Part 3

To be completed for all Type A, Type B, Type C and Type D Power Generating Modules

Part 3 Section 1a -
summary of the new Generating Units that comprise the Power Generating Module

Part 3 Section 1b -
summary of the existing Generating Units that comprise the Power Generating Module

Part 3 Section 2 -
Generating Unit data

Part 3 Section 1a - summary of the new Generating Units that comprise the Power Generating Module The second section of Part 3 should be completed for each different Generating Unit. (See Note 5)

Power Generating Module general data

Name(s) / identifiers of Power Generating Modules. Where the Power Generating Module contains components or products that are type tested, include the type test reference numbers here.

Will any Generating Unit operate in island mode?	◯ Yes	◯ No
Will any Generating Unit supply electricity to on-site load?	◯ Yes	◯ No
Will the Generating Unit operate solely in infrequent short-term parallel operation mode	◯ Yes	◯ No

	Number of Generating units	Type of prime movers	Energy Source Availability (see Note 6)	Energy Source and Technology Type (see Note 7)
Synchronous Power Generating Module			◯ Intermittent ◯ Non-intermittent	
Fixed speed induction Generating Unit			◯ Intermittent ◯ Non-intermittent	
Double fed induction Generating Unit			◯ Intermittent ◯ Non-intermittent	
Series inverter connected Generating Unit			◯ Intermittent ◯ Non-intermittent	
Electricity Storage Generating Unit			◯ Intermittent ◯ Non-intermittent	
Other (please specify				
			◯ Intermittent ◯ Non-intermittent	

Part 3 Section 1b - summary of any existing Generating Units that comprise the Power Generating Module

Power Generating Module general data

Name(s) / identifiers of Power Generating Modules. Reference the Engineering Recommendation under which the Power Generating Modules were connected (eg G83, G59, G98, G99)

Does any Generating Unit operate in island mode? ◯ Yes ◯ No

Does any Generating Unit supply electricity to on-site load? ◯ Yes ◯ No

	Number of Generating units	Type of prime movers	Energy Source Availability (see Note 6)	Energy Source and Technology Type (see Note 7)
Synchronous Power Generating Module			◯ Intermittent ◯ Non-intermittent	
Fixed speed induction Generating Unit			◯ Intermittent ◯ Non-intermittent	
Double fed induction Generating Unit			◯ Intermittent ◯ Non-intermittent	
Series inverter connected Generating Unit			◯ Intermittent ◯ Non-intermittent	
Electricity Storage Generating Unit			◯ Intermittent ◯ Non-intermittent	
Other (please specify			◯ Intermittent ◯ Non-intermittent	

Note 5 - Synchronous Power Generating Modules are generally synonymous with Generating Unit in EREC G99 except certain cases, such as a Combined Cycle Gas Turbine (CCGT) Module for example. A CCGT Module can be comprised of a number of Generating Units.

A Power Generating Facility may be made up of a number of Synchronous Power Generating Modules.

Asynchronous or Inverter connected Power Generating Modules are defined as Power Park Modules in EREC G99 and are typically comprised of several Generating Units connected together.

A Power Generating Facility could comprise several Synchronous Power Generating Modules and one Power Park Module. The exception to this is when new plant is being connected to a Power Generating Facility where there are Power Generating Modules which were connected under EREC G83 or EREC G59 and EREC G99 should be referred to for more detailed consideration of this.

Note 6 - Intermittent and Non-intermittent Generation is defined in EREP 130 as follows:

Intermittent Generation: Generation plant where the energy source for the prime mover cannot 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 7 - Energy Source & Technology Type

Please select combination of Energy Source and Technology Type from the list below. For example, a solar PV array would be R11 and a gas turbine would be I3.

If the Generating Units are part of a CHP scheme, “CHP” should be included with the code numbers.

If the Generating Unit is part of a Vehicle to Grid Electric Vehicle “V2G” should be included with the code numbers.

