Key Points of ENTSO-E Response to NC RfG and NC DC Consultation

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entsoe
Reliable Sustainable Connected

NC RfG – Aggregation of PGM behind a connection point

- ENTSO-E view is that the aggregation of the Pmax of all GUs that share a connection point (CP) is essential for the sizing of a PGM, given also that NC-RfG requirements apply at CP.
- ENTSO-E proposal aims to clarify and ensure consistency between the legal provisions and the whereas sections of the NC RfG.
- Additionally, ENTSO-E would like to ask ACER to define the criteria needed to differentiate between:
  - (1) a storage installed within a PPM to provide storage capability
  - (2) a storage used solely for the purpose of meeting the requirements of this regulation (and this synchronous power generating unit and storage are indivisible and create an SPGM).

NC RfG – Aggregation of PGM behind a connection point

The significance of power-generating modules should be based on their size and their effect on the overall system. Synchronous machines should be classed on the machine size and include all the components of a generating facility that normally run indivisibly. An installation containing a set of synchronous machines that cannot be operated independently from each other, such as combined-cycle gas turbine installation, should be assessed on the whole capacity of that installation.

Non-synchronously connected power-generating units ~~of the same underlying technology~~, where they are collected together to form an economic unit and where they have a single connection point should be assessed on their aggregated capacity. ~~Moreover, to ensure an appropriate harmonisation or rules for mass-market products, capacities of units of different classes, for instance, photovoltaic, electricity storage, combined heat and power installations, or V2G electric vehicles, should not be aggregated for the purpose of the determination of significance.~~

Electricity storage modules integrated to a power-generating module, where the module is either non-synchronously connected to the network or connected through power electronics, used solely for the purpose of meeting the requirements of this regulation should be considered as part of such module while its capacity should not count towards the power-generating module capacity.

NC RfG – Art. 5.2 (A/B Threshold)

1. ENTSO-E would like to highlight that the reduction of upper limit for type A/B from **1 MW to 0,5 MW will have huge impact on retrieving high quality forecast data from Significant Grid Users (SGUs) as required in SOGL, because SGU are defined in SOGL as B, C and D PGMs of RfG.**

2. This would result in significant increase in resources from TSO, DSOs and connected parties for enabling this increase of data exchange.

3. This impact on SOGL should be addressed either in RfG 2.0 or in next version of SOGL.

NC RfG – Art. 5.2 (A/B Threshold)

- ENTSO-E comments and proposals concerning EVs

1) The maximum capacity for V2G is **defined at V2G electrical charging park level** and **identified as ESM to ensure they comply with the same requirements with PGMs**

2) The collection of **EVs behind a same connection point that constitute a charging park** shall be aggregated when the total capacity of the charging park is above a given threshold. With regard to this threshold, ENTSO-E sees the benefits of aligning the requirements of installations above the A/B threshold with SO GL requirements applicable to significant grid users (esp. on data exchanges).

3) ENTSO-E would like to raise awareness that the A/B-threshold harmonized to a maximum of 500kW is not the same as for EV3 which goes up to 1MW.

4) ENTSO-E supports the view that **any charging unit or any electrical charging park** with a total capacity behind a single connection point that results more than the threshold A/B is treated as charging park and for it the ESM requirements apply.

NC RfG – Electromobility – applicability of NC RfG

In the definitions

'V1G electrical charging park' means **an ESM** where three or more V1G electric vehicles can be simultaneously connected **to it**.

'V2G electrical charging park' means **an ESM** where one or more V2G electric vehicles can be simultaneously connected **to it**.

