Power generating module Document (“PGMD”)

This form is intended for the registration of a new Power Generating Module (PGM) with a capacity from 1 MW to 50 MW (“type B”) or from 50 MW to 60 MW (“type C”). If you want to register more than one new power generating modules, please complete a separate form for each power generating module. A wind farm or solar park, consisting of several generating units (e.g. wind turbines), connected to one connection point, is considered as a single power generating module, so that one form will suffice. You can complete this form with the help of your installer and/or the supplier of the power generating module. Fill in all requested information on this form. Add attachments only if requested.

General data

Site of the connection point (As stated in connection agreement (ATO)

Street/house number :

Post code :

City :

EAN code of the connection : *(if already known)*

Commissioning date

The planned date of commissioning of the power generating module.

Date :

Power generating module data

The data below relates to the power generating module as a whole.
This concerns parameters/performance at the connection point of the system operator.

Structure of electrical installation

Attach a single-line diagram/plan of the structure of your electrical installation as an annex to this form. It must include the primary components from the point of connection to the generators or convertors. The location and settings of the protection must be Incorporated in the single line diagram.

Diagram in annex.

Primary energy source

Choose from one or more of these standard categories:

- ☐ B01 - biomass
- ☐ B04 - natural gas
- ☐ B09 - geothermal
- ☐ B11 - hydropower
- ☐ B16 - sun
- ☐ B17 - waste
- ☐ B19 - wind
- ☐ B15 - other renewable (please specify) :
- ☐ B20 - other (please specify) :

If present storage

Capacity MWh :

Power MW :

Parkcontroller

Is the power generating module equipped with a parkcontroller?

- ☐ yes
- ☐ no

Maximum capacity : MW

Maximum active power that the power generating module can produce and deliver to the grid at the connection point.

Installed peak power : MW_p

In the case of a wind farm or solar park, the total sum of the installed power of wind turbines or solar panels.

Declared supply voltage Uc* : kV

**Supply voltage Uc agreed by the power system operator and the network user. See the connection agreement (ATO) or the offer for the realisation of connection to the grid.*

Short-circuit current/nominal current ratio : (Isc/In)

The short circuit contribution of the power generation module relative to the nominal current

Protection settings (RfG article 14(5) and Netcode elektriciteit, articles 2.13 and 2.37)

If present in the PGM, the resulting behaviour at the connection point.

			Breaking time	
Undervoltage U<	:	p.u. (% of Uc)		ms
Overvoltage U>	:	p.u. (% of Uc)		ms
Overcurrent I>	:	kA		ms
Overcurrent I>>	:	kA		ms
Underfrequency f<	:	Hz		ms
Overfrequency f>	:	Hz		ms

Protection settings shall not conflict with the requirement to remain in operation in the event of a short circuit in the grid (fault-ride-through Netcode 3.17) or with a deviating voltage or frequency (Netcode 3.15:10)

Power Quality, in case of a Power Park Module (PPM) (Netcode elektriciteit, article 2.15)

For all Generating Units in the PPM (e.g. wind turbine, solar PV inverter) in attachments type test reports as specified in NEN-EN-IEC 61400-21 (en) Wind turbines - Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines:
Annex A.2: Voltage fluctuations (continuous operation, flicker), Switching operations
Annex A.3: Current harmonics, interharmonics and higher frequency components

Measurements

Name of supporting document attached as an annex.

Data for generator/generating unit

The data below relate to the individual generating units that are part of the power generating module. A distinction can be made between solar PV, wind energy and other. The data is hereby specified per generating unit type. Also the number of generating units shall be specified. It is possible to fill in up to 3 different types of solar PV inverters. If there are more than 3 inverter types, please specify in an annex. If there are different types of wind turbines, please specify in an annex.

Solar PV facility

Number of inverters	:			
Nominal power per inverter	:			

Rated apparent power of the inverter, expressed in MVA.

