





ACER Workshop GC NC Amendments

Hybrid, Ljubljana/MS Teams platform

25 October 2022

European Engine Power Plants Association

Family definition



- PGU manufacturers produce similar products with variations on power size and voltage, while keeping all other characteristics the same. It is impractical for those manufacturers to obtain individual equipment certificates for each unit – in many cases this may require testing a large quantity of units (hundreds of tests). Therefore, an approach to allow testing a representative unit of a product "family" and apply the results to other members within the family is required.
- Certification and family concepts are on PGU and not PGM level
- PGU Family definition is missing in existing NC RfG and is essential for acceptance of PGU certification among EU countries.
- The existing "fixed power range family definition" does not encourage manufactures to improve their product quality and product scaling accuracy.
 - Manufacturers can design PGUs and scale them in large power ranges with high product quality and accuracy.
 - In practice, manufactures may reduce PGU types to fit the "fixed power range family definition" in certain market. At the end, the customers lose SPGU selection flexibility.
- EG HCF is investigating the possibility of using a SPGU family definition with extended test and validation criteria, instead of repeating tests on different SPGUs from the same manufacturer.
 - Family definitions for PPMs (Wind and Inverter based) are under investigation as well.

EUGINE will propose an amendment on Article 2 which would include the definitions of "family" based on generation type (SPGU, PPM-Wind, PPM-Inverter based) coming from the EG HCF.

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Harmonized definition of SPGM



- More clarity is needed on the type-classification of synchronous power generating modules (SPGM).
 There are today many inconsistencies across EU member states on how the determination of significance is applied (installed capacity vs individual unit rating).
 - This issue was first raised by EUGINE in a letter to the EU Commission, dated 22nd June 2016
- It would be helpful for SPGM manufacturers if the legislation clearly defines how the type-classification should be considered.

EUGINE will propose an amendment to the initial statement (9) and Article 2 (9).





Harmonized classification of Types A, B, C and D at EU level

- EUGINE agrees with the policy analysis and recommendations on the determination of significance of PGMs
 - Small units connected at high voltage have little impact on system stability
 - Type D requirements can have a significant impact on the total price of a unit
 - Harmonize the threshold for power regarding Types (same in all the EU)
- In paragraph 40 of the policy paper, it is stated that a complete removal of the voltage criteria for all types of PGMs does not seem to be a viable solution. From a synchronous generator manufacturer perspective, it would nevertheless appear as a good solution to remove the voltage criteria completely, so making the assessment of type purely based on (unit/module) MW capacity size. If that were implemented, all technical requirements would depend on the MW capacity.

EUGINE will propose an amendment to Article 5.

Harmonize limits for all FRT events



 NC RfG has FRT outline profile for type B,C,D requirement, at the same time, article 14, paragraph 3(b) has following statement:

fault-ride-through capabilities in case of <u>asymmetrical faults</u> shall be specified by each TSO.

- Nevertheless, there is no common definition about PGU/PGM operation conditions, such as "full/partial load, over / under- excitation".
- Lack of boundary condition leads to difficulty in acceptance of FRT test results among EU countries.
- Both symmetrical and asymmetrical faults shall follow the same profile.
- Boundary conditions should be reasonable, a simple "worst on top of worst case" definition can be difficult to fulfil.

EUGINE will propose an amendment to Article 14 section 3.

Include the definition of "prototype declaration"



- The grid codes may be newly published or updated at certain time intervals. At the same time, manufactures may release new product design or update software frequently. In these scenarios, the concept of "prototype declaration" is essential.
- There are already concept of "prototype" in several countries.
- Period of "prototype declaration" is not equivalent to "transaction period" for a newly published grid code.
- A harmonized agreement among all EU countries about "prototype declaration" is expected.

EUGINE will propose an amendment to Article 7.



