Comments at the ACER Policy Paper for new connection codes

Hybrid Workshop at ACER 25/10/2022

ENERGY IS US

Major concerns of vgbe in the new RfG network Code

The comments formulated by vgbe are limited to the RfG NC.
vgbe has no comments regarding the Demand Connection Code.

The high level goal of the new RfG network code should be:

- To convince the European Commission and European Parliament to create a unique level playing field in all EU countries. To respect this goal, the new RfG network code should impose for all requirements a well defined harmonised value where reasonable or a range in which each country has to chose its own value. So, national particularities can be honored.

- vgbe has detected several areas not presented in the Policy Paper. The transition to a system defined in the European Green Deal has consequences at places not described in the Policy Paper.

- vgbe insists that the new RfG code should apply only for NEW installations or for installations that are modified and evaluated as "subjected to RfG NC" according to the criteria of a substantial modernisation.

15 Areas to discuss according to ACER's Policy Paper (in chapter 7)

1. Requirements for pump-storage hydro PGMs
2. Determination of significance of PGMs
3. Requirements for mixed customer sites with generation, demand and storage
4. Requirements for type A PGMs
5. Significant modernisation
6. Technical requirements for storage
7. Electromobility
8. Simulation models and compliance monitoring
9. Advanced capabilities for grids with high share of PPMs
10. Requirements for weather hazards resilience
11. Technical requirements for active customers / energy communities
12. Requirements for units providing demand response services
13. Harmonisation of type B,C and D PGM requirements
14. Improvements to the applicable rules and procedures
15. Demonstration of compliance

BUT SEVERAL AREAS ARE MISSING.

Missing areas in ACER's Policy Paper

Following areas are not described in the Policy Paper

- RoCoF : a final proposal of the text accepted by the all members of the workshop will come too late
- Requirements for offshore grids with generation, storage and consumption
- Synchronous condensers installed and operated by grid users such as generating compagnies
- For type A & B, the RfG classification cannot be used in other codes (SO GL / E&R)
- Modification of exaggerated requirements such as the envelopes for reactive power requirements
- Modify the overvoltage requirement for 400 kV installations due to legal void by missing international standards
- Right of a PGM / consumer to disconnect at abnormal voltages / frequencies
- Reduction of duration of tests of reactive power, the current requirements are exaggerated
- Rules for a new synchronous PGM in the electrical neighbourhood of a HVDC terminal

Area 1 : Requirements for Hydro Pump Storage (1)

The Expert Group Pump Storage Hydro identified the limits of various pump storage technologies:

- Fixed speed pump turbines
- Single shaft ternary pump turbines
- Variable speed pump turbines – Double Fed Induction Machine (DFIM)
- Variable speed pump turbines – Full converter

The conclusions about physical limitations have to be respected in the new version of RfG.
Since all technologies make use of the energy of moving water representing a large inertia, the speed of change of active power is limited, even if connected by a full converter.
Therefore the technically imposed ramping rates of each technology should be respected.

A solution has to be found for a grid configuration where only a HV connection (e.g. 110 kV) is realistic because a MV grid does not exist in the vicinity. It is appropriate to impose in this situation the requirements for a MV connection and not a HV connection. This issue can be solved by applying the proposal described on another slide of this presentation by erasing the voltage criterion in the classification of PGMs.

Area 1 : Requirements for Hydro Pump Storage (2)

In RfG Version 2016 an obligation for synchronous compensation mode is introduced only for Pump Storage Hydro technology, not for any other rotating technology e.g. DFIM Wind Farms or conventional power plants Since synchronous compensation mode, is also a special operation for Pump Storage Power Plants additional investments e.g. for blade cooling, have to be done, even if the mode is not used by the relevant system operator. vgbe proposes to erase this requirement.

The report includes additional findings about low inertia run-of-river bulb turbines, which have only limited FRT capability. Nevertheless to further support the development of renewable energy sources, this kind of turbines should not be forbidden by the future RfG. Beside having only limited FRT capability, such turbines still introduce additional natural inertia and short circuit power to a grid having a high share of RES. Typically these run-of-river power plants are in operation all the time, day and night.

Area 2 : Determination of significance of PGMs

- vgbe proposes to define for each type of PGM a range with a minimum and a maximum limit for the capacity. So not only a maximum value will be defined for each type, but also a minimum value.

- Using the classification of the RfG NC in the SOGL and E&R creates unforeseeable difficulties. vgbe thinks that in some countries, the classification of PGMs type A and type B is defined by operational considerations instead of connection considerations. This cross reference between both codes for type A & B has to disappear. It is impossible to create a well functioning market for a small PGM if it is classified as a type B PGM in a single country if all other European countries classify it as a type A PGM.

- The voltage criterion at the connection point with the grid should be erased to respect an identical situation between a connection at a public grid and a connection at a private grid for all PGMs.

