



EUTurbines comments to

ENTSO-E Public consultation on Connection Codes Implementation Guidance Documents (Overview of questions answered)

Comment the IGD Rate-of-change-of-frequency withstand capability

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Electrical System Robustness.

There is no guidance on how or if ROCOF will be tested for PMGs, what type of RoCoF profiles and loading conditions would be used if simulations are to be carried out for compliance monitoring.

Page 2: Guidance on the harmonisation of measurement window should be provided. Rolling time window for average RoCoF needs to be chosen carefully: a too long period might hide large RoCoF values, which are possibly not withstood by PGMs. A too short period might cause measurement/calculations issues or unnecessary trips. Realistic case scenario simulation is necessary as a common basis within one synchronous zone.

/ ROCOF as protection.

ROCOF protection settings as generating unit protection and/or to detect Loss of Mains are not addressed (just few generic lines). But this is a key part of the phenomena.

/ ROCOF Phenomena

// Frequency variation decoupled from voltage variation in a grid during RoCoF events are seldom the case. Guidance is required to realistic treatment of the impact of both frequency and voltage variations and the impact on equipment as the power system stabiliser among others.

// Past events (Grid Splitting in Central Europe and Turkey accident) have shown that in case of system split, the frequency increase in some areas and decrease in some other areas and the ROCOF is higher where the frequency increases and lower where the frequency decreases.

Different operational strategy can be considered when the frequency increases (e.g. generation disconnection at high frequency) or decreases.

/ TSs are today under revision and the present ones are addressing generating unit requirements based on mass penetration (type A and/or type B), this should be stated in the IGD.

The value of 2.5 Hz is not appropriate to be used in this context, since this value was not backed-up with technical studies or evidence and no time size window was defined for this parameter.

General (other) comments:General Comments to ALL IGDs:

The following comments apply to all IGDs and to the on-going process in general. EUTurbines appreciates the good overview provided with the current drafts of IGDs, which allows national committees to focus easily on the detailed tasks of the implementation of the relevant NCs. In many of the IGDs, however, there is very little technical background given on how to find suitable values for the parameters.

Additionally, many of the parameters obviously need to be aligned between neighbouring countries or even within a complete synchronous zone. This needs to be further emphasised, not only as a recommendation. As a consequence, the relevant compliance and testing procedures need to be the same for the same parameter, in order to have harmonised compliance conditions among the EU Member States.

Furthermore, a Cost Benefit Analysis should be applied, not only to the few cases as defined in the respective IGD, but rather has to be the standard procedure when determining any detailed requirement. Alternative technical solutions need to be considered, in order to have the lowest overall socioeconomic impact.

Specific to the RoCoF IGD: An Ad hoc working group at European level per synchronous area shall be created to examine and review all issues related to the Rate-of-change-of-frequency withstand capability.

A procedure to ensure that existing PGM already on the grid are not damaged or allowed to trip during such RoCoF requirements must be defined.

Comment the IGD Making non-mandatory requirements at European level mandatory in a country

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Page 2: Objective" .. How to proceed, ... where the need for this requirement can be demonstrated."

How does the IGD address whether a non-mandatory clause is required by the TSO and what process is to be followed by the TSO to make a requirement mandatory? The objective is set, but the IGDs shall provide the process/guidance on how to demonstrate that non-mandatory requirements are needed (e.g. CBA, public consultation, etc.). The examples provided are not sufficient.

/ It would be helpful to make better reference to the specific articles in the NCs or other documents, as provided in other IGDs. A possibility would be, to integrate the table of non-exhaustive / non-mandatory requirements.

General (other) comments:

The IGD states the definitions, but merely defers to individual national consultation the responsibility of making non-mandatory European requirements mandatory or not in a given country. It is not obvious it sets a practical methodology to that end.

Comment the IGD Cost-benefit analysis

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Page 2: "When do the CNCs require a CBA?"

CBA could be one of the possible criteria that can be used to evaluate technical alternatives for requirements, including the definition of non-exhaustive requirements. Why is the table in page 2 limited to the three cases mentioned?

/ Page 8 and 9: the list of data requested by the system operator shall be consistent with normal/typical data commonly available for the generating unit technology, considering the time the generating unit has been built. On old units, it is also possible that not all the information is available, or that they are archived in paper format. Therefore, to recover the information or to contact the equipment supplier to get data, depending on the data, it could take time. This has to be acknowledged by the System Operator and shall not constitute a breach of CNC obligation. In such cases, the use of typical data can be an acceptable solution.

/ Page 6: in addition to network based and market based solutions, operational alternatives and operational strategy shall be considered when carrying out a CBA.

/ The different parties involved in the process and their responsibilities shall be clearly defined, including the way the CBA conclusion shall be evaluated.

