European Network of Transmission System Operators for Electricity

entsoe

CONNECTION NETWORK CODES – RESPONSE TO THE COMMENTS RECEIVED DURING THE PUBLIC CONSULTATION OF THE DRAFT REVISED IMPLEMENTATION GUIDANCE DOCUMENTS (2021)

Period of consultation: 02/12/20 - 31/01/21 (found here)

From: Steering Group Connection Network Codes

CONTENTS

1. Introduction

Overview of connection codes

The European Connection Network Codes - Requirements for Generators (RfG), Demand Connection Codes (DCC) and High Voltage Direct Current Connections (HVDC) – have been developed in accordance with Regulation (EU) 714/2009 and are cornerstones to fulfil the internal market for electricity (IEM Regulation) third.

The first connection network code, which entered into force on 17 May 2016, is the Commission Regulation (EU) 2016/631 of 14. April 2016 establishing a network code on requirements for grid connection of generators (RfG). The Commission Regulations on DCC and HVDC followed after that - (EU) 2016/1388 of 17. August 2016 establishing a network code on demand connection (DCC), entering into force on 18 August 2016, and the Commission Regulation (EU) 2016/1447 of 26. August 2016 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules (HVDC), entering into force on 8 September 2016 respectively.

In order to support the implementation of network codes at national level, and as required by the codes, ENTSO-E has produced non-binding guidance on implementation, which are also consulted by the stakeholders. This guidance is provided through so-called Implementation Guidance Documents (IGDs).

Legal background for IGDs

Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (RfG), (Article 58), Commission Regulation (EU) 2016/1388 of 17. August 2016 establishing a network code on demand connection (DCC) (Article 56) and the Commission Regulation (EU) 2016/1447 of 26. August 2016 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules (HVDC) (Article 75) – Non-binding guidance on implementation - stipulate:

1. *No later than six months after the entry into force of this Regulation, the ENTSO for Electricity shall prepare and thereafter every two years provide non-binding written guidance to its members and other system operators concerning the elements of this Regulation requiring national decisions. The ENTSO for Electricity shall publish this guidance on its website.*

2. *ENTSO for Electricity shall consult stakeholders when providing non-binding guidance.*

3. *The non-binding guidance shall explain the technical issues, conditions and interdependencies which need to be considered when complying with the requirements of this Regulation at national level.*

ENTSO-E and its dedicated body Steering Group Connection Network Codes (CNCs) produced several Implementation Guidance Documents (IGDs) in topics that were important and in cases complex to support the national implementation of the CNCs.

Last set of IGDs was published in March 2018 and complying with the maintenance period as mentioned above in the extract of the Regulation, Steering Group CNC has reviewed the IGDs and provided first revisions.

The revised drafts were submitted for a public consultation from 2 December 2020 until 31 January 2021.

Objectives of IGDs

The main objective of the implementation guidance is to support system operators in the process of determination on national level of non – exhaustive requirements during the national implementation. The objectives of the implementation guidance documents are:

- to facilitate a common understanding of technical issues specified in the connection network codes, in context of new technologies and new requirements (e.g. synthetic inertia)
- to deliver broader explanations and background information and to illustrate interactions between requirements,
- to recommend coordination/collaboration between network operators (TSO) where either explicitly required by the connection codes or reasonably exercised from a system engineering perspective,
- to give guidance to national specifications for non-exhaustive requirements, and
- to express the need of further harmonisation beyond what is requested by the CNCs when reasonable from a system engineering perspective.

List of IGDs subject to the consultation

No	Titles of IGD	Status	Short descriptions
1	Autonomous connection/reconnection and admissible rate of change of active power	Updated	This document addresses the issue of autonomous connection of power generating modules of type A, B and C. Autonomous connection is not recommended for type D power generating modules. Automatic within the context of article 13.7 shall be understood as autonomous. The motivation for allowing autonomous reconnection after an incidental disconnection or during system restoration is that neither the relevant TSO nor the relevant DSO can manage to respond to all individual start-up requests of power generating modules. Autonomous reconnection of power generating units

			after an incidental disconnection includes, but is not limited to, the following fundamental conditions: • Specifications of the voltage range, for which reconnection is allowed • Specifications of the frequency range, for which reconnection is allowed • Specification of a minimum observation time of voltage and frequency conditions • Specification of a maximum gradient of active power increase after reconnection Uncoordinated/uncontrolled reconnection of a large amount of distributed generation after system disturbance could result in system stability problems and cause system split or islanding. Therefore, some basic rules/conditions for reconnection shall be specified. In addition, coordination between frequency ranges for reconnection of power generating modules and disconnection/reconnection of demand facilities shall also be taken into account where relevant. The document provides guidance on implementing the capability of power generating modules related to voltage and frequency ranges, observation time and gradient of active power increase for connection or reconnection. Recommendation is provided on the preferred values of voltage and frequency intervals for autonomous reconnection as well as a minimum observation time and maximum gradient of active power increase after reconnection is based on current practice and for Continental Europe (CE) on the ENTSO-E report on Dispersed generation impact on CE region security.
2	Demand Response – System Frequency Control	Updated	Demand response is an important instrument for increasing the flexibility of the internal energy market and for enabling optimal use of networks. It should be based on customers' actions or on their agreement for a third party to take action on their behalf. A demand facility owner or a closed distribution system operator ('CDSO') may offer demand response services to the market as well as to system operators for grid security. In the latter case, the demand facility owner or the closed distribution system operator should ensure that new demand units used to provide such services fulfil the requirements set out in this Regulation, either individually or commonly as part of demand aggregation through a third party. In this regard, third parties have a key role in bringing together demand response capacities and can have the responsibility and obligation to ensure the reliability of those services, where those responsibilities are delegated by the

			demand facility owner and the closed distribution system operator. The objective of this implementation guidance document is to support the definition of the main criteria/motivation for the recommended settings as well as the applications of the demand response system frequency control (DR SFC) capabilities of demand units of a synchronous system on a national level. For the specification of the relevant parameters it is essential to be aware of the objective of DR SFC, the deployment strategies that can be applied and to understand its interaction with other frequency stability related requirements and assumptions for a system defence plan. In order to implement comprehensively the DR SFC capabilities, this implementation guidance document will look beyond the DR SFC in the NC DCC, considering the proposed settings for LFSM outlined in other guidance documents. For each synchronous area, proposals for national choices of the non-exhaustive DR SFC parameters are provided in this IGD.
3	Parameters of Non-exhaustive Requirements	Updated	This is a general guidance document that provides a reference to all non- exhaustive parameters. It is aimed to provide the general considerations that are considered relevant in defining nationally these parameters and the principles of coordination between users and system operators to achieve this. This IGD provides only guidance and could not be construed as binding for the implementation of the CNCs at the national level by Member States, NRAs, system operators and all other relevant stakeholders. This general guidance also provides the most generic principles for determining all non-exhaustive parameters, and should be read in conjunction with the more specific guidance on major issues, clustered into the following separate IGDs: • Parameters related to Voltage issues • Parameters related to Frequency stability • Restoration issues • Active and reactive power control • Instrumentation, simulation models and protection For those clusters, general guidance in order to help the Transmission System Operators (TSOs) to define their own parameters has been provided in their own IGDs. Within these clusters, there are a number of requirements many of which have their own specific IGDs.