	Energy Source (Note 7)
A	Advanced Fuel (produced via gasification or pyrolysis of biofuel or waste)
B	Biofuel - Biogas from anaerobic digestion (excluding landfill & sewage)
C	Biofuel - Landfill gas
D	Biofuel - Sewage gas
E	Biofuel - Other
F	Biomass
G	Fossil - Brown coal/lignite
H	Fossil - Coal gas
I	Fossil - Gas
J	Fossil - Hard coal
K	Fossil - Oil
L	Fossil - Oil shale
M	Fossil - Peat
N	Fossil - Other
O	Geothermal
P	Hydrogen
Q	Nuclear
R	Solar
S	Stored Energy (all stored energy irrespective of the original energy source)
T	Waste
U	Water (flowing water or head of water)
V	Wind
W	Other (Please detail energy source as applicable)

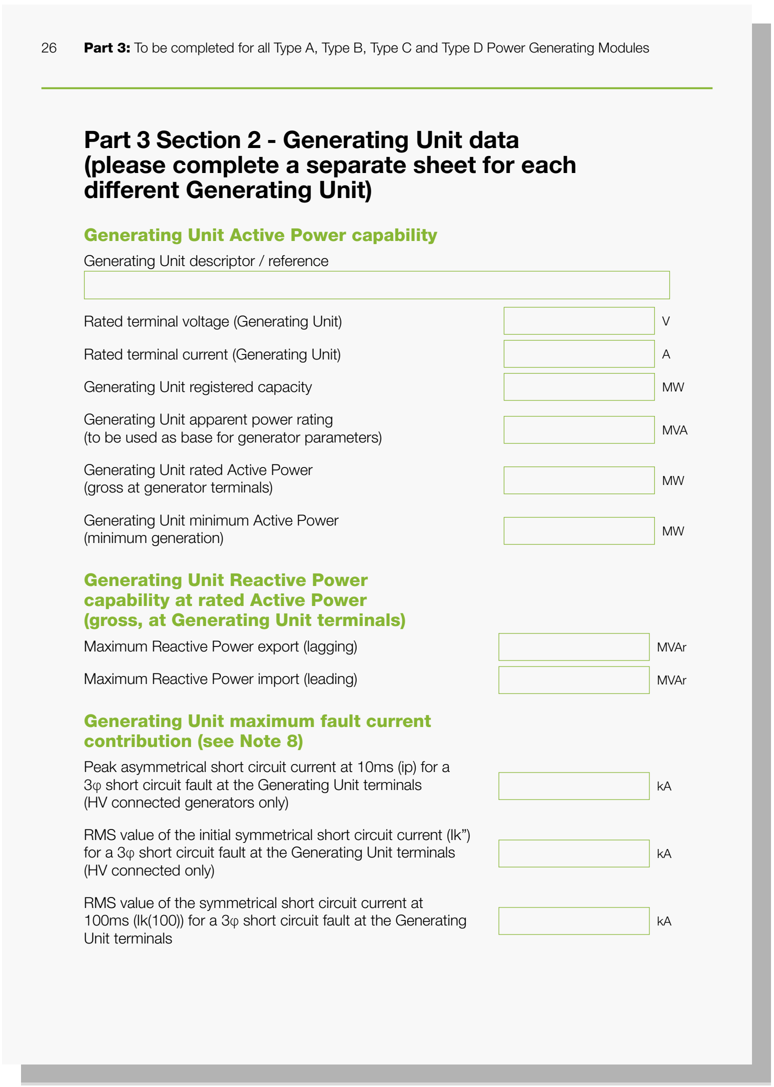
	Energy Conversion Technology (Note 7)
1	Engine (combustion / reciprocating)
2	Fuel Cell
3	Gas turbine (OCGT)
4	Geothermal power plant
5	Hydro - Reservoir (not pumped)
6	Hydro - Run of river
7	Hydro - Other
8	Interconnector
9	Offshore wind turbines
10	Onshore wind turbines
11	Photovoltaic
12	Steam turbine (thermal power plant)
13	Steam-gas turbine (CCGT)
14	Tidal lagoons
15	Tidal stream devices
16	Wave devices
17	Storage - Chemical - Ammonia
18	Storage - Chemical - Hydrogen
19	Storage - Chemical - Synthetic Fuels
20	Storage - Chemical - Drop-in Fuels
21	Storage - Chemical - Methanol
22	Storage - Chemical - Synthetic Natural Gas
23	Storage - Electrical - Supercapacitors
24	Storage - Electrical - Superconducting Magnetic ES (SMES)
25	Storage - Mechanical - Adiabatic Compressed Air