Art. 5.2:

Power-generating modules, excluding V2G electrical charging park below ~~1MW~~ the maximum capacity from which a power-generating module is of type B, within the following categories shall be considered as significant:

NC RfG – Art.13.12 (voltage ranges)

ENTSO-E considers that ACER proposal neglects the possibility of having type A PGMs above 1kV, below 110kV and above 110 kV. Therefore, we would like to propose an alternative approach as follows, which takes care of this gap and should be considered with changes as proposed in Art. 14.2.a

12. With regard to voltage stability, unless otherwise provided in this Regulation, the power-generating module shall be capable of staying connected to the network and operate continuously within the range of 0,85 pu - 1,1 pu at the connection point should that be at or below ~~400V~~1 kV. With regard to voltage level above 1 kV and below 110 kV the relevant system operator, in coordination with the relevant TSO, shall specify ranges of the network voltage at the connection point within which a power-generating module shall be capable of staying connected to the network and operating. The specification shall include minimum time periods during which a power-generating module must be capable of operating for voltages deviating from the reference 1 pu value at the connection point without disconnecting from the network. The voltage ranges shall cover at least the range of 0,85 pu - 1,1 pu.

+ Article 14.2.a as in the ENTSO-E legal text proposal, submitted in November 2022

NC RfG – Art.13.12

Table XY should contain the outer boundaries of all the synchronous areas. Hence, we ask to increase the duration in order to stay connected within this f-range.

On that ENTSO-E proposes a solution:

Frequency range
47,0 Hz-47,5 Hz for 20s,
47,5 Hz-48,5 Hz for 90 min
48,5 Hz-49,0 Hz for unlimited
49,0 Hz-51,0 Hz for unlimited
51,0 Hz-51,5 Hz for 90 minutes
51,5 Hz-52,0 Hz for 15minutes,
52,0 Hz-52,5 Hz for 10s

NC RfG – Art.13.a (4)

Regarding **autonomous reconnection after tripping** as per same reasons than already stated in article 13a.4.

- ENTSO-E proposes to add "Autonomous connection is allowed unless specified otherwise by the relevant system operator in coordination with the relevant TSO".

- Moreover, we proposal to keep same settings as in article 13.9 as 50,1 Hz (Continental Europe) to allow restoration initial stages at higher frequency in order to avoid impact of autonomous reconnection but keeping this targeted frequency withing normal operation ranges (50,2 Hz too high since it is the value for entering in emergency state as per SOGL).

- Moreover, the minimum observation time 60s for reliability and coherence purposes with 13 and 13a.4. Please harmonise 13a.3 with PGMs.

4. Unless specified otherwise by the relevant system operator in coordination with the relevant TSO, a type EV1 and EV2 V2G electric vehicle and associated V2G electric vehicle supply equipment may autonomously reconnect to the network after tripping due to a system disturbance under the following conditions:
(a) Frequency range 49.8 Hz ≤ f ≤ 50.1 Hz;
(b) Minimum observation time: 60 s.

NC RfG – Art.13.a (9)

- ENTSO-E considers that the Uret for EV1 and EV2 should be the same as for PPM type A - 0,05 p.u and not 0,15p.u.

- Although this value was initially proposed by ENTSO-E for type A PPMs, recent discussions on the minimum threshold of 100 kW for type A/B as well as a recent study from Spain, have shown that this value needs to be 0,05p.u in order to avoid large scale tripping of EVs and PPMs in case of faults in the transmission grid.

NC RfG – RoCoF

ACER proposal

Type A, B, C and D PPMs	Type A, B, C and D SPGMs with Pmax < 400 MW	Type D SPGMs with Pmax ≥ 400 MW
1) Staying connected to the network and operating at: • ±4,0 Hz/s over a period of 0,25 s, • ±2,0 Hz/s over a period of 0,5 s, • ±1,5 Hz/s over a period of 1 s, and • ±1,25 Hz/s over a period of 2 s; 2) Staying connected to the network and operating at the sequence defined by the frequency against time profiles	Staying connected to the network and operating at: • ±2,0 Hz/s over a period of 0,5 s, • ±1,5 Hz/s over a period of 1 s, • ±1,25 Hz/s over a period of 2 s;	Staying connected to the network and operating at: ±1,0 Hz/s over a period of 0,5 s

NC RfG – RoCoF

ENTSO-E does to support the exclusion of type D SPGMs based on the 400 MW capacity threshold. The source of this value seems to be based on past experience of existing units installed in one country that may not reflect other countries and modern design of specific sites. The RoCoF withstand capability is a major design parameter for power systems. ENTSO-E would like to propose an alternative approach as follows:

4. With regard to frequency stability:

~~(a) requirement laid down in Article 13(2)(b) shall not apply to a synchronous power-generating modules with maximum capacity larger than or equal to 400 MW;~~

~~(b) synchronous power-generating modules with maximum capacity larger than or equal to 400 MW shall be capable of staying connected to the network and operate at rate-of-change-of-frequency up to ±1,0 Hz/s over a period of 0,5 s;~~

(a) If technically justified by the facility owner, a type D SPGM can apply for an exception to the relevant TSO from the 2Hz/s over a period of 0,5s requirement. In that case, the minimum capability shall be as high as technically possible but not less than:

- 1 Hz/s over a period of 1 s;
- 0,75 Hz/s over period of 2 s;
- 0,65 Hz/s over period of 4 s;

(b) if the rate-of-change-of-frequency is used for loss of mains protection, the relevant system operator, in coordination with the relevant TSO, shall specify the threshold of this rate-of-change-of-frequency-type loss of mains protection.

NC RfG – Grid Forming

ENTSO-E does not support the part of activation and deactivation for grid forming capability for all PPMs types. Unlike the reactive power modes of the PPM, ENTSO-E acknowledges that grid forming has a significant impact on the design and compliance, increasing costs and potentially making it uneconomical. But ENTSO-E considers it will become a core requirement to address future system needs. ENTSO-E therefore recommends the following:

- mandatory requirement for all type C and D PPMs
- mandatory grid forming capability for all type B PPMs **at and above the 110 kV voltage level**
- mandatory grid forming capability for all type B PPMs **below 110 kV only if** it is directly connected to a substation (bus-bar) with dedicated feeder
- non-mandatory grid forming capability for other type B PPMs as long as a roadmap is developed to assess a further roll-out of this capability (including an impact assessment on island mode detection)
- ENTSO-E does not support the deletion of the fast fault current requirement already stated for type B PPMs when they are in Grid following mode.

NC RfG – Grid Forming

Art. Y(7)

~~The relevant system operator may specify that the activation of grid forming mode is subject to necessary adaptations to the system operator's network and operating and maintenance procedures.~~ -Member State or the entity designated by the Member State shall ~~set~~ provide the formal and substantive conditions under which the relevant system operator may conduct grid forming specification for type A PPM. -------and------ ~~(d) The power park module shall have the capability to activate or deactivate grid-forming mode.~~

Art.20. 1. - Type B PPMs

Type B power park modules shall fulfil the requirements laid down in Article 13, Article 14~~, and Article Y(67), (78) and (89)~~, except for Article 13(2)(b) and, Article 13(8). ~~Requirement laid down in Article Y(8)(d) shall not apply to type C power park modules with maximum capacity larger than or equal to 10 MW.~~

With regard to grid forming capability:

(a) Type B power park modules connected at and above 110 kV shall fulfil the requirements laid down in Article Y(6) and Y(8).

(b) Type B power park modules connected below 110 kV shall fulfil the requirements laid down in Article Y(6) and Y(8) if it is connected to a feeder dedicated to one or more power park modules connected to substation with transformation to 110 kV or above;

(c) The member state or the entity designated by the member state shall set out a formal process of whether and under what conditions type B power park modules connected below 110 kV other than paragraph 1 (b) shall fulfil the requirements laid down in Article Y(6) and Y(8).

NC RfG – Forced oscillations

- ENTSO-E and Wind Europe have agreed to have an article with a range of limits of forced oscillations and a default value.
- This gives the chance on national or project specific level to change the limits that oscillations are accepted based on the site specific conditions.
- The range of limits (min and max) as well as the default value are provided by the SPD task force supporting this topic.
- Common position paper with legal text to be shared directly at ACER.

NC DC

NC DC – Definitions

- For ENTSO-E the part of the legal text proposal as "being part of a demand facility or part of a closed-distribution system," is important to avoid legal ambiguity and misinterpretation of the applicability technical requirements. We invite ACER to check the justification as provided in the ENTSO-E proposal.
- Inclusion of Data centre demand units

‘demand unit’ means an indivisible set of installations, being part of a demand facility or part of a closed-distribution system, containing equipment which can be actively controlled by a demand facility owner or by a CDSO, either individually or commonly as part of demand aggregation through a third party. ~~or is a~~ V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit or heat-pump are demand units.