			Those IGDs (found in Active Library[1]) have been developed for specific non- exhaustive requirements and for some activities that have to be carried out for the national implementation (for example cost benefit analysis).
4	Maximum Admissible Active Power Reduction at Low Frequencies	Updated	The objective of this implementation guidance document is to determine the main criteria for the national level specification of the capability of PGMs to avoid the reduction of active power output more than an admissible value due to the decrease of frequency decrease following a disturbance. For the implementation of the relevant parameters it is essential to stress the objective of this requirement and to clarify how it interacts with other frequency stability requirements and external factors such as power plant technology and ambient conditions. For each synchronous area, proposals for national choices for the non-exhaustive requirement on admissible active power reduction at low frequencies are provided through this IGD.
5	Frequency ranges	Updated	This document addresses the frequency ranges required for the AC transmission and distribution lines including HVDC systems on the AC lines, the power generation and demand facilities. The general principle for the frequency range and time duration requirements are follows: • Frequency ranges for transmission and distribution network lines, including HVDC systems on the AC lines, to stay connected to the system shall be wider than for power generating and demand facilities • Frequency ranges for power generating facilities to stay connected to the system shall be wider than for demand facilities • Frequency ranges for demand facilities to stay connected to the system shall be narrower than for power generating facilities
6	IGD on Compliance Verification – Compliance Testing and Use of Equipment Certificates	Updated ***(this section was updated on 7 Oct. 2021)***	As per the Connection Network Codes (CNCs) the equipment connected to the system for the first time or significantly modernised need to be compliant with the technical requirements forming part of the CNCs and its compliance need to be verified at the time of the request of the Operational Notification and monitored throughout its life. For any new equipment or significantly modernised one being connected to the system, it shall be carried out the applicable compliance tests, modelling and simulations during the operational notification issuing process. To make sure that equipment complies with the requirements of the CNC during its lifecycle, the RSO shall have the right to request that

[1] https://www.entsoe.eu/network_codes/cnc/cnc-igds/

			the power generating facility owner carries out compliance tests, verification and eventually simulations according to an accepted Compliance Verification Programme. In particular: • Compliance tests and simulations to be carried out based on a Compliance Testing and Simulations programme during the Operational Notification issuing process. • Compliance test and eventual applicable simulations to be carried in accordance a Compliance Monitoring Programme, after any failure, modification or replacement of any equipment that may have an impact on compliance with the applicable requirements as described by RSOs and in line with CNCs, during the lifetime of the facility. Based on the above, the following phases of the Compliance Verification Process can be defined: • Compliance Testing (CT) – CT is an activity that takes place during the Operational Notification period (for type D during Interim Operational Notification and Limited Operational Notification) with the purpose of demonstrating the compliance with the minimum required functionality and parameter ranges, based on site testing or/and equipment certificates (issued based on tests) according to NC RfG, NC HVDC and NC DC. Compliance tests are executed as site test by PGM owner. The RSO may participate in such tests and record the performance of the PGM as per Art 40.5 of RfG. The CT closes with the issuing of the Operational Notification (for Type D Final Operational Notification). • Compliance Simulation (CS) – CS is an activity that takes place during the Operational Notification period (for type D during Interim Operational Notification and Limited Operational Notification) with the purpose of demonstrating the compliance with the minimum required functionality and parameter ranges, based on simulations or/and equipment certificates (issued based on simulations) according to NC RfG, NC HVDC and NC DC. The simulated verifications of the availability of the minimum required functionality and parameter ranges are foreseen whenever testing is not applicable due to the risk of damaging the facility. The simulation model should be certified by an authorized body, in line with the requirements for the equipment certification. The certification of the simulation model should verify that the model is representative of the tested unit. Compliance Simulations are executed by PGM owner and are verified by the RSO. The Compliance verification based on simulation and equipment certificates (backed by simulations) closes with the issuing of the Operational Notification. • Compliance Monitoring (CM) – process for the recursive verification of the availability of the minimum required

			functionality and parameter ranges still exist. This activity is an on-going activity throughout the life of the facility, and it starts after the issue of the operational notification (for Type D Final Operational Notification) and it ends when the generating is disconnected from the grid and decommissioned or the Operational Notification is not valid anymore These requirements are in line with the ACER Framework Guidelines on Connection Codes Article 2.4 "the basis of the Compliance testing, compliance monitoring and enforcement" and are likely to be similar in principle to many of the existing national processes through which RSOs seek assurance that equipment connected to their systems is technically appropriate and is capable of meeting standards in terms of technical capability, behaviour or provision of services. The aim of the present document is to describe CT and the application of equipment certificates in the fulfilling of the compliance process during the connection of the equipment. In addition, the document describes also the role and responsibilities of the parties in the CT in the framework of the operational notification process. CS and CM will be covered each by dedicated documents.

2. Individual comments

Autonomous connection/reconnection and admissible rate of change of active power

Commenter	Type of comment	Comment	Remarks
Orgalim	clarification	The most important change is in the wording (both title and content), changing "Automatic" by "Autonomous", because, as explained in the Introduction, the word "Automatic" in the context of RfG 13.7 should be better understood as "Autonomous". No objections to this. The content remains basically unchanged. The only relevant modifications are: o The earlier version said that D type generating units were not allowed to "automatic" connection/reconnection. This has been modified as "autonomous" connection/reconnections of D type "is not recommended". We think that the spirit has not changed but that this redaction is more consistent with the RfG. o Recommendations for Δθ, ΔU and Δf were added to the general default settings for reconnection. This is a logical addition, lacking in the previous version. A clarification on how to understand the "Maximum gradient of active power increase" has been added, too. o **As in other updated IGDs, the presentation of previous practices in different countries has been suppressed. And we recommend, too, to include an annex with the values actually proposed in the national implemented codes.**	Not accepted. Almost three years after the initial national implementation of the connection codes, the previous practise in the member states is no longer relevant. Acknowledged that the current implemented values could support and be valuable. However, this is more an implementation monitoring activity and could be found in other documents rather than in the IGDs. It is recommended to check the monitoring files of ENTSO-E. The CNC Active Library includes a monitoring file with all information on national specifications, which have been provided to ENTSO-E
WindEurope	general	The most important change is in the wording (from "Automatic" to "Autonomous") which is a reasonable recommendation. The content remains basically unchanged apart from two modifications: According to the previous version, Type D generating units were not allowed to perform "automatic" connection/reconnection. Based on the revised version "autonomous" connection/reconnection of Type D units "is not recommended". This redaction is more consistent with the NC RfG. Recommendations for Δθ, ΔU and Δf were added to the general default settings for reconnection. A clarification on how to understand the "Maximum gradient of active power increase" has been added as well. These are useful additions. **As in other updated IGDs, the presentation of former practices in different countries has been suppressed. Including an annex with the values currently proposed in national implementations would be very helpful.**	Not accepted. Almost three years after the initial national implementation of the connection codes, the previous practise in the member states is no longer relevant. Acknowledged that the current implemented values could support and be valuable. However, this is more an implementation monitoring activity and could be found in other documents rather than in the IGDs. It is recommended to check the monitoring files of ENTSO-E. The CNC Active Library includes a monitoring file with all information on national specifications, which have been provided to ENTSO-E

VGB	clarification	1. The definitions have to be revised. No difference exists between connection and reconnection. The sole allowed definitions are "connection" by an operator and "autonomous connection" by a control system based on real-time observations.	Accepted with changes. To replace "autonomous reconnection" by "autonomous connection/reconnection"
VGB	clarification	2. Page 3: No proposals for reconnection after an incidental disconnection for type A because Art.14.4 applies for type B. Is it the intention of this IGD to transfer the definition of those conditions to each TSO / RSO? What is the added value of this IGD if each TSO / RSO can define its own requirements?	Accepted. Art 13.7 defines in general the capabilities automatic, i.e. autonomous connection, regardless whether it applies to initial connection or reconnection after disconnection. Art 14.4. introduces the right of the relevant TSO to define additional conditions for reconnection after disconnection. This explanation can be added to the IGD.
VGB	clarification	3. The sentence "Autonomous connection is not recommended for type D power generating modules." is not consistent with Art.16.4.a imposing a synchronisation only after authorisation of RSO.	Accepted. We acknowledge the clarification point and we will take it into account. To change the IGD accordingly
VGB	technical	4. Page 6: The maximum frequency deviation of 0.2 Hz is too narrow. Change in 0.3 Hz. Be aware that OEM of synchronous generators allow 0.35 Hz!	Not accepted. The frequency variations here refer to the steady state variations in order to synchronise. The point of view is not linked only to the generators capability to withstand the frequency variation.
Caterpillar (Electric Power Division)	technical	For this IGD the proposed parameters are given in Page 6. To make the proposed information complete, we suggest adding the recommended resolution, for example: • Voltage range at the grid connection point: 0.9 p.u. ≤ U ≤ 1.1 p.u. in steps of 0.01 p.u. • Frequency range: 47.5 Hz ≤ f ≤ 51.0 Hz in steps of 0.1 Hz • Adjustable observation time: from 0 to 300 s in steps of 5 s • Minimum observation time reconnection: 60 s, Maximum: 1800 s (30 minutes) in steps of 5 s. Also, the IGD states; "This document addresses the issue of autonomous connection of power generating modules of type A, B and C. Autonomous connection is not recommended for type D power generating modules." We propose that further information is included on the recommendations specific to Type D power generating modules. NC-RfG Article 16, 4a) states "synchronisation shall be performed by the power-generating facility owner only after authorisation by the relevant system operator;" **A brief summary of existing practices for type D modules would be useful, and it is proposed should be included in this IGD.**	Not accepted. We are not sure what the steps means and what is the purpose of the recommendation. The aim of the values is to provide a specified range of the given variables in order to meet conditions. It is not needed to specify any steps but rather to provide a range of settings. Also we do not see the need to specify the maximum observation time or the actual capabilities of the SPGMs, but we provide the ranges here. With regard to the last part of the question, the question is part of implementation monitoring work. Type D power-generating modules shall fulfil the following general system management requirements: with regard to synchronisation, when starting a power-generating module, synchronisation shall be performed by the power-generating facility owner only after authorisation by the relevant system operator.

