	per unit
Standstill rotor reactance (HV connected generators only)	per unit
State whether data is inner-outer cage or running-standstill (HV generators connected only)	
Generator rotor speed range – Minimum to rated speed (HV connected generators only)	rpm
Total effective inertia constant at rated speed (generator and prime mover). HV connected generators only	MWsec/MVA

Note E1 – Fault current contribution data should be provided in Part 1 of this application form

----------PART 2d ----------

Generation set model data: Series converter / inverter connected generation sets

Generation set maximum fault current contribution data (see Note E1)	
Generator rotor speed range (HV connected generators only)	rpm
Total effective inertia constant (generator and prime mover). HV connected generators only	MWsec/MVA

Note E1 – Fault current contribution data should be provided in Part 1 of this application form

----------PART 2e----------

Transformer information

Transformer identifier	
Transformer type (Unit/Station/Auxiliary)	
Number of identical units	
Type of cooling	
Rated (apparent) power	MVA
Rated voltage ratio (on principal tap)	kV/kV
Positive sequence resistance (HV connected only)	per unit
Positive sequence reactance at principal tap	per unit
Winding configuration (e.g. Dyn11). HV connected only	
Type of tap changer (on load / off circuit)	
Tap step size	%
Maximum ratio tap	%
Minimum ratio tap	%
Method of voltage control (HV connected only)	

Method of earthing of high-voltage winding
Method of earthing of low-voltage winding