- In our opinion, a PV panel of 10 kW installed at a residential building or at the roof of a nuclear plant should be treated identically. This uniformity is expressed also in the Expert Group “Harmonisation of certification and product Family grouping” by proposing to define the characteristics of the Power Generating Unit (PGU) at terminals of unit and not at the connection point. This issue is also a topic for the area “Mixed customer Sites”

Area 3 : Requirements for mixed customer sites

The outcome of the report is not drafted for a good / correct solution because its intention was to add new requirements to the RfG NC in its existing version. Due to the intention to write a complete new RfG NC, the report of this Expert Group has to be re-investigated.

The RfG NC is a technical code implying that no technical difference between a CDS and non-CDS may exist. Only the capacity of the PGM should define its characteristics without any interaction with the voltage at the connection point with the grid operator. Even the "voltage level at connection point to MCS" cannot define the classification of the PGM. All photo-voltaic panels connected at the LV or MV internal grid operated by customers should be coherent for all voltages inside the customer's site as well with one connected directly to the grid of the DSO.

The new RfG NC should attribute a similar status to a private grid as this attributed to a TSO/DSO grid and this not only for the classification of PGMs but also for the requirements.

Area 4 : Requirements for type A PGMs

vgbe accepts the final report of Expert Group.

Based on the principles of the European Green Deal, vgbe is convinced that a large part of generation will shift from large units, connected to the TSO grids, to small units connected to the DSO grids. A similar quality of the supplied power should be granted and so following requirements are reasonable:

- Fault Ride Through and post fault active power recovery
- Controllability of active power
- Controllability of reactive power

However vbge accepts that exceptions can exist for some technologies based on technological characteristics.

To create a real European mass market for smaller units, a harmonisation of threshold between type A and type B PGMs is required. Some proposals to create this harmonisation are described in a previous slide.

Area 5 : Significant modernisation

vgbe cannot accept some of the conclusions of the expert group “Criteria for Significant Modernisation (CSM)” as expressed at the ESC of 7 December 2021.

vgbe insists to insert following additional specifications:

- To use the standard IEC/EN 13306 for correct definition of the wording “modernisation, replacement, …”
- To allow “efficiency” modernisations (e.g. new sophisticated blades in a turbine) without risking the notion “significant modernisation”. This to be consistent with the philosophy of the European Green Deal.
- To use the content of chapter 6 of the final report for the legal drafting of the new version of the RfG NC.

More specified, this would mean:

- PGM maintenance (see IEC/EN13306) is “to retain or maintain the original required function of the item”, so maintenance can never be classified as a modernisation or modification.
- To be considered as “significant”, ranges for the change of “the key electrical characteristics of PGM” have to be specified. vgbe proposes that fair and realistic ranges (15% - 30%) shall be inserted in the RfG V2 NC in which each Member State can define its own value and that the lower limit of the ranges does not endanger maintenance or efficiency improvements by classifying them as a significant modernisation.
  Key electrical characteristics are listed in the final report and are e.g. active capacity, reactive capability,...
- A definition of the term “spare parts” according to EN 13306.
- Clear description of the application of this CSM criterion on wind farms and photo-voltaic installations.

Area 6 : Technical requirements for storage
Area 7 : Electromobility

Both areas are similar regarding the technical capabilities of PGMs with similar capacities.
vgbe sees a large difference: the uncertainty that a Electric Vehicle is connected or not.

The charging mode of all storage devices should always be considered as a demand response service. In case of an abnormal grid condition (alert state or even before an alert state), the charging mode has to be stopped before disconnecting other "classic" load / consumption. The impact on the charging process is minimal if the disconnection takes only a limited time.

Area 8 : Simulation models and compliance monitoring

vgbe accepts the final report of this expert group.

As stated by this expert group, no requirements exist if a new synchronous PGM is developed in the vicinity of an existing HVDC terminal or near a large PPM. Interactions are possible; one potential interaction is for instance the phenomenon of sub-synchronous torsional interactions requiring a investigation by experts. The statement in the Issue Logger that the local TSO has to solve this, has no European level playing field because EU regulation is missing. A European regulation has to be specified.

Area 9 : Advanced capabilities for grids with high share of PPMs

It is impossible to give comments because this expert group has only started recently.

vgbe sees a lot of new issues due to the high share of PPMs in the future electrical system:

- Consequences for protection systems due to a lower short circuit power.
- A role of synchronous condensers not described in the current European codes
- A role for ultra fast reacting batteries as already applied in the UK.
- Interactions with existing synchronous PGMs such as sub-synchronous torsional interactions
- Interactions with existing consumers

Area 10 : Requirements for weather hazards resilience

The weather hazards are environmental ones and have to be defined locally. The hazards for abnormal temperatures are completely different in the north of Scandinavia and in the south of the Iberian peninsula.

vgbe sees following hazards caused by extreme weather or climate change

- Extreme high temperatures impacting the cooling capabilities of a PGM due to the limitation of the water temperature as specified in the environmental permit.
- Extreme low temperatures outside the design specifications of the PGM.
- Drought limiting the capabilities of hydro power PGMs
- High wind speeds imposing wind turbines to shut down
- Dust or snow deposits on photo-voltaic panels limiting the injected power (e.g. volcanic ashes as in 2010)

Interactions with the environmental rules will create conflicts : in a mountainous region, an avalanche can destroy a tower of the connection of a PGM. It is impossible to receive the environmental permits to build two separate connection lines in order to cover the avalanche risk.

vgbe recognises that weather hazards exist also for grids. Is it the intention to draft a European code for grids?