	Energy Conversion Technology (Note 7)
26	Storage - Mechanical - Diabatic Compressed Air
27	Storage - Mechanical - Liquid Air Energy Storage
28	Storage - Mechanical - Pumped Hydro
29	Storage - Mechanical - Flywheels
30	Storage - Thermal - Latent Heat Storage
31	Storage - Thermal - Thermochemical Storage
32	Storage - Thermal - Sensible Heat Storage
33	Storage - Electrochemical Classic Batteries - Lead Acid
34	Storage - Electrochemical Classic Batteries - Lithium Polymer (Li-Polymer)
35	Storage - Electrochemical Classic Batteries - Metal Air
36	Storage - Electrochemical Classic Batteries - Nickle Cadmium (Ni-Cd)
37	Storage - Electrochemical Classic Batteries - Sodium Nickle Chloride ($NaCL_2$)
38	Storage - Electrochemical Classic Batteries - Lithium Ion (Li–ion)
39	Storage - Electrochemical Classic Batteries - Sodium Ion (Na–ion)
40	Storage - Electrochemical Classic Batteries - Lithium Sulphur (Li-S)
41	Storage - Electrochemical Classic Batteries - Sodium Sulphur (Na-S)
42	Storage - Electrochemical Classic Batteries - Nickle – Metal Hydride (Ni-MH)
43	Storage - Electrochemical Flow Batteries - Vanadium Red-Oxide
44	Storage - Electrochemical Flow Batteries - Zinc – Iron (Zn –Fe)
45	Storage - Electrochemical Flow Batteries - Zinc – Bromine (Zn –Br)
46	Storage - Other
47	Other (Please detail energy conversion technology as applicable)

Part 3 Section 2 - Generating Unit data

Please complete a separate sheet for each different Generating Unit

If you are connecting more than one different Generating Unit you should complete a separate Part 3 form for each different Generating Unit. Master versions of the Part 3 form are separately available for this purpose.


26 **Part 3:** To be completed for all Type A, Type B, Type C and Type D Power Generating Modules

Part 3 Section 2 - Generating Unit data (please complete a separate sheet for each different Generating Unit)

Generating Unit Active Power capability

Generating Unit descriptor / reference

Rated terminal voltage (Generating Unit)		V
Rated terminal current (Generating Unit)		A
Generating Unit registered capacity		MW
Generating Unit apparent power rating (to be used as base for generator parameters)		MVA
Generating Unit rated Active Power (gross at generator terminals)		MW
Generating Unit minimum Active Power (minimum generation)		MW

Generating Unit Reactive Power capability at rated Active Power (gross, at Generating Unit terminals)

Maximum Reactive Power export (lagging)		MVAr
Maximum Reactive Power import (leading)		MVAr

Generating Unit maximum fault current contribution (see Note 8)

Peak asymmetrical short circuit current at 10ms (ip) for a 3φ short circuit fault at the Generating Unit terminals (HV connected generators only)		kA
RMS value of the initial symmetrical short circuit current (Ik”) for a 3φ short circuit fault at the Generating Unit terminals (HV connected only)		kA
RMS value of the symmetrical short circuit current at 100ms (Ik(100)) for a 3φ short circuit fault at the Generating Unit terminals		kA

Part 3 Section 2 - Generating Unit data (please complete a separate sheet for each different Generating Unit)

Generating Unit Active Power capability

Generating Unit descriptor / reference

Rated terminal voltage (Generating Unit)		V
Rated terminal current (Generating Unit)		A
Generating Unit registered capacity		MW
Generating Unit apparent power rating (to be used as base for generator parameters)		MVA
Generating Unit rated Active Power (gross at generator terminals)		MW
Generating Unit minimum Active Power (minimum generation)		MW

Generating Unit Reactive Power capability at rated Active Power (gross, at Generating Unit terminals)

Maximum Reactive Power export (lagging)		MVAr
Maximum Reactive Power import (leading)		MVAr

Generating Unit maximum fault current contribution (see Note 8)

Peak asymmetrical short circuit current at 10ms (ip) for a 3φ short circuit fault at the Generating Unit terminals (HV connected generators only)		kA
RMS value of the initial symmetrical short circuit current (Ik”) for a 3φ short circuit fault at the Generating Unit terminals (HV connected only)		kA
RMS value of the symmetrical short circuit current at 100ms (Ik(100)) for a 3φ short circuit fault at the Generating Unit terminals		kA

Impedance data for fault current contribution calculations (see Note 8)

Are there any transformers between the Generating Unit and the Connection Point?	◯ Yes ◯ No	
Number of Generating Units connected to the transformer		Number
Rated apparent power of the transformer		MVA
Positive sequence reactance of the transformer		per unit
For sites with significant other impedance (multiple transformers, cables or overhead lines) between the Generating Unit and the Connection Point sketch of site detailing generator connection and impedances provided	◯ Sketch ◯ SLD	

This information can be detailed on the single line diagram (SLD) provided in Part 1

Note 8 – 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.

