**Amendment proposals for NC RfG and NC DCC**  
From: Oesterreichs Energie

# Amendment proposals for NC RfG

## Mixed Customer Sites / Definition of Pmax

Mixed customer sites (MCS) can be classified as a combination of demand facilities (DF) and power generating modules (PGM) that share a common connection point. Nowadays, the number of MCS is constantly increasing due to the installation of renewable energy source (RES) based generation at the sites of already existing DF.

Depending on the specific combination of a MCS, only power may be drawn and there may be only partial or no feed-in (zero feed-in) from a PGM to the grid at the connection point.

From Oesterreichs Energie point of view, any partial or zero feed-in at the connection point must not restrict the type classification (A/B/C/D) of a PGM and the corresponding national grid codes as long as synchronous operation with the public grid exists.

**In the case of MCS, the maximum continuous active power which a PGM can produce, less any demand or losses associated solely with facilitating the operation of that power-generating module, should be used for the type classification in accordance with the national thresholds.**

Taking this into account, Oesterreichs Energie suggests the following text modifications in the existing text of NC RfG:

*Article 2*

*Definitions*

*[…]*

*(16) ‘maximum capacity’ or ‘Pmax’ means the maximum continuous active power which a power-generating module can produce, less any demand or losses associated solely with facilitating the operation of that power-generating module ~~and not fed into the network~~ as specified in the connection agreement or as agreed between the relevant system operator and the power-generating facility owner;”*

Risks in case of deviating consideration:

If only the actual feed-in at the grid connection point or virtual surplus feed-in is taken into account, most of the new PGM in MCS with partial or zero feed-in would not be able to be assigned to an appropriate type according to NC RfG. In this case the following risks will arise:

* Operational risks with regard to congestion/load flow consideration and power balance due to insufficient plannability (forecast), observability (operational information exchange) and missing capabilities to change the active power.
* Increased risk of high generation loss in the event of grid disturbances in the grid due to lack of FRT capability with possibly serious effects on load flow, voltage and control area balance.

## Article 3

Add (e) power-generating modules and RES for other frequencies than 50 Hz and DC-current (e. g. 16.7 Hz power supply systems in Austria and Germany)

**Reasoning**

16.7 Hz power supply system does not operate synchronously with the synchronous area

## Mixed Customer Sites / Removal of voltage criteria

New PGM installations within MCS with a connection point ≥ 110 kV are to be considered as type D due to the voltage criterion according to Article 5(2) d) NC RfG. On the other hand, the exclusive consideration of the active power criteria would result in a classification as type A or type B for many small PGM.

The costs associated with equipping the PGM with the necessary equipment to meet the requirements of type D facility would significantly degrade the economic viability of the projects and question their implementation.

The principles of the NC RfG provide for proportionality and optimization of overall efficiency and overall costs to be taken into account. Furthermore, the non-realization of power generation plants in mixed systems (usually PV systems on the roofs of industrial buildings) is not in the sense of the European objectives for the cost-effective and efficient supply of electrical energy, especially from renewable resources.

**Therefore, an exemption from the voltage criterion according to Article 5(2) d) NC RfG for PGM with Pmax< 5 MW or a potentially smaller national B/C threshold should be included in a future version of NC RfG.**

Risks in case of deviating consideration:

Meeting the type D requirements is expected to cause disproportionate significant additional costs at any time during the lifetime of the affected PGM. The additional costs would significantly jeopardize the profitability of the affected projects and thus the feed-in of CO2-free, renewable energy.

## PSH expert group recommendations and specific requirements regarding variable-frequency pump storage hydro power plants

General requirements

The review of the technical requirements defined by NC RfG with regard to their applicability to pump storage hydro PGM has demonstrated that a distinction between the relevant generation technologies and the operation modes is necessary for assessing and evaluating whether these requirements can reasonably be applied.

**If no changes in a future version of NC RfG are implemented, the requirements for pump storage hydro PGM will remain ambiguous and subject to differences in interpretation and therefore a lack of harmonization. The recommendations summarized in the respective PSH expert group report shall therefore be included in a future version of NC RfG.**

Specific requirements regarding variable-frequency pump storage hydro power plants

Taking into account stability aspects, “hard-coded” LFSM-O or –U response time requirements might not be applicable/technically feasible for new or substantially modified variable-frequency pump storage hydro PGM technologies. In this case, the robustness of the frequency dependent functions, limiting components (e.g. dynamics of pressure pipes) and potential damages to the PGM or other facilities, due to too fast response times have to be considered.