Vestas	technical	Signal designation in figure 1 must be more specific. "Signal in order to cease active power output (Psetpoint ≠ 0% Pmax)" instead of "Signal in order to cease active power output (not active)" Note: Wording "not active" probably too vague. | Proposed change: "Signal in order to cease active power output (Psetpoint ≠ 0% Pmax)"	Accepted. Accepted and the figure will be modified accordingly.
Vestas	technical	Signal designation in figure 1 must be more specific. "Synchronizing variables (within prescribed ranges)" instead of "Synchronizing variables" | Proposed change: "Synchronizing variables (within prescribed ranges)"	Accepted. Accepted and the figure will be modified accordingly.
Vestas	technical	Signal designation in figure 1 must be more specific. "Ramp-up limit P/t [% Pmax/min]" instead of "Ramp-up limit P/t [MW/min]" | Proposed change: "Ramp-up limit P/t [% Pmax/min]"	Accepted. Accepted and the figure will be modified accordingly.
Vestas	technical	Default synchronizing conditions to be stated out with a plus-minus sign and declared supply voltage Uc shall be used as reference value for voltage magnitude difference | Proposed change: • Condition on voltage phase angle difference: Δφ< ±10° • Voltage magnitude difference: ΔU< ±4% Uc • Frequency difference: Δf< ±0.2 Hz	Accepted. Accepted and the text will be modified accordingly.

Demand Response – System Frequency Control

Commenter	Type of comment	Comment	Remarks
ENA/GEODE	editorial	There is confusion over the decimal point convention "50.0 Hz +/- 200 mHz in case of a load imbalance of +/- 3.000 MW." I think this means 3GW, not 3MW - but the 50Hz uses the more correct decimal point rather than a comma.	Accepted.
ENA/GEODE	editorial	At the botton there is an orphaned heading which should be attached to its paragraph on the next page - and it is wrong - it should be TSO-DSO.	Accepted.
Orgalim	general	This IGD has experienced only a few changes, Just the introductory redaction, without any change on technical content. The update was due to the fact that no values had been provided in the previous version for the maximum frequency deviations recommended for each Synchronous area, because the technical work was ongoing; and the frequency thresholds for the Baltic were neither provided, for the same reason. In addition, a minor change in the upper threshold for GB area has been proposed. Any technical support or reference to the technical work carried out to decide recommended thresholds and deviations would have been acknowledged.	Not accepted. The CNC Active Library includes a monitoring file with all information on national specifications, which have been provided to ENTSO-E
TenneT TSO BV	technical	In my opinion you are now blocking DemandSide to enter the FCR-market by in fact setting a deadband off 200mHz. (in CE). In tmhe future more and more productuion will be out off operation and so you will need other means to supply FCR. I would urge to note somewhere in the IGD that if a DS is awarded/contracted for delivering regular FCR (within the FSM) he don't has to set a deadband of 200mHz. Doing so you don't block hem in entering the regular market. Kind regards,	Accepted with changes. If a DR-SFC is contracted for delivering FCR within the FSM, it doesn't need to set a deadband (e.g. of 200mHz for CE synchronous area). We will adopt the text of the IGD.
WindEurope	general	This IGD has experienced only few changes, just the introductory redaction, without any change on technical content. The revised version includes maximum frequency deviations recommended for each synchronous area. The previous version did not include this information because the technical work was ongoing. In addition, a minor change in the upper threshold for GB area has been proposed.	Not accepted. The current version of the IGD includes the relevant information as well as current updated thresholds.
VGB	technical	1. This IGD imposes the triggering of SFC by frequency measurement and forbids an external signal for this SFC service. What is the intention of ENTSO-E regarding the existing habits in some countries to reduce the load by the TSO in an alert state of the grid but at a normal steady state system frequency?	Not accepted. This question is not related to the content of this IGD. NC DC in article 27. defines demand response services. Such information is not known to ENTSO-E.

VGB	clarification	2. The sentence "The value of the system frequency can be measured at the connection point of any device within the demand system facility. "on page 7 is not correct. The notion "connection point" has a completely different legal meaning (see RfG NC Definition 15) and may not be used in this context.	Accepted with changes. The value of the system frequency can be measured at the point of coupling of any device within the demand system facility that corresponds to frequency at the connection point
VGB	technical	3. The IGD supposes a high replacement rate of 10 years for equipment able to offer SFC. The value of 10 years seems too short for several devices (e.g. space heating without any mechanical components).	Not accepted. The 10 years period is just an example. The life cycle length and parameters can be determined based on periodic updates at 3 yearly periods (based on review period foreseen in the network codes).
VGB	technical	4. The table on page 9 indicates thresholds in all synchronous areas. Will all equipment offering SFC undertake an action at those unique frequencies? This will disturb the injection – demand balance and cause enormous frequency deviations. If a SFD consumption of 6000 MW would disconnect at a frequency of 49.8 Hz, the frequency will rise to the value of 50.2 Hz and "pumping / switching ON-OFF between 49.8 Hz and 50.2 Hz" will start. What about a linear functionality similar to the droop function offered by generators?	Not accepted. The selectivity of this functionality should be evaluated based on system needs on synchronous area and be decided by the relevant TSO based on studies. This does not mean that all DU that are providing DR SFC will connect or disconnect at the same frequency.
VGB	technical	5. What about the behaviour of such SFD equipment during the restoration phase after a black-out? Each time that a threshold value is reached, the load will change and generating units are unable to control the frequency.	Accepted. The primary purpose of DR SFC is to support system frequency before system defence plan take action. Demand units participating in DR SFC also support system restoration state as they support system frequency.
VGB	clarification	6. VGB does not understand the table on page 10 with the title "Consequential the recommended non-exhaustive maximum frequency deviation parameters for each synchronous area are:" This table contains the start frequency of LFDD and the frequency at which generators can disconnect. What is the intention of this table?	Not accepted. 1. Yes, it is the starting frequency of LFDD for DS/DF and not for PGMs. 2. To recommended non-exhaustive maximum frequency deviation parameters for each synchronous area. The intention is explained in the IGD DR SFC (page 9).
VGB	clarification	7. The proposed method to counteract over-frequency is to energise additional load. This means additional consumption outside the supply contract. This can provoke legal disputes. How will ENTSO-E solve this issue?	Not accepted. In over frequency additional DU inside DF are energised. No additional load outside the supply contract is energised.
Vestas	editorial	RfG reference needs to be adjusted acc. to NC RfG, Article 15 (2) (d). "RfG, Article 15(2)(d) [FSM]" instead of "RfG, Article 15(2)(c) [FSM]" | Proposed change: "RfG, Article 15(2)(d) [FSM]"	Accepted.
Vestas	editorial	"DR-SFC" instead of "DR SCC" | Proposed change: "DR-SFC"	Accepted.