If you have a site with several Power Generating Modules or induction motors you can complete the site maximum fault level contribution information in Part 2 and you do not need to complete these fault current contribution entries. In this case it is likely that the DNO will require completion of Part 4 at a later stage.

If you are providing the Generating Unit maximum fault current contribution it is necessary to provide any other significant site impedance data to enable the DNO to calculate the fault current contribution from the Generating Unit(s) at the Connection Point. A sketch marked with the transformer and circuit resistance and reactance should be provided. This can be in ohms or per unit. If provided in per unit the base should be stated. This can be provided per meter together with the total circuit length, or for the total circuit length.

Electricity Storage Plant

Storage device capacity ☐ MWh

Does the storage form part of a CHP scheme? ○ Yes ○ No

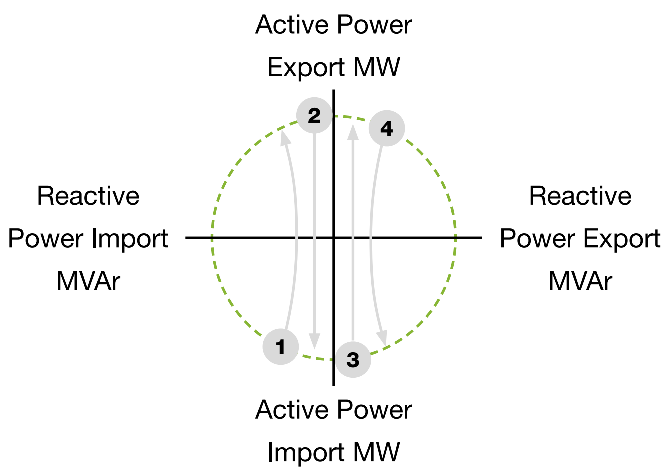
Please describe the operational mode (eg frequency response, generation arbitrage)

For the intended control mode or to meet a specific commercial service are there any known technical or operational requirements? For example the scheme may be required to operate at a Power Factor other than which might be required by the DNO as measured at the Connection Point?

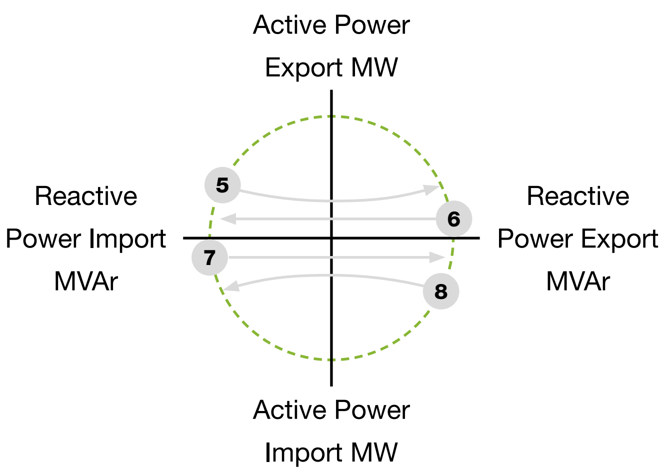
Please provide details below

Diagrammatical representation of example active power swings

Active power swings



Reactive power swing



These diagrams assume the other vector (MW or MVAr) does not change during the power swing.

A more onerous condition, from a voltage step change perspective, occurs when the power factor is maintained and both vectors change from one operational mode to the other. In this case the swing would move diagonally between quadrants.