Brand and type of inverter

Brand/manufacturer	:			
Type	:			

Wind turbines

Number of wind turbines :

Nominal power of wind turbine : MVA

Rated apparent power of the wind turbine, expressed in MVA.

Wind turbine technique (generator technique used in the wind turbine)

Choose from one of these categories:

☐ doubly-fed induction generator (DFIG)

☐ full inverter

Brand and type of wind turbine

Brand/manufacturer :

Type :

Synchronous

Number of Synchronous generators :

Nominal power per generator : MVA

the rated apparent power the synchronous generator, expressed in MVA.

Brand/Manufacturer :

Type :

Nominal power factor (cos φ) :

Sub transiënt reactance (saturated) : *p.u. (“per unit”)*

Other

Total nominal power	:	
Brand/Manufacturer	:	
Type Generator	:	

Data for step-up transformer (if present)

In the case of a synchronous generator, the step-up transformer connects the production unit to the DSO/TSO grid. In the case of a power park module, such as a PV farm or a wind farm, the step-up transformer connects the farm or part of the farm to the DSO/TSO grid. Any transformer in a single wind turbine is part of the Generating Unit itself and is not referred to here. This form can be used to specify three step-up transformer types. If more than three step-up transformer types are installed, they must be specified in an attachment.

Name plate data		**TR type 1**		**TR type 2**		**TR type 3**	
Nominal power	:		MVA		MVA		MVA
Nominal voltage primary (HV)	:		kV		kV		kV
Nominal voltage secondary (LV)	:		kV		kV		kV
Nominal relative short-circuit voltage	:		%		%		%
Nominal copper or short-circuit losses	:		kW		kW		kW
Nominal iron or no-load losses	:		kW		kW		kW
Vector group windings (e.g. Dyn5)	:						

Star point treatment

Choose from one of these categories:

- ☐ isolated
- ☐ star grounded
- ☐ impedance grounded

Tap changer

Rated voltage highest tap position	:		kV		kV		kV
Rated voltage lowest tap position	:		kV		kV		kV
Tap size	:		kV		kV		kV

Tap changer control

Choose from one of these categories:

- ☐ online (continuously on-load adjustable)
- ☐ offline (only off-load adjustable)

Data for demonstrating compliance with technical requirements

Your power generating module must comply with the legal technical requirements for connection to the grid. These requirements are based on European Regulation 2016/631 (“Requirements for generators”, RfG) and are included in the Dutch Netcode elektriciteit.

Declaration of Conformity

By signing the bottom of this form, you declare that your power generating module meets all relevant technical requirements for connection to the grid, as stated in the RfG and the Netcode elektriciteit and the connection agreements.

Demonstration of compliance

You must demonstrate that your complete power generating module meets the RfG and Netcode elektriciteit requirements at the Connection Point. You can do this through an equipment certificate that covers all requirements at the Connection Point. A certificate for a single component (generator, wind turbine, PV inverter) can be a part of the demonstration, but is not sufficient to demonstrate the compliancy of the complete power generating module.
However, you can also choose to draw up a specified declaration of conformity yourself. The requirements to which you have to comply with and the way in which you have to demonstrate compliance can be found in the document “RfG compliance verification”. The requested substantiation (by means of conformity tests and simulations) should be submitted as an appendix to this PGMD. The “RfG compliance verification” document is available via this link:
https://www.netbeheernederland.nl/dossiers/regulering-20/documenten

Equipment Certificate

You must provide proof that your power generating module meets the requirements of RfG and Netcode elektriciteit.
A recognized certifying body can provide an equipment certificate for this that can serve as proof. You should send a copy of this equipment certificate as an annex to this form.
If you do not have an equipment certificate that demonstrates full conformity, you must draw up a specified declaration of conformity (see below).

Do you have an equipment certificate that demonstrates full conformity? Choose:

☐ yes, see annex
☐ no

Specified declaration of conformity

Instead of or in the absence of an equipment certificate, you can choose option 1 or 2:

1. To draw up a specified declaration of conformity yourself. This shall be supported by reports of conformity tests and simulations and, where appropriate, component certificates. For this option, please fill in Annex I (for types B and C) and Annex II (for type C only).