Parameters of Non-exhaustive Requirements

Commenter	Type of comment	Comment	Remarks
ENA/GEODE	general	I do not understand the point of this IGD.	The point of this IGD is to help the TSOs and RSOs in member states in implementation of non-exhaustive requirements on the national level. The IGD provides new definitions of the terms "general" and "site specific" timing of implementation non-exhaustive requirements and their relationships with mandatory / non-mandatory and exhaustive / non-exhaustive requirements.
Orgalim	general	This IGD is replacing the old excel table "CNC_Non_exhaustive_requirements_171212.xlsx". Of course, this is a more readable and easy to manage document, and it is a useful list of all non-exhaustive requirements, in order to help to find different specifications. But the excel table included too the parameters proposed by the different countries by the end of 2017, as an useful guidance. It should have been really interesting to have comparative tables with the parameters adopted by the different countries, in order to add actual value to this document. Like proposed, the value is more limited.	Not accepted. The excel file was prepared in 2017 to support the transparency of the different national implementation processes - i.e. proposals for non-exhaustive requirements and the status of implementation. Although the excel file was based on the CNCs provisions, it was never meant to be part of the Implementation Guidance Document since the objective and use would be different. The excel file has evolved since then and we have recently uploaded a much more comprehensive file as part of the ENTSO-E's Monitoring activities. The user is now able to see all the selected proposals from this file and the Implementation Monitoring Report. The IGD had to be revised for consistency reasons MS Excel file "CNC_Non_exhaustive_requirements_171212.xlsx" is one of previous Implementation Monitoring Files. The actual Implementation Monitoring File and Implementation Monitoring File can be found in ENTSO-E Active Library of CNC

WindEurope	general	WindEurope welcomes this opportunity to provide feedback on the revision of Implementation Guidance Documents. Overall, the revision is very relevant and will certainly improve the application of various aspects of grid connection requirements at national level. However, the NC RfG (or EU directive) has been published in 2016 and national implementation should have been finalised two years later. The objective of these IGDs was to support national implementation. Nonetheless, certain aspects of national implementation have already been finalised, so revisions come too late in the process regarding these aspects. In certain cases, such as for example frequency range and exhaustive requirements, it may no more be relevant to update the IGDs but rather to consider this revised content for an RfG update overall (RfG V2.0). In other cases, such as compliance assessments, simulations, tests, and equipment certificate the discussion at national level is still open thus the respective IGD revisions (e.g., on compliance verification) will indeed support the national processes and hopefully harmonize those across the different member states. IGD for Non-Exhaustive requirements: The revised IGD provides a good overview of non-exhaustive requirements and related to them generic information. A general concern is that it seems that most requirements are now non-exhaustive. This might lead to many variations when it comes to national implementation. It would be helpful to include a table presenting the exhaustive requirements as well. This IGD is replacing the previous excel table "CNC_Non_exhaustive_requirements_171212.xlsx". The revised version is more readable and easier to manage for identifying the different specifications. However, the previous excel table also included parameters proposed by the different countries (by the end of 2017) and this was useful guidance. The revised document should also include comparative tables with the parameters adopted by the different countries. Some specific points on HVDC Non-Exhaustive Requirements – Frequency Issues: Wider frequency ranges: HVDC components such a transformer will require special design consolidations to operate without saturation at under frequency ranges and the required time of operation under these conditions. This will have an impact on the CAPEX of the equipment. Drives providing air and water cooling for the HVDC system will require special deign consolidations to operate under extended under and over frequency ranges. This will have an impact on the CAPEX of these equipment. Out the shelf equipment cannot be utilized if extended frequency deviations are applied. Fast Active Power Reversal: Fast active reversals will impact the DC transmission cable design. The converters may reverse the power very fast, but the DC cable may impact the reversal time and should be taken to consternation. The fast power reversal may impose transients in the connected AC system. The power reversal requirement should define the limits of the AC system short circuit capacity.	Not accepted. The Table of Exhaustive requirements is out of the scope of IGD on Parameters of Non-exhaustive Requirements. The excel file was prepared in 2017 to support the transparency of the different national implementation processes - i.e. proposals for non-exhaustive requirements and the status of implementation. Although the excel file was based on the CNCs provisions, it was never meant to be part of the Implementation Guidance Document since the objective and use would be different. The excel file has evolved since then and we have recently uploaded a much more comprehensive file as part of the ENTSO-E's Monitoring activities. The user is now able to see all the selected proposals from this file and the Implementation Monitoring Report. The IGD had to be revised for consistency reasons MS Excel file "CNC_Non_exhaustive_requirements_171212.xlsx" is one of previous Implementation Monitoring Files. The actual Implementation Monitoring File and Implementation Monitoring File can be found in ENTSO-E Active Library of CNC.

EUTurbines	clarification	In the tables from page 11 till the end of the documents it is recommended to add a legenda that permit to understand the information in the table. This could be also a brief description at the beginning. For example there are two columns named "Timing of Proposal" (which is not completely clear what the meaning). In the column are indicated "G" and "S" which maybe could mean "General" and "Site Specific". However this information shall be somewhere indicated.	Accepted with changes. The list of introductory definitions of applied acronyms is extended with FCN: Fixed Consecutive Number. The terms "General" and "Site specific" are matched in their definitions with initial letters "G" and "S" in the tables.
Vestas	general	Link doesn't lead to IGDs but to "ENTSO-E Federation Service" | Proposed change: Link to be used: https://www.entsoe.eu/network_codes/cnc/cnc-igds/	Accepted with changes. The hyperlink of Active Library on page 3 is updated with following link: https://www.entsoe.eu/active-library/codes/cnc/
Vestas	editorial	Unnecessary line break | Proposed change: Delete line break between "In…" and "…cases of different applications…"	Accepted. The text on the page 4, paragraph 3 is formatted.
Vestas	editorial	Correct listing of IGDs (false line breaks) | Proposed change: IGD Parameters related to frequency stability IGD Instrumentation simulation models and protection IGD Voltage related parameters IGD System Restoration IGD Harmonisation IGD Making non-mandatory requirements at European level mandatory at national level IGD Reactive power control modes for PPM & HVDC	Accepted. The text of IGD list on the page 5 is formatted.
Vestas	general	Incomplete sentence (compared to IGD version 16-11-2016) "The choice of most of the non-exhaustive parameters in each country at the entry into force of the NC will need to take into account the immediate and future system characteristics (for example RES penetration), including both the networks development and that of its portfolio of users." instead of "The choice of the non-exhaustive parameters when the NC enters in force needs to take into account the immediate and future system characteristics (for example RES penetration), including both the networks development." | Proposed change: "The choice of most of the non-exhaustive parameters in each country at the entry into force of the NC will need to take into account the immediate and future system characteristics (for example RES penetration), including both the networks development and that of its portfolio of users."	Accepted with changes. The sentence is updated. "The choice of the non-exhaustive parameters at the entry into force of the NC needs to take into account the immediate and future system characteristics (for example RES penetration), including both the networks development."

Vestas	editorial	Column designation missing. Excel designation ("XY") not helpful in PDF document. "In column "Timing of Proposal" in the following tables "G" refers to..." instead of "In column XY in the following tables "G*" refers to..." | Proposed change: "In column "Timing of Proposal" in the following tables "G" refers to..."	Accepted. The definitions of the terms "General" and "Site specific" are updated. General: CNC demands the requirement to be implemented in National Implementation of CNC. In the column "Timing of Proposal" in the following tables "G" refers to the term "General" and Regulatory aspects in NC RfG Article 7(4), NC DCC Article 6(4), NC HVDC Article 5(4). Site specific: CNC demands the requirement to be implemented in due time for plant design / commissioning at latest. In the column "Timing of Proposal" in the following tables "S" refers to the term "Site specific" and Regulatory aspects in CNC: NC RfG Article 7(2), NC DC Article 6(2), NC HVDC Article 5(2).
Vestas	editorial	Column designation missing. Excel designation ("XY") not helpful in PDF document. "In column "Timing of Proposal" in the following tables "S" refers to..." instead of "In column XY in the following tables "S*" refers to..." | Proposed change: "In column "Timing of Proposal" in the following tables "S" refers to..."	Accepted. The definitions of the terms "General" and "Site specific" are updated. General: CNC demands the requirement to be implemented in National Implementation of CNC. In the column "Timing of Proposal" in the following tables "G" refers to the term "General" and Regulatory aspects in NC RfG Article 7(4), NC DCC Article 6(4), NC HVDC Article 5(4). Site specific: CNC demands the requirement to be implemented in due time for plant design / commissioning at latest. In the column "Timing of Proposal" in the following tables "S" refers to the term "Site specific" and Regulatory aspects in CNC: NC RfG Article 7(2), NC DC Article 6(2), NC HVDC Article 5(2).