**Therefore, Oesterreichs Energie proposes to add the following sentence to potentially “hard-coded” LFSM-O or –U response time requirements Article 13 (2) and Article 15(2) iii:**

*“If the response time is greater than stated above, the power-generating facility owner shall justify the higher response times, providing technical evidence to the relevant TSO.”*

## Mismatch between voltage ranges and international standards

Oesterreichs Energie recognizes that in some EU member states special requirements are necessary for electrical equipment at the 400 kV grid voltage level, in order to take account of specific local grid operating conditions. However, in the view of Oesterreichs Energie, such local requirements do not constitute a justification for extending the voltage requirements to an entire synchronous area.

It is critically noted that the extended voltage ranges for 400 kV according to Article 16(2) a) are outside the standardized ranges used for compliance verification and quality testing by manufacturers of electrical equipment. Manufacturers do not provide any warranty or guarantee for voltages outside these standards.

Although we are aware of the possibility for grid operators to operate their electrical equipment with voltages > 420 kV at their own risk, according to Article 3 NC RfG the relevant (transmission) grid operators have to refuse the connection of a system that does not comply with the requirements set. Oesterreichs Energie therefore believes that the described discrepancy is not a pure risk decision.

**Oesterreichs Energie proposes to change in Table 6.2 of NC RfG the time period for operation within the voltage range of CE of 1,05-1,10 pu to the same wording as for Nordics:**

*“To be specified by each TSO, but not more than 60 minutes”*

## BftA expert group recommendations / New requirements for type A

The number of installed type A PGM has reached a level where the operation of this equipment has a major impact on system security.

**As also recommended by the expert group BftA, new (preferably harmonized) requirements for (non-synchronous) type A (including FRT, reactive power capability and voltage ranges) should become mandatory.**

## New requirements for electrical storages, electric vehicle charging devices, power-to-gas facilities and controllable loads

The number of installed electrical storages, electric vehicle charging devices, power-to-gas facilities and controllable loads (e.g. boilers) will significantly increase in the near future and thus affect the safe operation of distribution and transmission grids.

**Oesterreichs Energie therefore proposes to include new (general and specific) requirements for the abovementioned grid users in a future version of NC RfG. Especially a frequency-dependent load behaviour of such units is important for a secure system operation.**

## Lack of of high-voltage ride through (HVRT) requirements

In the case of faults in electrical grids the situation right before fault clearance could have very low voltages at a given location. This aspects are already addressed by NC RfG by respective low-voltage ride through (LVRT) requirements. However, just after fault clearance, the voltage can recover very quickly, sometime towards values greater than 1.1 pu. **PGM should therefore also withstand voltage overshoots for a given amount of time.**

Besides new HVRT requirements, Oesterreichs Energie proposes to add in parallel further clarifications: Article 14 (3) c and 16 (3) d

*"The respective over-voltage protection settings must not counteract the HVRT requirement. The relevant system operator may define other over-voltage protection settings, in order to ensure voltage quality criteria or the risk of high voltages for customers.”*

These additional clarifications take into account, that the recommended over-voltage protection settings in national grid codes usually require the fulfilment of voltage quality criteria (EN 50160) and the risk mitigation of high voltages for customers. With typical protection relays (U>, U>>) there could be a contradiction between the relevant system operator’s protection concept and the activation of HVRT in certain grid areas.

## Error correction of Q-Capability diagram (decouple from fixed 1,1 pu) Article 18 2b figure 7 and Article 21 3b Figure 8

The currently existing reactive power requirements in Article 18 and 21 are not set for the whole operational voltage range, since the outer envelope is fixed with 1,1 pu. This error leads to an undefined reactive power capability in case of voltages greater than 1,1 pu (e.g. where the reference voltage 1 pu is equal to 110 or 220 kV).