General (other) comments:

The effort of providing flow chart diagrams of the CBA process and main evaluation criteria is appreciated. That being said, more could be done in the area of defining roles and responsibilities and common weighting factor across Europe (for a given evaluation criteria). See comments in the Technical Information part.

CBAs should be applied not only to the few cases as defined in this IGD, but rather must be the standard process when determining a detailed requirement. Alternative technical solutions need to be considered, in order to have the lowest overall costs in terms of socioeconomic aspects. See comments in the Technical Information part.

Comment the IGD Parameters of non-exhaustive requirements

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Some of the non-exhaustive requirements are clearly pan-synchronous area (e.g. frequency related parameters). As such, it is not appropriate to let an individual TSO define values without coordination with its neighbours.

/ Page 5, line "Admissible active power reduction..." misses: "take into account of the technical capabilities of power-generating modules" as stipulated in RfG Art 13 5b

/ Page 5, line "Frequency stability": "time period for frequency stability to be reached" is not a parameter for the equipment but for the system design (see RfG Art 15, 2a). Instead "Time for reaching x% of the target output" would be better.

/ LFSM-O Requirements in terms of compliance on an aggregate level are not found in art 13.2.(a)

/ LFSM-O Requirements 13.2.a should be 13.2.a, c and d;

/ LFSM-O Requirements 13.2.e is in reality 13.2.f.

/ Frequency Stability Requirements in 15.2.(a) are applicable only for type C and D and not to type B.

/ FRT Capability for type D requirements art 16.3.a.(ii) are mandatory.

General (other) comments:

An Ad hoc working group at European level per synchronous area shall be created to examine and review all issues related to the Parameters of non-exhaustive requirements.

Comment the IGD Compliance monitoring

Do you consider this IGD helpful to reasonably support the national implementation process?: Yes

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Title: the title can be generalized in "Compliance", in fact compliance monitoring is one of the aspect presented in the report.

/ It is not clear what "POD control" means (see tables in page 11 and 12).

/ More guidance is required on compliance testing, A defined list of evidence and process must be provided in order to demonstrate compliance, based on current practice. This can include data submission, Factory Acceptance Tests (FATs), Site Acceptance Tests (SATs), test procedure profiles for frequency response or islanding, steady state, transient and dynamic studies, data trending such as disturbance recording, SCADA recording, post event investigation reports. It must be clearly defined and understood by all parties which support material will or will not be accepted for any compliance.

In addition, more guidance should also to be given on the level of detail required for model submission and validation.

/ Page 3 and page 14: Type A generator. It seems in the IGD as if EqCs (Equipment Certificates) is mandatory, while this is not necessary true according to the RfG Code (art 40 RfG mentioned as well in page 6).

/ When compliance verification is delegated to a third party, the third party shall reflect the requirement as applicable to the System Operator. The third party is not entitled to add or define different or more stringent requirements, unless within the framework of the RfG and agreed with the System Operator.

General (other) comments:

The present IGD has the merit of clearly listing the technical items which may be subject to test or simulation.

Guidance on the harmonisation of compliance testing and simulation and monitoring procedures, at least within one synchronous zone, would be of great benefit to all stakeholders. It should be avoided that at the end there are "difficult" and "easy" countries regarding obtaining the compliance certificate for the same requirement.

Comment the IGD Post fault active power recovery

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Page 9 Technology Characteristic.. "Due to inherent feature of synchronous generator directly connected to the grid there is no justification to specify post fault active power recovery performance. .."

Based on this, it should be clearly recommended to System Operators that no specific requirements shall be provided in response to art 17(3) for PGM.

At the same time, we would like to highlight some points:

During transient PMG based on synchronous generator have the active and reactive power that will oscillate, depending mainly on the oscillation of voltage and current, the swing of the stability angle and consequent slight rotor speed oscillation. Therefore, the sentence in page 5, indicating that consumption of active and reactive power shall be forbidden, needs to be revised or it shall be specified that this could be a requirement only for PPM.

General (other) comments:

The IGD provides an interesting insight regarding the matter.

Comment the IGD Need for synthetic inertia for frequency regulation

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: Yes

General (other) comments:

The IGD does not clearly define (measure) what synthetic inertia shall be (if any need). It is recommended an ad-hoc working group be formed at European level to analyse this.

Synthetic inertia could be a possible application of CBA.

Comment the IGD Frequency related parameters for non-exhaustive requirements

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Some of the non-exhaustive requirements are clearly pan-synchronous area (e.g. frequency related parameters). As such, it is not appropriate to let an individual TSO define values without coordination with its neighbours.

/ Page 5: "...but experience has also shown that often real and manageable concerns from users can be overcome." and: "Industry concerns expressed at the time and since with regard to the loss of control stability and hence GT/CCGT units has proven not to be the case for more than 10 years". These statements provide no value and are not necessarily correct. We therefore request their removal.