Vestas	editorial	Requirement designation (column "Non-exhaustive Requirement") needs to be changed acc. to NC RfG, Article 13 (4). "Admissible Active Power Reduction from maximum Output with falling Frequency" instead of "Admissible Active Power Reduction" See FCN 8 | Proposed change: "Admissible Active Power Reduction from maximum Output with falling Frequency"	Accepted. The text in the Table 1.1, FCN 8, column "Non-exhaustive Requirements" is updated. "Admissible Active Power Reduction from maximum Output with falling Frequency"
Vestas	editorial	Requirement designation (column "Non-exhaustive Requirement") needs to be changed acc. to NC RfG, Article 15 (2) (a). "Active power controllability" instead of "Frequency Stability" See FCN 13 | Proposed change: "Active power controllability"	Not accepted. The text of the Article 15(2): "Type C power-generating modules shall fulfil the following requirements relating to frequency stability: …" Thus, the term "frequency stability" doesn't need to be changed.
Vestas	editorial	Requirement designation (column "Non-exhaustive Requirement") needs to be changed acc. to NC RfG, Article 15 (2) (d) (i). "Frequency Sensitive Mode (FSM)" instead of "Frequency Sensitive Mode" See FCN 15 | Proposed change: "Frequency Sensitive Mode (FSM)"	Accepted with changes. The text in the Table 1.1, FCN 15-18, column "Non-exhaustive Requirements" is updated. "FSM"
Vestas	editorial	RfG reference (column "RfG NC Article No.") needs to be changed/adjusted acc. to NC RfG, Article 15 (6) (e). "15 (6) (e)" instead of "15 (6)" See FCN 21 | Proposed change: "15 (6) (e)"	Accepted. The text in the Table 1.1, FCN 21, column "RfG NC Article No." is updated. "15(6)(e)"
Vestas	editorial	Requirement designation (column "Non-exhaustive Requirement") needs to be changed acc. to NC RfG, Article 15 (6) (d). "Installation of devices for system operation and devices for system security" instead of "Rates of Change of Active Power Output" See FCN 22 | Proposed change: "Installation of devices for system operation and devices for system security"	Accepted. The text in the Table 1.1, FCN 22, column "Non-exhaustive Requirements" is updated. "Installation of devices for system operation and devices for system security"

Vestas	editorial	RfG reference (column "RfG NC Article No.") needs to be changed/adjusted acc. to NC RfG, Article 16 (3) (c). "16(3)(c) (Voltage-against-time profile for asymmetric faults)" instead of "16(3)© (Voltage-against-time profile for asymmetric faults)" See FCN 9 | Proposed change: "16(3)(c) (Voltage-against-time profile for asymmetric faults)"	Accepted. The text in the Table 1.2, FCN 9, column "RfG NC Article No." is updated. "16(3)(c) (Voltage-against-time profile for asymmetric faults)"
Vestas	editorial	Parameter designation (column "Parameters/Ranges/Values") needs to be changed/adjusted acc. to NC RfG, Article 21 (3) (c) (i). "P-Q/Pmax-profile below maximum capacity" instead of "U-Q/Pmax-profile below maximum capacity" See FCN 33 | Proposed change: "P-Q/Pmax-profile below maximum capacity"	Accepted. The text in the Table 1.2, FCN 33, column "Parameters/Ranges/Values" is updated. "P-Q/Pmax-profile below maximum capacity"
Vestas	editorial	Parameter designation (column "Parameters/Ranges/Values") needs to be changed/adjusted acc. to NC RfG, Article 21 (3) (c) (iv). "Appropriate timescale to reach any operating point within P-Q/Pmax-profile" instead of "Appropriate timescale to reach any operating point within U-Q/Pmax-profile" See FCN 34 | Proposed change: "Appropriate timescale to reach any operating point within P-Q/Pmax-profile"	Accepted. The text in the Table 1.2, FCN 34, column "Parameters/Ranges/Values" is updated. "P-Q/Pmax-profile below maximum capacity"
Vestas	editorial	RfG reference (column "RfG NC Article No.") needs to be changed/adjusted acc. to NC RfG, Article 21 (3) (d) (vii). "21(3)(d)(vii) (Specifications of the three reactive power control mode options)" instead of "21(3)(d)(vii) (Specifications of the two reactive power control mode options)" See FCN 37 | Proposed change: "21(3)(d)(vii) (Specifications of the three reactive power control mode options)"	Accepted. The text in the Table 1.2, FCN 37, column "RfG NC Article No." is updated. "21(3)(d)(vii) (Specifications of the three reactive power control mode options)"
Vestas	editorial	Parameter designation (column "Parameters/Ranges/Values") needs to be changed/adjusted acc. to NC RfG, Article 15 (6) (c) (i). "Simulation models" instead of "Operation following Tripping to Houseload" See FCN 9 | Proposed change: "Simulation models"	Accepted. The text in the Table 1.3, FCN 9, column "Non-exhaustive Requirements" is updated. "Simulation models"

Vestas	editorial	RfG reference (column "RfG NC Article No.") needs to be changed/adjusted acc. to NC RfG, Article 15 (6) (c) (i). "15(6)(c)(i)" instead of "15(5)(c)(i)" See FCN 9 | Proposed change: "15(6)(c)(i)"	Accepted. The text in the Table 1.3, FCN 9, column "RfG NC Article No." is updated. "15(6)(c)(i)"
Vestas	editorial	Parameter designation (column "Parameters/Ranges/Values") needs to be changed/adjusted acc. to NC RfG, Article 15 (6) (c) (iv). "Simulation models" instead of "Operation following Tripping to Houseload" See FCN 11 | Proposed change:	Accepted. The text in the Table 1.3, FCN 11, column "Non-exhaustive Requirements" is updated. "Simulation models"
Vestas	editorial	RfG reference (column "RfG NC Article No.") needs to be changed/adjusted acc. to NC RfG, Article 15 (6) (c) (iv). "15(6)(c)(iv)" instead of "15(5)(c)(iv)" See FCN 11 | Proposed change: "15(6)(c)(iv)	Accepted. The text in the Table 1.3, FCN 9,11 and 12, column "RfG NC Article No." is updated. "15(6)(c)(iv)"
Vestas	editorial	Requirement designation (column "Non-exhaustive Requirement") needs to be changed acc. to NC RfG, Article 15 (6) (d). "Installation of devices for system operation and devices for system security" instead of "Operation following Tripping to Houseload" See FCN 12 | Proposed change: "Installation of devices for system operation and devices for system security"	Accepted. The text in the Table 1.3, FCN 12, column "Non-exhaustive Requirements" is updated. "Installation of devices for system operation and devices for system security"
Vestas	editorial	RfG reference (column "RfG NC Article No.") needs to be changed/adjusted acc. to NC RfG, Article 16 (4) (d). "16(4)" instead of "16(4)(d)" See FCN 16 | Proposed change: "16(4)(d)"	Accepted. The text in the Table 1.4, FCN 16, column "RfG NC Article No." is updated. "16(4)(d)"

Maximum Admissible Active Power Reduction at Low Frequencies

Commenter	Type of comment	Comment	Remarks
ENA/GEODE	clarification	The text at the bottom implies that TSOs will obtain information on a project by project basis on the low frequency response of individual SPGMs. A process to support this could be needed - there is no obligation in the RfG or the SOGL for a DSO to pass on this information from a DSO connected generator to the TSO.	Not accepted. This statement is not correct. According to NC RfG and SO GL all relevant documents must be exchanged and provided by the relevant parties.
WindEurope	general	The revision brings no changes in the core technical content only an update of the text and presentation. Annex 1 (Approach in current grid codes) of the previous version is not included in the revised one. A comparative annex including final national approaches would be very useful. IGDs provide indeed guidelines for EU codes implementation at national level. However, the evolution of networks should be monitored every 15 -20 years, and the update of actual national codes shall remain the focus (and not only the update of IGDs).	Not accepted. The main reason for the revision of this IGD was to fulfil the request of particular stakeholders. ENTSO-E has accepted this feedback and has accordingly amended the IGD. The relevant paragraph below figure 1 reflects this request "Concerning the national implementation of article 13(5), it is recommended to require from SPGMs, on a project-specific basis, the inherent power vs. frequency characteristics (i.e. without any power compensation control measures) with the ambient temperature as a variable to be shown in the range between -10 to 40oC. This shall not say that the above requirement is to be met for the whole set of temperatures but rather that this information is important for TSOs to be able to size FCR, FRR, and RR as well as the load shedding scheme and eventually minimum system inertia. Furthermore, the provision of this information will support the verification of compliance of the PGM with the defined requirement. ". Moreover, in the public consultation phase, additional information are provided in order to enhance the content of this IGD.