Electricity Storage Plant

Active and Reactive Power swing requirements (refer to diagram for example numbering) (see Note 9)

Change from Import Active Power to Export Active Power (swing 1 and / or 3)

Initial values:

MW Import | MVAr | ◯ MVAr Import | ◯ MVAr Export | MW/s

Final values

MW Export | MVAr | ◯ MVAr Import | ◯ MVAr Export

Change from Export Active Power to Import Active Power (swing 2 and / or 4)

Initial values:

MW Export | MVAr | ◯ MVAr Import | ◯ MVAr Export | MW/s

Final values

MW Import | MVAr | ◯ MVAr Import | ◯ MVAr Export

Change from Import Reactive Power to Export Active Power (swing 5 and / or 7)

Initial values:

MVAr Import ☐ MW ☐ ◯ MW Import ◯ MW Export MVAr/s ☐

Final values

MVAr Export ☐ MW ☐ ◯ MW Import ◯ MW Export

Change from Export Reactive Power to Import Active Power (swing 6 and / or 8)

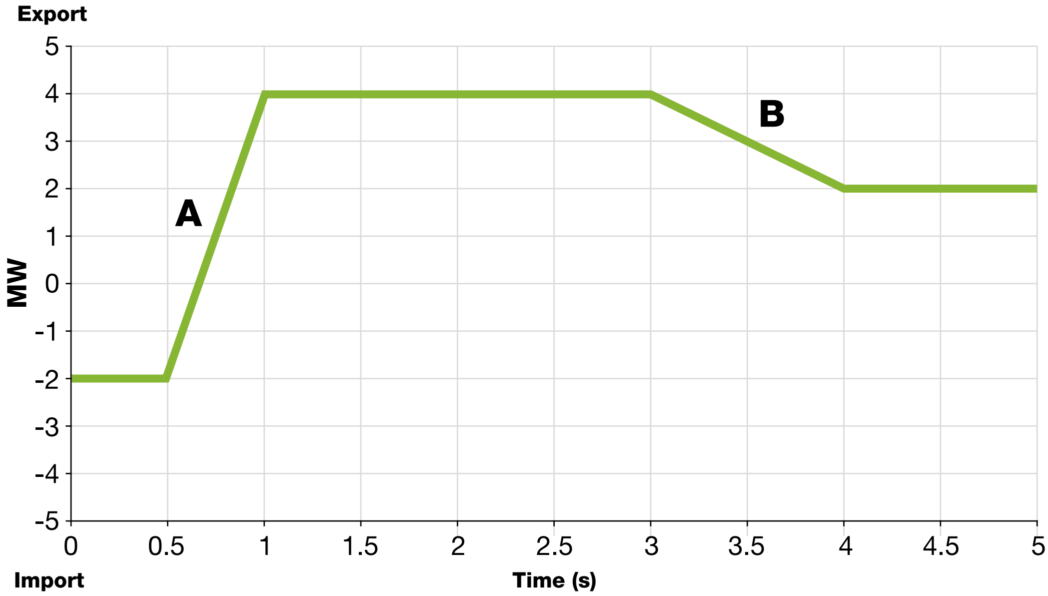
Initial values:

MVAr Export ☐ MW ☐ ◯ MW Import ◯ MW Export MVAr/s ☐

Final values

MVAr Import ☐ MW ☐ ◯ MW Import ◯ MW Export

Example of Ramp Rate / Total Power Swing (Change in MW)



A - Example of ramp which transitions from import to export

Ramp rate (Positive)	= (2+4) MW / 0.5sec	= 12 MW per sec
Total power swing	= (2+4) MW	= 6 MW

B - Example of ramp during export

Ramp rate (Negative)	= (4-2) MW / 1 sec	= 2 MW per sec
Total power swing	= (4-2) MW	= 2 MW

Note 9 – System design studies will be undertaken in accordance with P28 to assess the worst case voltage step change based on the worst case power swing of both Active Power and Reactive Power required by the Customer. It is recognised that the design and operation of the Electricity Storage System may mean that these parameters will not all change simultaneously and to ensure that the connection design meets the Customer's requirements an accurate representation the Electricity Storage Plant operation should be detailed here.

The outcome of the studies and hence the possible need for network reinforcement is dependent on the change in magnitude and direction of both Active Power and Reactive Power. It should be noted that the Connection Agreement will be based on the values provided in this form and if the Electricity Storage Plant owner wishes to change the operating arrangements in the future, it will be necessary for them to formally request a Modification to their Connection Agreement so that the DNO can assess the capacity of the distribution system to accommodate the revised operating regime.