Do you draw up a specified declaration of conformity? Choose:

☐ yes, see specified declaration of conformity in Annexes I and II
☐ no

2. In case of a PPM type B and as a temporary measure: if a type of inverter or wind turbine is used that already has demonstrated compliance to RfG and Netcode elektriciteit and has been accepted in other projects, refer to this type, to be verified by your system operator. You shall also demonstrate compliance to the reactive power requirements for the whole PPM at its connection point, using a load flow based network calculations program.

Choose:

☐ yes, see manufacturer and type designation in the “Data for generator/generating unit” section and network calculation results in annex
☐ no, see specified declaration of conformity in Annexes I and II

Contact details and signature

Name	:
Name Company	:
Street / House number	:
Post code	:
City	:
Telephone number	:
Email address	:
Signature *(fill in using Adobe Reader "Fill in and sign" function)*	:

Annex I Requirements for Power Generating Modules types B and C

This annex describes the requirements that must be met for Power Generating Modules types B and C. For each requirement, it is indicated whether tests and/or simulations are required as evidence. Instead of a test and/or simulation, a certificate or certified test/simulation reports can also be used as evidence for the relevant component.

RfG 13(2): LFSM-O: limited frequency sensitive mode - overfrequency

The technical capability of the power generating module to continuously modulate the active power to contribute to the frequency control in the event of a large frequency increase in the system is demonstrated. The steady-state parameters of controls (such as droop and power-frequency control threshold value) and the dynamic parameters, including frequency step change response shall be verified.

In case of a PPM type B and if for this requirement certificates or certified test reports are available for all generating units, controllers and other dynamically active equipment in the PPM, simulations to prove compliance with this requirement will not be required by the system operator. The control settings shall be specified to the system operator.

Proof

Test and simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.1*

RfG 13(1): Frequency range and voltage range (in the case of a PPM)

To prove that the power generating module is able to remain connected to the grid and operate within the range of the frequency and voltage at the connection point.

The frequency range and voltage range tests may be executed as type test on a generating unit.

Proof

Test :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.7*

RfG 18(2) and 21(3): Reactive power capability

Performance at connection point.

The technical capability of the power generating module to deliver inductive and capacitive reactive power at the connection point according to RfG and Netcode elektriciteit is demonstrated. The capability of the power generating module to change the operating point to any desired value of the reactive power within the agreed reactive power range is demonstrated.

In case of a PPM type B and if for this requirement certificates or certified test reports are available for all generating units and other active components in the PPM, these may be used together with load flow based network calculations to prove the PPM reactive power capability at the connection point. In that case an on-site test will not be required by the system operator.

Proof

Test and simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" paragraph 4.2.8*

RfG 14(3): Fault-Ride-Through

Performance at connection point

The fault-ride-through capability of the power generating module in accordance with the conditions described in RfG Article 14 (3) (a), under which the power generating module is able to remain connected to the grid and remain in stable operation after the electrical system has been disrupted by faults in the electricity system that have been switched off according to company policy is demonstrated by a type test or a simulation.

In case of a PPM type B and if for this requirement unit certificates or certified test reports are available for all generating units in the PPM, simulations to prove compliance with these requirements will not be required by the system operator.

Proof

Test or Simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.14*

RfG 14(4): Reconnecting after the power generating module has been disconnected caused by a network disturbance

After being disconnected from the grid due to a network disturbance, it is demonstrated that the power generating module is capable of reconnecting with the grid and supplying stable minimum power to the grid.

Proof

Test :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.15*

RfG 17(3) and 20(3): Post fault active power recovery

Performance at connection point.

The capability of the power generating module to restore the amount of active power prior to the failure as soon as possible after a fault.

In case of a PPM type B and if for this requirement unit certificates or certified test reports are available for all generating units in the PPM, simulations to prove compliance with this requirement will not be required by the system operator.