EUTurbines	technical	Point C Steady State domain / Gas Turbine technology are sensitive to low frequency behaviour, we would recommend to modify CCGT to CCGT/Cogeneration based on Gas Turbine along the IGD document / GT technology, as described in graph at page 12, cannot fulfill intrinsically any requirements, but needs mitigation/compensation. This mitigation/compensation however are limited in time and, as described in this same chapter in the IGD, the support is expected to last as much as to permit to the different compensating system on the grid to react. In the RfG the falling power at low frequency is described without any reference to time. However low frequencies requirements are non-exhaustive requirements to be defined by TSOs at national level. Some countries are requesting that generating units are capable to operate for very long or even for unlimited time. **This requirement is not a reasonable one when associated to supporting the grid, but it shall be understood as the capability of the generating unit to remain connected rather than providing support to the grid** (the grid is not expected to run undefinedly below 49.5 Hz. The so called "steady state" support is expected to help support the implementation of a load shedding scheme and the reaction of grid reserves which shall not take much time to react. It is recommended to add a wording indicating that the support to the grid is expected to last up to when grid support scheme are expected to react (5min and up to max 30 min). It is recommended to add a note in the steady state domain where the 30 min are the requested time duration independently from max time duration at low frequencies as defined in each countries and independently from each slope. It is recommended to modify the table in the upper part of page 8 (it is not clear the content and the value in the table). It is recommended to add a footnote in the table at the bottom of page 8 (beginning of page 9) stating that t3 30 min is the longer time expected in general as an upper limit and in UK where the limit are very high (and it should be similar in any other countries with such profile), the time duration is expected to lats 5 minutes.	Not accepted. We have introduced into the IGD the proposed modification with regard to the duration of the compensation/mitigation measures. In this IGD, the capability of the PGMs to remain connected during large disturbance frequency drops while simultaneously maintain the active power output at the pre-disturbance value is regarded as system support functionality. Table 1 in the IGD defines for transient as well as the steady state domain the duration of the requested capability. The NC RfG defines the 49Hz and 49.5Hz as frequency thresholds for this capability. This IGD aims to associate these frequency ranges to given time domain where the response is expected. The tables are modified and additional graphs have been added in order to explain clearly the expected capability.

EUTurbines	clarification	/ Information to be provided "Concerning the national implementation of article 13(5), it is recommended to require from SPGMs, on a project-specific basis, the inherent power vs. frequency characteristics (i.e. without any power compensation control measures) with the ambient temperature as a variable to be shown in the range between -10 to 40oC. This shall not say that the above requirement is to be met for the whole set of temperatures but rather that this information is important for TSOs to be able to size FCR, FRR, and RR as well as the load shedding scheme and eventually minimum system inertia. Furthermore, the provision of this information will support the verification of compliance of the PGM with the defined requirement." It is not clear if the curves to be provided are the ones corrected (including the contribution of additional means to match the requirement) or the one without correction mean. Intrinsic curve can be provided to system operator so that they can plan for mitigation/compensation resources. It shall be understood that these curves are expected calculated performance. When considering mitigation technologies, it shall be considered that, despite engineering, there are risks associated and that this mitigation cannot be tested under any condition. The requirements can be met at plant level (at the point of connection) therefore involving additional compensation (such as plant load shedding or using storage and reserve shared among the generation within the same plant). This is not described in the document; it should eventually be permitted (as an example in a CCGT where ST is oversized, the use of additional reserve of steam to compensate for the GT loss).	Accepted. The text has been adopted accordingly.
EUTurbines	technical	/ Reference to UK Grid Code ambient condition UK Grid Code reference the 25°C as the maximum temperature for which the requirements is applicable and falling power at low frequency requirements are expected to be applicable for CCGT for a limited frequency range, down to 48.8 Hz, where under frequency protection are set to trip, and below such limited range, for a limited time of 5 minutes, as it can be seen in the extract from the UK Grid Code. UK Grid Code recognized the technical limitation for CCGT associated with Gas Turbine technology. (refence to Figure 2) Therefore 25°C could be a reference where the corresponding limitation of technologies are also recognized (steep slope, high temperature, but support requested for a short period of time for CCGT technologies due to Gat Turbine limitation), a generic indication to such ambient temperature would be out of context and mitigation technologies for prolonged time could not be considered cost effective. Temperature reference had been introduced in consideration as an additional parameters to consider the technologies behaviour.	Not accepted. The ambient temperature should be specified at national level, based on geographic location specific conditions. The IGD provides examples on this topic based on current practices in some countries. The aim of this IGD is to define the requested capability that supports the system needs.

EUTurbines	clarification	/ LFSM-U and FSM (-U) Original text in the IGD: "This net additional active power output should be demonstrated at the connection point and therefore it is expected that the control system acting on the power of the primary energy source should, in addition to the increase of this power compared to the 50Hz value, further increase this power to compensate for any active power reduction at low frequencies discussed within this IGD." The LFSM-U and FSM(-U) are limited by the generating unit output power, unless the system operator define a spinning reserve the generating unit shall provide. For example, if the generating unit (based on Gas Turbine technology) is already running at its maximum power when the frequency decrease, the generating unit will try to keep its maximum power, but the power is expected to decrease according to the characteristic as defined in art 13.5. If the generating is operating at partial load (e.g. 50% Pmax) and the frequency decrease, the generating unit is expected to increase its power according to the LFSM-U (and FSM) characteristic and up to its maximum power that it can achieve (based on ambient condition and system frequency). If a spinning reserve shall be calculated based on the LFSM-U slope and considering in addition the power limitation, the generating would always operate at partial load. This would result in having the generating unit operating at low efficiency (with associated CO2 impact) which is not desirable. Check for a better wording or consider adding the example above for clarity.	Not accepted. The requirement described in this IGD is related to the capability of PGMs to maintain active power at falling frequency. What the IGD refers to is that the FSM and LFSM-U requirements might "interact". Moreover, the IGD clearly provides the relevant IGD discussing the LFSM-U and FSM requirements. The proposed examples do not fit well in this IGD and would create more confusion, than clarification. Hence, the proposal cannot be accepted. As stated in the IGD "It is important to recall that this requirement defines the capability to maintain the rated active power output of a PGM in case of low frequency with relevance for plant design. It is not an operational requirement and therefore the impact of the availability/unavailability of the primary energy source (e.g. water for hydro power plants) shall not be considered while assessing the compliance of a PGM with this requirement."
EUTurbines	technical	Mitigating effect are a possibility (depending on the requirements, they can be very costly for a very rare event). However since mitigation effect are widely needed with very few exception, the requirement as itself cannot be than requested for an indefinite time, but it shall be time limited as already commented, for example not exceeding 30 minutes for CCGT and Cogeneration (5 minutes in UK and in general where steep slopes are requested).	Not accepted. The IGD clarifies that the support is expected to last according to the recommendations of Table 1.
VGB	editorial	1.Use of unknown abbreviations such as UFLS, SPD	Accepted. Revised and clarified
VGB	general	2.Comments at figure 1 have to be formulated by manufacturers as Siemens or General Electric. The association EUTurbines has published a document regarding this topic in October 2018 entitled "EUTurbines Statement on Frequency Requirements" and it was also sent to ENTSO-E. VGB will send this paper to you by Email.	Accepted. We have updated that based the provided input.
VGB	editorial	3.Page 5 and page 10 : Careless use of wording such as "large frequency deviation (i.e. frequency below 200mHz)". The frequency is never lower than 0.2 Hz. Should you have to add the word "deviation" in the underlined part of the sentence between brackets?	Accepted with changes. The definition large frequency deviation is understood in this IGD as the variation of the system frequency which goes beyond the 200mHz band. This are rare events and caused due to large system disturbances compared to the small signal disturbances which would lead to oscillations of frequency within the 200mHz band.