## Harmonization of RoCoF, LFSM-O and –U requirement for each synchronous area Article 13 (1) b and Article 13 (2) a

Article 13 (1) b add sentence …Frequency withstand capabilities are key for the design of a synchronous area robustness. Varying national requirements could lead to inefficiencies and an undefined behaviour within a synchronous area. Furthermore, the already existing implementation guidance documents (IGD) recommend already specific requirements for RoCoF, LFSM-O and –U.

RoCoF for Continental Europe:

* ±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

LFSM-O and -U thresholds for Continental Europe: 50,2 Hz / 49,8 Hz

# Ad Chapter 8 to Article 13

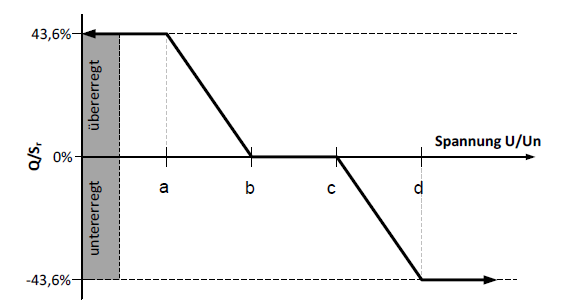
## Requirements for Typ A infeed converters

**Reasoning**

The two additional function Q(U) and P(U) are very helpful to integrate a lot of additional solar power into the existing LV-grids and due to a long tradition in Austria (since 2016) we know that almost all infeed converters can provide the function just by activating them in the software.

### Q(U)

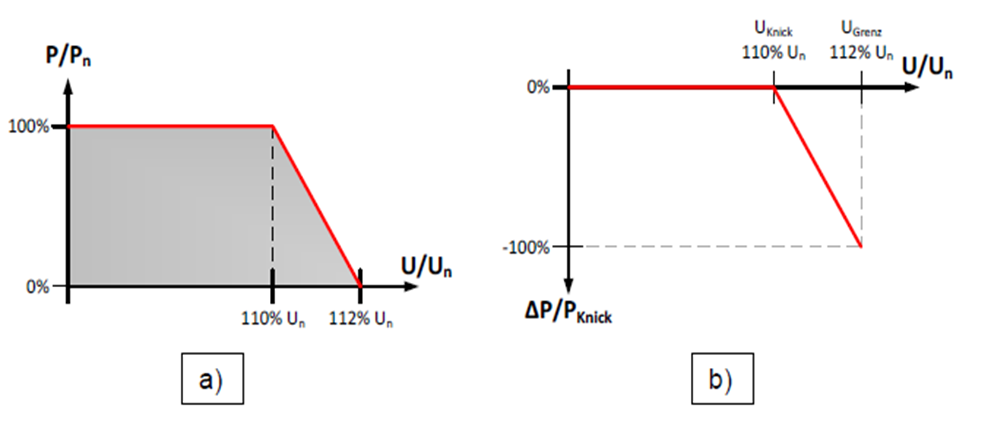
Typ A power-generator modules shall be capable of providing reactive power with regard to U/Un specified by the relevant DSO



|  |  |  |  |
| --- | --- | --- | --- |
| setpoint | *U/Un* | *Q/Sr* | |
| a | 0,92 *Un* | 0,436 | *cos ϕ* = 0,9 over excited |
| b | 0,96 *Un* | 0 | *cos ϕ* = 1 |
| c | 1,05 *Un* | 0 | *cos ϕ* = 1 |
| d | 1,08 *Un* | -0,436 | *cos ϕ* = 0,9 under excited |

### P(U)

Typ A power-generator modules shall be capable of providing active power with regard to U/Un starting at 110% Un.



# Amendment proposals for NC DCC

## Article 3

Add (c) demand facilities that part of other frequencies than 50 Hz and DC-current (e. g. 16.7 Hz power supply systems) that not connected on the synchronous area (e. g. static converter stations)

**Reasoning**

16.7 Hz power supply system does not operate synchronously with the synchronous area

## Short-circuit requirements (thresholds)

The issue found in the current requirements of Article 14 NC DCC is a lack of clarity with the risk that the requirement is not implement coherently in each EU member state. Furthermore, ineffective case-by-case discussions or legal dispute may be triggered in case of new or substantially changed connections.

**Oesterreichs Energie therefore proposes to delete Article 14 in a future version of NC DCC.**