Generation Connections

Generation Application Part B: Technical Form

For all applications with total installed generation capacity greater than 16A per phase (>4kW).

01 May 2018

How to fill out this application form

All applicants must fill out part 1a and part 1b of this form.

Please complete any sections of Part 2 which may be relevant to the proposed generation scheme.

Please ensure that information for any existing generation within the proposed generation scheme is included.

Part 2 contains the following:

Generation set model data for:

- 2a: Synchronous generation sets (or equivalent synchronous generation sets)
- 2b: Series converter / inverter connected generation sets
- 2c: Fixed speed induction generation sets
- 2d: Doubly fed induction generation sets
- 2e: Transformer information (HV connected Generation schemes only)

Additional Information

This technical information form is based on the ENA generation application form template.

There may be information that we will require in order to design your connection that is not specifically asked for on this form. We would like to invite you to submit any other relevant information which you deem necessary to the design of your connection.

NIE Networks reserves the right to put your application on hold until we have obtained all of the information required to design your connection, this includes but is not limited to the information requested on this form.

Multiple Generators on Site

If all generators on site are not of the same type or design, then multiple forms from Part 1b and Part 2 will be required. Please mark clearly the generator for which each form applies to.

e.g. an installation that involves 3 identical DFIG wind turbines as well as a solar powered PV array will require a Part 1b containing the wind turbine information and a Part 1b containing information regarding the PV. It would also require a Part 2c for the wind turbines and Part 2d for the inverter connected PV. (This would also require Part 2e if the installation is to be an HV connection).

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

Note: We will require copies of the relevant technical electrical documentation as proof of the technical information provided in this application form.
We will also require details of any existing generation on site

Preferred connection point voltage (Leave blank if no preference):	kV
Single line diagram of any on-site existing or proposed electrical plant or, where available, operation diagrams	☐ Tick if attached
For inverter connected generation: Individual (and Aggregated*) Harmonic studies.	☐ N/A ☐ Tick if attached ☐ To be submitted at a later date *Aggregated Harmonics apply where more than 1 inverter is to be employed
What security is required for the connection? ***(see Note A1)*** **:**	
No. of generation sets in Generation scheme :	
Are all generation sets of same design/rating?	Yes / No
Will the Generation scheme operate in island mode?	Yes / No
Will generation plant supply electricity to on-site premises?	Yes / No
Will the generator operate in long term or short term parallel to the network? (e.g. short term standby generator or long term generation scheme)	Long term / Short term

Generation scheme standby import requirements (MIC) *(see Note A2)*

Maximum active power import	kW
Maximum reactive power import (lagging)	kVAr
Maximum reactive power export (leading)	kVAr
If Maximum active power import is greater than or equal to 200 kW, please attach the following:	☐ Tick if not applicable ☐ Tick if attached
Breakdown of all motors within the installation	
Starting devices of each motor	
Details of starting and running currents of all motors	
Frequency of starts	
Other abnormal loads within the supply	

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

Generation scheme top-up import requirements *(see Note A3)*

Maximum active power import	kW
Maximum reactive power import (lagging)	kVAr
Maximum reactive power export (leading)	kVAr

Generation scheme export requirements (MEC) *(see Note A4)*

Total Generation scheme output at registered export capacity

Registered export capacity (maximum active power export)	kW
Maximum reactive power export (lagging)	kVAr
Maximum reactive power import (leading)	kVAr

For limited/zero export schemes only *(see Note A5)*

Total installed generation capacity

Installed generation capacity (maximum active power output)	kW
Maximum reactive power (lagging)	kVAr
Maximum reactive power (leading)	kVAr
Single line diagram showing how the installed scheme will limit export.	☐ Tick if attached

Generation scheme maximum fault current contribution *(see Note A6)*

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

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

Generation scheme interface arrangements
(see Note A7)

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

Note A1 – NIE Networks will assume a single circuit connection to the Generation scheme is required unless otherwise stated. Options include:
(a) single circuit connection. Typical for the majority of generation connections.
(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 Generation scheme 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 Generation scheme 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. The minimum Distribution Code design is ±0.95 power factor.

Note A5 – A limited export scheme is where a generation scheme has a lesser export capacity (MEC) than the total installed generation on site (for example: a 10 MW wind farm with a 9.5 MW MEC). The generation scheme must not export power exceeding their MEC; therefore a suitable power limiting system will be required to prevent this.
If you do not require a limited/zero export scheme then please leave the related section of this form blank.

Note A6 - 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 A7 - The interface arrangements need to be agreed and implemented between the User and NIE Networks before energisation.

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

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

Note: If multiple types/variants of generation will be installed on site, a Part 1b must be completed for each type/variant of generator. (This includes any existing generation installed on site.)

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)	kW
Generation set apparent power rating (to be used as base for generator parameters)	kVA
Generation set rated active power (gross at generator terminals)	kW

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

Maximum reactive power export (lagging).	kVAr
Maximum reactive power import (leading).	kVAr

----------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	kA
RMS value of the initial symmetrical short circuit current (I_k") for a 3φ short circuit fault at the generation set terminals	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 A8***	
Positive sequence (armature) resistance	per unit
Inertia constant (generation set and prime mover).	kWsec/kVA
Direct axis reactances;	
Sub-transient (X''_d) – unsaturated / saturated	per unit
Transient (X'_d) – unsaturated / saturated	per unit
Synchronous (X_d) – unsaturated / saturated	per unit
Time constants:	
State whether time constants are open or short circuit	
D-axis sub-transient – unsaturated / saturated	s
D-axis transient – unsaturated / saturated	s

Note A8 – Asynchronous generators may be represented by an equivalent synchronous generator data set

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

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

Generation set maximum fault current contribution data ***(see Note B3)***	
Generator rotor speed range	rpm
Total effective inertia constant (generator and prime mover).	kWsec/kVA

Note B3 – Fault current contribution data should be provided in Part 1 of this application form

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

Generation set model data: Fixed speed induction generation sets *(see Notes C1 and C2)*

Magnetising reactance	per unit
Stator resistance	per unit
Stator reactance	per unit
Inner cage or running rotor resistance	per unit
Outer cage or standstill rotor reactance	per unit
State whether data is inner-outer cage or running-standstill	
Slip at rated output	%
Total effective inertia constant (generator and prime mover).	kWsec/kVA
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	kW-kVAr / time graphs
Active power and reactive power import during switching operations e.g. '6 to 4 pole' change-over	kW-kVAr / time graphs
Under voltage protection setting & time delay	puV, s

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

Note C2 – 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 2d ----------

Generation set model data: Doubly fed induction generation sets

Generation set maximum fault current contribution data ***(see Note D1)***	
Magnetising reactance	per unit
Stator resistance	per unit
Stator reactance	per unit
Running rotor resistance	per unit
Running rotor reactance	per unit
Standstill rotor resistance	per unit
Standstill rotor reactance	per unit
State whether data is inner-outer cage or running-standstill	
Generator rotor speed range – Minimum to rated speed	rpm
Total effective inertia constant at rated speed (generator and prime mover).	kWsec/kVA

Note D1 – Fault current contribution data should be provided in Part 1 of this application form

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

Transformer information (HV connected Generation schemes only; see note E1)

Transformer identifier	
Transformer type (Unit/Station/Auxiliary)	
Number of identical units	
Type of cooling	
Rated (apparent) power	kVA
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

Note E1 – All large scale generation applications should be HV connected.