VGB	clarification	4.A graph would be appreciated to explain the meaning of t1 and t2 on page 5	Accepted with changes. New graphs are provided
VGB	clarification	5.On page 5 is stated "no active power reduction is considered admissible above 49Hz".	Not accepted. The IGD provides clear description of the transient and steady state domain, as well as explanation of the relevant thresholds where active power reduction is permitted.
VGB	clarification	On page 7 is stated "It would make sense to align with the current grid codes where no active power reduction is considered admissible above 49.5Hz.". The value 49.5 Hz is consistent with RfG NC. So the value 49 Hz on page 5 has to be modified.	Not accepted. The value of 49Hz is referred to the transient domain, between time t1 to t2. The value 49.5Hz is related to the steady state domain between t2 and t3. We have added new figures and text to clarify this point.
VGB	clarification	6.The meaning of the columns on page 8 is not clear and also the percentages in the first column (e.g. 47.5 Hz;20%) are not clear	Accepted with changes. This is removed and better explained with new graphs.
VGB	editorial	7.On page 9, reference is made to figure 3. Is this correct? Not figure 1?	Accepted with changes. Corrected in the revised document of the IGD
VGB	technical	8.A classic Rankine PGM with a steam cycle cannot respect figure 1 due to the decreasing circulating volumes of steam by the slower rotating circulation pumps. Art. 13.5.b applies for this technology.	Not accepted. The IGD clarifies the system needs and the expected behaviour.
VGB	technical	9.On page 9 simulations are imposed between -10°C and 40°C. This is not coherent with RfG Title IV.	Not accepted. Based on NC RfG, article 13.5.a: The admissible active power reduction from maximum output shall: (a) clearly specify the ambient conditions applicable;
VGB	editorial	10.The provision on page 10 "mainly for PPM, the acceptability by the Network Operator of a P over Q priority control scheme at low frequencies." Is only applicable for PPMs. So the word "mainly" has to be erased.	Accepted. modification is made
VGB	clarification	11.Page 13: the sentence "Furthermore, the verification of compliance might be complex and shall be agreed with the power generating facility owner case by case." is important in order to respect a level playing field for future projects and imposes the publication of the verification rules."	Accepted. modification is made
Caterpillar (Electric Power Division)	editorial	The IGD states on Page 9; "It is recommended to require from SPGMs, on a project-specific basis, the inherent power vs. frequency characteristics between -10°C to 40°C. This shall not say that the above requirement is to be met for the whole set of temperatures but rather that this information for TSOs." This information may not be readily available from manufacturers as it is not possible to perform testing over the required temperature range. It is therefore respectfully proposed that this recommendation is removed.	Accepted. modification is made

Vestas	editorial	"...due to the decrease of frequency following a disturbance." instead of "…due to the decrease of frequency decrease following a disturbance." | Proposed change: "...due to the decrease of frequency following a disturbance."	Accepted. modification is made
Vestas	technical	Acc. to NC RfG, Article 13 (4), Figure 2, no active power reduction is considered admissible above 49.5Hz. "Taking into account the range defined by the NC, no active power reduction is considered admissible above 49.5Hz." instead of "Taking into account the range defined by the NC, no active power reduction is considered admissible above 49Hz." | Proposed change: "Taking into account the range defined by the NC, no active power reduction is considered admissible above 49.5Hz."	Accepted with changes. New graphs and explanations have been added in order to support better explanation.
Vestas	editorial	"...FSM capabilities2." instead of "...FSM capabilities22." | Proposed change: "...FSM capabilities2."	Accepted with changes.
Vestas	technical	Legend for Figure 3 needs to be adjusted Red solid line instead of red dashed line for "Typical GT power output (Unit specific)" | Proposed change: Use red solid line for "Typical GT power output (Unit specific)"	Accepted. modification is made

Frequency ranges

Commenter	Type of comment	Comment	Remarks
Orgalim	clarification	The only relevant changes are affecting the proposals for two Synchronous areas, in both cases recommending extended times to be withstood by generation facilities in some frequency ranges: o CE (Central Europe): in 51.0-51.5 Hz: from 30 mn to 90 mn; in 51.5-52.0 Hz: from nothing to 60 mn o IE/NI (Ireland): in 47-47.5 Hz: from nothing to 20 s; in 51,5-52,0 Hz: from nothing to 15 mn It would be really interesting to know the reason of the modified recommendations: if based on new available simulations/studies, or in the information gathered in some incidents, if just they are including the actual agreements between TSOs in these two areas (so, in this case this is like an "as built" edition). In the case of Ireland, the changes make this area specification equal to the Synchronous GB area. Is this fitting the main reason for changes?	Accepted. Accepted partially. The recommendation for CE SA frequency ranges has been changed unintentionally. The frequency ranges recommendation from previous version of the IGD are still valid for Continental Europe in case of power-generating facilities . The only change is in the recommendation of frequency ranges for synchronous area of Ireland and Northern Ireland in case of power-generating facilities to align with the Great Britain synchronous area. Since both are the small synchronous areas and the need for wider frequency ranges is reasonable.

WindEurope	general	Repeated from previous IGD but important also for this case: WindEurope welcomes this opportunity to provide feedback on the revision of Implementation Guidance Documents. Overall, the revision is very relevant and will certainly improve the application of various aspects of grid connection requirements at national level. However, the NC RfG (or EU directive) has been published in 2016 and national implementation should have been finalised two years later. The objective of these IGDs was to support national implementation. Nonetheless, certain aspects of national implementation have already been finalised, so revisions come too late in the process regarding these aspects. In certain cases, such as for example frequency range and exhaustive requirements, it may no more be relevant to update the IGDs but rather to consider this revised content for an RfG update overall (RfG V2.0). In other cases, such as compliance assessments, simulations, tests, and equipment certificate the discussion at national level is still open thus the respective IGD revisions (e.g., on compliance verification) will indeed support the national processes and hopefully harmonize those across the different member states. IGD for Frequency Ranges: The revised IGD explains very well the principles behind of coordination the frequency ranges for the different facilities. On the other side the IGD suggests extending frequency ranges for power generating facilities, which are not in line with developing requirements. Especially the proposal for the extended frequency ranges for Central Europe: • 90 minutes for 51,0 Hz to 51,5 Hz • 60 minutes for 51,5 Hz to 52,0 Hz (frequency range wider compared to NC RfG requirement) • 30 minutes and description for longer minimum time periods for 47,5 Hz to 48,5 Hz and 48,5 Hz to 49,0 Hz but also the respective ones for Ireland should not be stated in the revised IGD. The recommended values have not been consulted with relevant stakeholders and no other justification has been provided for their choice e.g., new simulations/studies by TSOs or analysis based on some incidents or just reflections of actual agreements between TSOs in the respective areas (Central Europe, Ireland). Such significant increase of requirements cannot be imposed through an IGD revision. If relevant and necessary, these would need to be proposed and consulted through the official process of Network Code revision (which could afterwards be supported by relevant Implementation Guidance Documents). Such unilateral decisions or proposals can have important negative implications in terms of equipment cost, sustainability and harmonisation of requirements among countries. For example, in the case of wind turbine technology, equipment which has been designed and developed based on the NC RfG (published in 2016) may suddenly not fulfill the Network Code requirements anymore. Also, suggesting new frequency ranges in specific regions is a step back in terms of harmonisation of requirements across Europe. Frequency range was supposed to be an exhaustive requirement. For example, the revised IGD mentions Spain as an example for widening the frequency range requirement, but finally the recommended values are lower than the ones for the Canary Islands; Recommending such changes without supporting them with stability studies will have a significant impact on the total equipment cost.	Accepted with changes. Accepted partially. The recommendation for CE SA frequency ranges has been changed unintentionally. The frequency ranges recommendation from previous version of the IGD are still valid for Continental Europe in case of power-generating facilities. The only change is in the recommendation of frequency ranges for synchronous area of Ireland and Northern Ireland in case of power-generating facilities to align with the Great Britain synchronous area. Since both are the small synchronous areas and the need for wider frequency ranges is reasonable. The proposals for IE / Nothern Ireland indeed go beyond the current RfG provisions, but a system need has been identified and the extended ranges have been proposed to the national authorities for approval (see footnote in the IGD).