Area 10 – 15 : Areas with a limited impact for vgbe

Area 11 : Technical requirements for energy communities : outside the scope of vgbe

Area 12 : Requirements for units providing demand response services :
See previous slide regarding batteries and Electromobility operating in charging mode

Area 13 : Harmonisation of type B,C and D PGM requirements between Member States
vgbe prefers a legislation with only a limited number of requirements defined at a national level.

Area 14 : Improvements to the applicable rules and procedures
vgbe accepts the intention to streamline the process of potential amendments

Area 15 : Demonstration of compliance
vgbe prefers that certificates edited by a single authorised body, should be accepted at a pan-European level

New Area : Rate of Change of Frequency (RoCoF)

Due to the European Green Deal, the robustness of the electrical system will decrease with several consequences such as decreasing the frequency stability and decreasing short-circuit power.
A high RoCoF is a consequence of a system split due to the fading-out of synchronous generators. As stated in the workshop on 1 February 2022, this will become a major European problem for which European regulation is needed to provide definitions of the measurement method and precision, the withstand capability threshold, the tests or simulations.
Several countries want to impose values above 1 Hz/sec where ENTSO-E declared that a RoCoF above 1 Hz/sec is not manageable by the grid protections and where DNV-KEMA declared in its study for EirGrid that some synchronous PGMs cannot withstand a RoCoF of 1.5 Hz/sec and almost all synchronous PGMs cannot withstand a RoCoF of 2 Hz/sec.
In order to increase the grid stability and robustness, the installation / operation of synchronous condensers is recommended. This kind of installations should be installed and operated by generating companies because rotating machines are their core business. This “inertia service” can be compared with the supply of reactive power. They are not described in the current network codes. An appropriate description of the requirements for synchronous condensers and other grid stabilising installations is needed.

vgbe proposes to wait at the results of the workshop scheduled by ENTSO-E before the end of November 2022. It is too soon to propose a well defined legal text.

New Topic : Erase requirements with unintended consequences (1)

The current version of the RfG NC imposes voltage withstand capabilities that are not described in international standards. Especially the requirement for an over-voltage up to 440 kV in the 400 kV networks is not justified. A modification of international standards will take several years. An intermediate solution, acceptable for all stakeholders must be defined in the new version of the RfG NC, for instance by specifying an over-voltage up to 420 kV according to the existing IEC standards as long as a new standard does not exist.
A harmonisation of the over-voltage ranges between all European synchronous areas (1.10 pu in table 6.2 of the current RfG NC) and the Baltic area (1.15 pu) is also needed.

vgbe proposes to modify the reactive power requirements of PGMs to more realistic values. The shape and boundaries of the envelope in the current code are not realistic. The current code imposes the capability to inject additional reactive power at over-voltages and to absorb reactive power at under-voltages. This will never be applied during real operations. A more realistic envelope will limit the differences between European countries and create larger markets and reduce the costs.

New Topic : Erase requirements with unintended consequences (2)

Art. 45.7.b.(i) of RfG NC imposes to verify the reactive power capabilities in several operating points and each one during a period of time of 1 hour. This duration has technically spoken no added value and is considered as meaningless. vbge proposes to change this duration to 60 minutes for only one operating point and to 15 minutes for the other operating points. The operator of the PGM defines the moment of those tests.

Some member states consider the mismatch between voltage ranges according to Article 16(2) for Type D PGMs, and the U-Q-Diagram according to Articles 18(2) and 21(3) for Type C+D as an error in the current version of RfG NC. This ambiguity in interpretation is not acceptable for a good European legislation.
vgbe asks to clarify this intended difference by adding to both Article 18(2) point b(i) and Article 21(3) point b(i): "without prejudice to the partially wider voltage ranges of Article 16(2) point (a), the relevant system operator …. shall specify the reactive power provision capability requirements in the context of varying voltage. ,,,"

New Areas to investigate in detail with other stakeholders

On 12 November 2013, KEMA has published a report regarding the requirements in the RfG NC. This report was submitted to the European Commission DG TREN with project number ENER/B2/151/2012. The recommendations are summarised at the pages viii – xv of this report. Most recommendations are still valid today and need to be re-investigated in the context of the European Green Deal

Articles are needed in the RfG NC to safeguard grid users in case of abnormal grid characteristics such as voltage, frequency and grid stability. Voltages outside the imposed ranges at a normal state of the grid were reported by FNN-VDE and presented at the GC ESC of 9/3/2021. The PGM has the right to disconnect at such abnormal grid characteristics but what with the financial consequences of the non respect of the submitted power injection schedules? A financial statement about this respect has to be added to the new RfG NC and DCC.

A clear statement in the RfG NC that all nuclear safety requirements for nuclear PGMs prevail over requirements of the electrical codes is needed.

QUESTIONS???