Proof

Test or Simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.16*

RfG 20(2): Fast current injection in the event of a fault (in the case of a PPM)
Performance at terminals of the individual power generating modules of the PPM.
The capability of the power park module to ensure the injection of fast fault current, due to rapid voltage deviations at the terminals of the individual power generating modules of the PPM (for example of wind energy inverters, PV inverters), is demonstrated.
In case of a PPM type B, if for this requirement unit certificates or certified test reports are available for all generating units in the PPM, simulations to prove compliance with this requirement will not be required by the system operator.

Proof

Test or Simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.18*

Annex II Additional Requirements for Power Generating Modules type C

This annex describes the requirements that must be met for Power Generating Modules type C. For each requirement, it is indicated whether tests and/or simulations are required as evidence. Instead of a test and/or simulation, a certificate can also be used as evidence for the relevant requirement.

RfG 15(2)(c): LFSM-U: limited frequency sensitive mode - underfrequency
The test shows that the power generating module is technically capable of continuously modulating the active power in operating points below the maximum capacity in order to contribute to the frequency control in the event of a large frequency decrease in the power system. The steady-state parameter settings of the controls, (such as droop and power-frequency control threshold value) and the dynamic parameters, including frequency step change response shall be verified.

Proof

Test and simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.2*

RfG 15(2)(d): FSM: Frequency sensitive mode
The test shows that the power generating module is technically capable of continuously modulating the active power over the full operating range between maximum capacity and minimum regulating level to contribute to the frequency control. The steady-state parameters of regulations, such as droop and deadband and dynamic parameters, including robustness through frequency step change response and large, fast frequency deviations shall be verified.

Proof

Test and simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.3*

RfG 15(2)(e): Frequency restoration
The technical capability of the power generating module to participate in frequency restoration control is demonstrated and the cooperation of FSM and the scheme for the restoration of the frequency is verified.

Proof

Test :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.4*

RfG 15(2)(a): Active power controllability (in the case of a PPM)
The technical capability of the power park module to be in operation at a load level that is lower than the reference value established by the relevant system administrator or relevant TSO is demonstrated.

Proof

Test :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.9*

RfG 21(3)(d): voltage control mode/reactive power control mode/power factor control mode in the case of a PPM
The capability of the power park module to remain in operation in voltage control mode/reactive power control mode/power factor control mode is demonstrated. The settings, accuracy, insensitivity and duration for activating the reactive power are verified. The system operator selects one of the three control options (voltage/reactive power/power factor) for testing.

Proof

Test :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.10/11/12*

RfG 15(5)(a): Black-start capability (in case of a Synchronous PGM and if applicable)
It is demonstrated that a generating unit with black-start capability is able to start up from standstill without any external electrical supply within a time specified by the relevant system administrator, in consultation with the relevant TSO.

Proof

Test :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.5*

RfG 15(5)(c)(iii): Tripping to houseload (in the case of a Synchronous PGM)
The technical capability of the power generating module to successfully trip to houseload from any operating point in its P-Q-capability diagram and continues to run in stable operation after the system has been switched off is demonstrated.

Proof

Test :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.6*

RfG 15(5)(b): Island operation (if applicable)
It is demonstrated that the power generating module is capable to modulate active power over the full frequency range in island operation.

Proof

Simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.13*

RfG 21(2)(a): Synthetic inertia (only for power park module and if applicable)
The power park module is shown to be able to provide synthetic inertia to a low frequency event with very fast frequency deviation.

Proof

Simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.19*

RfG 21(3)(f): Power Oscillations Damping Control (only for power park module and if applicable)
It is demonstrated that the power park module is capable of damping active power oscillations. It is also shown that the control features for voltage and reactive power of a power park module do not have a negative effect on damping power oscillations.

Proof

Simulation :

Name of supporting document attached as an annex. *See "RfG Compliance verification" section 4.2.17*