Operational Voltage requirements

- The operational voltage requirements vary significantly from each member state and are way beyond the applicable IEC standards for which the product is manufactured
- Harmonization of the requirements is very important for the manufacturers to maintain standard and proven product.
- Voltage withstand requirement has direct impact on the insulation class, winding, frame size of the equipment and indirect impact on the dynamics

EUGINE will propose an amendment to Article 13 (1) by adding a subsection "c" for rotating generators. Caterpillar: Confidential Green

According to IEC 60034-1:2022 Generators are manufactured to operate within the Voltage and frequency ranges as specified below.

Example: Operational Voltage requirements from different Member state Grid codes

1.1 German Grid code Requirements

Below is an example of Grid code requirement from Germany



1.2 Italy Grid code Requirements (TERNA)

Below is an Example from Italy Grid code Requirements from TERNA

Specifically, synchronous generator groups must be capable of remaining connected to the grid and operating without limits on time with frequency and voltage values at the connection point (CP) within the following ranges: Grid Code Chapter 1 - Access to the national transmission service Chap. 1-1

- 85% Vn \leq V \leq 115% Vn if the CP has nominal voltage (Vn) lower than 300 kV
- 85%Vn \leq V \leq 110%Vn if the CP has Vn greater than or equal to 300 kV

25 October 2022

0.94

1.10

1,05

1.04

1.03

0,97

0.95

0,94

0,98 1,00 1,02 1,04

Page 7

IEC:

Key

X axis frequency p.u.

Zone A

rating point

Zone B (outside zone A)

Yaxis Voltage p.u.





- LFSM-O/-U Active Power Response Time
- In the IGD on "Limited Frequency Sensitive Mode" from 31st January 2018, ENTSO-E states;
 - "The recommended response times for active power decrease in case of increasing frequency are:
 - Synchronous power generating modules: ≤ 8 s for an active power change of 45% maximum power"

Such a requirement results in an active power rate of change that is extremely high and may not be fulfilled by internal combustion gas engines due to technical limitations

- Some countries have made specific provisions in their grid codes, whereas others have directly implemented the recommendation of the IGD
- Derogation processes can be followed but are cumbersome and poorly defined in many countries
- ENTSO-E accepted the comment in a modified way and informed that "technological constraint shall be duly taken into account" in the response to comments document from 31st January 2018
- A formal position paper on this topic was published by EUGINE (10th January 2019)

EUGINE will propose amendments to Article 13(2) and Article 15(2) to define a maximum active power rate of change to be included for internal combustion engines and gas turbines aligned with the technology capability.

25 October 2022 Page 8 Caterpillar: Confidential Green

Modification of the protection list for Type B and C regarding rotor earth fault

- Many protections schemes mentioned in the NC RfG as "may" could be requested as "must" by member state representatives; some of this functions would imply a considerable increase in the cost of Type B units.
- The recommendation is to reduce the scope of the required protections for Type B and increase the list within Type C and D as needed with an additional article on electrical protection schemes and settings.

EUGINE will propose amendment on Article 14 (5) (b) (iii), and create additional sections in articles 15 (Type C) and 16 (Type D) (iii) protection schemes may cover the following aspects:

- external and internal short circuit,
- asymmetric load (negative phase sequence),
- stator and rotor overload,
- over-/underexcitation,
- over-/undervoltage at the connection point,
- over-/undervoltage at the alternator terminals,
- inter-area oscillations,
- inrush current,
- asynchronous operation (pole slip),
- protection against inadmissible shaft torsions (for example, subsynchronous resona
- power-generating module line protection,
- unit transformer protection,
- back-up against protection and switchgear malfunction,
- overfluxing (U/f),
- inverse power,
- rate of change of frequency, and
- neutral voltage displacement.



HCFEG Input



The following topics will also be used for amendment proposals

Provide a path towards a harmonized approach for proof of compliance (SG3 and SG4)
Approach for acceptance of existing PGU certificates (SG3 and SG4)
Harmonized approach to accept validated simulation models (SG2)

EUGINE will propose amendments to

1. Articles 42, 43

- **2.** Articles 2 (47), 40 (1), 41 (1), 41 (3)
- **3.** Articles 43, 51, 52, 53.

flexible energy



Thank you for you attention! Questions?



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