/ Missing and to be considered: Capability of take part in island operation (Art 15.5b) to be added to the table. Concept on system splitting strategy and the frequency related issues to be potentially added as a chapter

/ The annexed table is partly a repetition of the one in the Parameters of non-exhaustive requirements IGD, with the same errors (RfG NC), see comments to such IGD.

General (other) comments:

An Ad hoc working group at European level per synchronous area shall be created to examine and review all issues related to the Frequency related parameters for non-exhaustive requirements.

Comment the IGD Instrumentation, simulation models and protection

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Guidance regarding the scope, purpose and format of the models is missing.

/ page 2: "When possible, provide the most challenging existing value of the parameter, as general guidance" should be replaced or removed: the value of the parameter shall be reasonable and defined to suffice the needs.

The "most challenging" requirements can lead to unnecessary costs without providing real added value. The most challenging requirements shall be explicitly justified when chosen.

/ The model to be used for simulation, which tolerances shall be reasonable (based on model defined for example in international standard) while representing the behaviour of the unit with respect to the phenomena to be studied, shall be in line with accuracy of the rest of the electrical system (including distribution systems and loads).

Simulation models, particularly if very detailed, have core, confidential and proprietary information of manufacturers. For this reason, it would be advisable to grant the possibility of submitting "black-box" models.

/ Examples of connection of generating units representing a typical configuration with the main component

shall be integrated in the IGD (schematic representation).

/ Examples of minimum instrumentation required shall be provided (referred to the schematic representation above mentioned).

/ An ad-hoc dedicated group is recommended to better detail the information.

General (other) comments:

The IGD clearly states the various technical stakes and draw interaction between stakeholders. That being said, the list of simulation needs and model types should be made clearer, for the sake of harmonisation and better integration in a common European model. Creating an ad-hoc group at the European level can only help in this regard.

Comment the IGD Voltage-related parameters for non-exhaustive requirements

Do you consider this IGD helpful to reasonably support the national implementation process?: Yes

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Fault ride-through capability assessment also requires a clear definition of grid topology (e.g. impedance of line, as defined by grid operator). Guidance should be provided in case FRT capability cannot be met due to adverse grid conditions or extreme clearing times.

/ Valid design rules need to be considered, e.g. for the time period at overvoltage on 400kV level. This could be considered a typical application for a CBA (consideration of technical alternative for voltage stabilisation methods in order to shorten periods of extreme voltage)

/ Synchronous generators are designed according to IEC 60034 which define the voltage range in +/-5% U_n , which is different from voltage requirements. Guidance on which way to proceed shall be addressed in the IGD, including eventually the use of transformers equipped with OLTC.

/ The principle and rationale of each TSO to require any ranges of fixed Q/Pmax and V within the outer/inner defined envelope (figure 7, 8 of the RfG NC) within the synchronous system should be described further through examples (Synchronous power plant, PPM, HVDC).

The IGD shall contain a dedicated chapter related to this point.

/ Frequency variation decoupled from voltage variation in a grid during RoCoF events are seldom the case. Guidance is required to realistically treat the impact of both frequency and voltage variations.

/ The annexed table is a part repetition of the one in the Parameters of non-exhaustive requirements IGD, with the same errors (RfG NC), see comments to such IGD. FRT Capability for type D requirements art 16.3.a.(ii) are mandatory; the System Operator shall provide pre fault and post fault grid information

General (other) comments:

Voltage Requirements could be a possible application for CBA.

While we recognise the IGD as a starting point, considering the complexity of the Voltage related theme, the IGDs should be improved. This could be done through a dedicated ad-hoc group.

Comment the IGD Harmonisation

Do you consider this IGD helpful to reasonably support the national implementation process?: No

Does the content of the IGD cover the technical issues of this topic appropriately?: No

Comments on the technical information within this IGD:

/ Page 3: Design of all electrical equipment (generating unit, loads, transmission and distribution system) is commonly based on International standard (product standard). CNC requirements are addressed in rules for connection standards. ENTSO-E and System Operators shall also consider the present testing methodology (state of the art in the past decades) and integrate it (rather than just modify it) when defining non-exhaustive/non-mandatory requirements to harmonise the existing system with the new one.

Present procedures in technical standards are also technology specific and, therefore, maybe best fitting to test the equipments. It would be helpful if some examples using existing standards that can be used for harmonisation can be provided.

General (other) comments:

The IGD would benefit from follow-up in an ad-hoc working group, to clearly define a modus operandi for harmonisation.

At the moment there are some equipment standards (product standard) that are in conflict with the RfG requirements. One example is the voltage and frequency operating profiles of synchronous machines recommended by the IEC standards. Harmonisation between RfG requirements and technical standards should first be established.