Data centre demand unit is a demand unit that centralizes an organization’s IT operations and equipment for the purposes of storing, processing and disseminating data and applications.

NC DC – Art. 19

- It is important for ENTSO-E to cascade the LFDD requirements towards the DSO and distribution connected DSO. ENTSO-E would like ACER to consider a way to enable this possibility at least at national level.

- Also the term "logic interface (input port)" should be harmonized with RfG wordings "communication interface (input port)" (art. 13(7)) and "cyber-protected data exchange interface" (art. 13a(2))

Entsoe proposed to add the following legal text: All transmission-connected demand facilities, transmission-connected distribution systems and, if specified by the relevant TSO in coordination with the relevant system operators, distribution-connected distribution systems and distribution-connected demand facilities, shall fulfil the following requirements related to low frequency demand disconnection functional capabilities:

NC DC – Art. XX should apply also for data centre demand units

ENTSO-E considers that the installation of large transmission connected data centres creates a cross border issue in terms of system security.

- Indicatively, the following installations are planned until 2030 in Europe.
- For France it is expected to have 3,5 GW installed capacity
- Netherlands 4,5 GW
- Ireland around 2 GW (on scale of 30% of Irish synchronous area).
- For Spain 3-4GW and
- For Itally 4 GW are foreseen.

Although those are indicative figures, more installations are expected across Europe at transmission and even distribution grids.

On that basis, ENTSO-E would like to raise and support the fact that the same requirements as applied to power to gas demand units shall apply also to data centre demand units connected at or above 110 kV.

Please extend all the requirement of power to gas demand units to data centre demand units connected at or above 110 kV.

NC DC – Figure XX

- Figure XX is not correct and it should end at the zero value. Also, for the case of V1G the droop should be 5%.
- Also include the new legal text for Nordic SA.
- For the case of LFSM-UC of Power to gas demand units and data center demand units, please provide a default droop with a range as for PGM (see the relevant article of RfG). Since those are not movable installations, it is possible and important to decide a general specific droop setting.

The frequency threshold shall be 49,8 Hz (inclusive), except for synchronous area IE and Nordic where the frequency threshold shall be 49,5 Hz (inclusive).

- Note: ENTSO-E is undergoing a stability study considering coordination of LFMS-U and underfrequency defence schemes, especially for EVs and Heat Pumps.
- Results estimated till Feb. 2024
- An update will follow latest when the process is at the EU Commission level.
- Result to be communicated to ACER.

NC DC – FRT / HVRT of V1G and PtG and V1G

ENTSO-E proposes to take the Uret for V1G as well as V1G to be 0,05p.u in table X.1.1. Please see also three relevant comment for the type A PPM, which should the same. If it is a standard and fully harmonised, better be 0.05p.u for system robustness.

ENTSO-E asks to add a requirement on HVRT to avoid mass disconnection of large scale power to gas demand facilities due to grid disturbances. This is an important requirement together with the FRT.

NC DC – FRT of V1G and PtG

In the view of ENTSO-E, **FRT profile of PtG demand unit shall be given with range,** as for PPM, following the generic FRT profile of figure 3 of existing version of RfG and table 7.2. The reason for using table 7.2 is that PtG demand units will be connected to transmission level.

- The recovery after fault should be discussed between TSO and P2G facility owner in order to address this risk.
- For France for example, we could have to delay the active power recovery of hundreds of ms after voltage recovery to improve transient stability of close nuclear power plants. However a recovery of 5s could be too long and lead to LFSM-activation, which is perhaps not intended for normal faults. A recovery ramp of active power after voltage recovery could be better than just a time recovery.The line should allow these discussions and set only maximum tolerable values. For Germany the time for active power recovery are much too long for the requirements in the German grid.

Art. XX (6) c. When the network voltage resumes, after the fault has been cleared, to a value within the voltage range of 0,85 pu – 1,1 pu, a power-to-gas demand unit shall recover its active power output level at the connection point. The relevant TSO shall specify the magnitude and time for active power recovery;