EUTurbines	general	General Comments Frequency topic are relevant for all stakeholder and therefore it is recommended to introduce a wording where wide involvement of stakeholder is recommended. Frequency ranges affect and impact all components part of the grid, from generation to users to transmission etc,. but also the industrial system, being the backbone of the industry).	No specific request for change.
EUTurbines	technical	Page 5 "In relation to the increased withstand capability stated in NC RfG article 13(1)(a)(ii): Preserving or restoring system security, as mentioned in article 13(1)(a)(ii), should cover black-start restoration schemes as well as operation of local transmission system areas (such as countries or national regions) which have a higher risk of being operated in a system split mode a wider withstand capabilities could enhance the system stability. Therefore, an agreement with a power-generating facility owner must focus on wider withstand capabilities than those specified in article 13(1)(a)(ii)." The requirements of 13(1)(a)(ii) is meant for local areas and not for countries or national regions. This questions had been raised at least two times during GC ESC. ENTSOE confirmed twice that this article is not meant to be used to enlarge frequency limits described in art 13.1(a)(i). That would mean that every country could modify (enlarging) frequency range as they like without respecting Table 2, which is not acceptable. To change country values a derogation process with appropriate justification and involving all stakeholder shall be put in place. Delete the sentence accordingly, since the article is self explanatory.	Not accepted. The explanation provides just that the wider frequency ranges, longer minimum times for operation or specific requirements for combined frequency and voltage deviations to ensure the best use of the technical capabilities of a power-generating module, if it is required to preserve or to restore system security, could be agreed with power generating owner. That is why the article 13(1)(a)(ii) has been introduced and recommend when it shall be taken into account and possibly applied. It is not in contradiction with article 13.1 of NC RfG requirements. The article does not entitle a country to extend frequency ranges discretionary, but upon agreement with the power generating facility owner only.
EUTurbines	technical	Page 5 "In relation to the combined effect of frequency and voltage ranges stated in NC RfG article 16(2)(a)(ii): Unless the non-mandatory requirement in article 16(2)(a)(ii) is implemented at a national level, the combined effect of frequency and voltage ranges (for type D PGM) must be understood as the minimum time of operation provided by the implementation of article 13(1)(a)(i) and article 16(2)(a)(i)." We consider this has not been properly considered in term of impact costs on the existing and future system (for example design and manufacturing of electrical components). We recommend to replace such sentence indicating that whereas 16(2)(a)(ii) is not adopted at national level, the European or, when non existing international product standard shall be used. Evidence of contemporary deviation of frequency and voltage can affect the design of the generating unit (e.g. synchronous generator) consistently and consequently associated costs. Correspondent deviation of frequency and voltage phenomena shall be consequently properly studies. Additional Note: there is confusion on the fact that requirements of art 16.2.a.i are applicable directly on the generating unit (and not at the PoC). It is recommended to add a clarification in such respect adding that generating unit are not expected to comply with the wider voltage range, in fact this wider range had been defined as a requirement since on the transmission system the step-up transformer are expected to be equipped with OLTC and consequently the expected voltage range at power generating unit level are within the normal limits foreseen by product standard.	Not accepted. The statement from IGD "In relation to the combined effect of frequency and voltage ranges stated in NC RfG article 16(2)(a)(ii): Unless the non-mandatory requirement in article 16(2)(a)(ii) is implemented at a national level, the combined effect of frequency and voltage ranges (for type D PGM) must be understood as the minimum time of operation provided by the implementation of article 13(1)(a)(i) and article 16(2)(a)(i)." is fully compliant with the text of the NC RfG. All requirements of the NC RfG should be understood as minimum requirements.

EUTurbines	technical	Page 7 and following – Recommendation/Proposals The RfG has been described with exhaustive and non-exhaustive requirements. We understand the recommendation and proposals are meant to provide guidance to define values for non-exhaustive requirements only and not to add any additional requirements that would require a formal derogation process. Synchronous area CE Correct and remove last line for associated with 51.5 Hz – 52 Hz: 60 min. This is not a non-exhaustive requirements an therefore cannot be recommended. The value proposed is in any case extremely outstanding (and it can lead to important design impact). We do not see this justifiable. EUTurbine already highlighted this point in the past. Any such values would require an amendment of the RfG (and a formal derogation in the member states that would like to adopt such a value). Synchronous area CE recommendation to frequency range between 47.5 Hz – 48.5 and 48.5Hz and 49 Hz Hz: 30 min or longer. Consider adding note recommending avoiding to specify "unlimited" as a requirement. Unlimited time is too generic and not in line with any synchronous area. It is recommended to specify a reasonable time associated with the synchronous area and eventually specific longer time for some specific region (the worst-case region shall not trigger requirements for the rest of the system). Synchronous area IE/NI Correct and remove last line for associated with 51.5 Hz – 52 Hz: 15 min This additional would be a deviation from RfG that require a derogation at national level. We would like to insist that today there is no published studies to show that such frequency range is really needed (this has been highlighted in the past by EUTurbine). As requirements shall be based on real system needs, technical explanation shall be in any case to be provided and made public. Also in this case we recommend this points to be raised among stakeholders. Note that EUTurbine already highlighted this point in previous DSA, GC ESC etc. meetings.	Accepted. Accepted partially. The recommendation for CE SA frequency ranges has been changed unintentionally. The frequency ranges recommendation from previous version of the IGD are still valid for Continental Europe in case of power-generating facilities . The only change is in the recommendation of frequency ranges for synchronous area of Ireland and Northern Ireland in case of power-generating facilities to align with the Great Britain synchronous area. Since both are the small synchronous areas and the need for wider frequency ranges is reasonable. The proposals for IE / Northern Ireland indeed go beyond the current RfG provisions, but a system need has been identified and the extended ranges have been proposed to the national authorities for approval (see footnote in the IGD).
VGB	technical	1. The requirement to operate in the frequency range 51.5 Hz – 52.0 Hz is a violation of the standard IEC 60034-1 imposing a maximum frequency of 1.03% equal to 51.5 Hz. Thermal overloads will occur in the alternator imposing a reduction of the output power. See page 69 figure 11 of this standard (inserting a figure in this webtool is not possible) Following restrictions are imposed according to this standard in chapter 7.3 on page 67 • The machine temperature at an operating point in zone B will exceed the temperature in zone A by 10° K. A reduction of the output can be imposed to reduce the temperature rise. • All excursions outside zone A have to be limited in value, duration and frequency of occurrence.	Not accepted. The facilities shall be capable of remaining connected to the network and operate within the frequency ranges and time periods according to article 13 of NC RfG. Standards should be aligned with network codes. The purpose of the CNC is not to be aligned with standards but to required capabilities for significant grid users to keep the system secure and stable.

VGB	clarification	2.To add at the tables page 7 – 9: frequency values only for a nominal voltage. For other values of the voltage at the connection point, IEC standards have to be respected.	Not accepted. The frequency ranges are applicable to unlimited and limited voltage ranges according to CNC and according to national implementation. The purpose of the CNC is not to be aligned with standards but to required capabilities for significant grid users to keep the system secure and stable.
VGB	technical	3.Retro-active application of requirements on existing PGMs according to RfG Art. 4.1.b shall never impose extended frequency ranges on existing PGMs. Consistency with SOGL Art. 25.2 has to be respected. The majority of existing PGMs in Continental Europe is conceived / designed for a maximum frequency of 51.5 Hz. "SOGL Art.25.2 When defining the operational security limits, each TSO shall take into account the capabilities of SGUs to prevent that voltage ranges and frequency limits in normal and alert states lead to their disconnection."	Not accepted. CNC are related to new facilities according to the scope of each CNC. No retro-active application is suggested by this IGD on Frequency ranges.
VGB	general	4.A trip to houseload at 52.0 Hz is not guaranteed successful.	Not accepted. It is not relevant for IGD on frequency ranges. If the technology can a quick resynchronization then the houseload operation is not mandatory.
VGB	general	5.Pumping mode of hydro storage installations at a frequency above 51.5 Hz is not guaranteed.	Not accepted. According to the article 6.2 of NC RfG the pumped storage power plant shall fulfil all the relevant requirements in both generating and pumping operation mode. An GC ESC EG has investigated the capabilities of pump-storage hydro and provided recommendations, which need to be taken into account for RfG amendments.
VGB	clarification	6.On page 5, the sentence ”Therefore, an agreement with a power-generating facility owner must focus on wider withstand capabilities than those specified in article 13(1)(a)(ii).” is not clear given the fact that Art.13.1.a.ii imposes to use the technical capabilities of the PGM. Wider withstand capabilities are not possible.	Not accepted. It is clearly stated in the NC RfG in article 13(1)(a)(ii) that wider frequency ranges, longer minimum times for operation or specific requirements for combined frequency and voltage deviations to ensure the best use of the technical capabilities of a power-generating module, if it is required to preserve or to restore system security, can be agreed between the system operator and power generation facility owner. The article does not entitle a country to extend frequency ranges discretionary, but upon agreement with the power generating facility owner only.

VGB	clarification	7.On page 8: "but longer minimum time periods may be required for countries, which are exposed to a higher risk of islanding (e.g. peninsular area) to allow for an extended period of time for system restoration". This will not be accepted by legal experts. A list of involved areas is needed.	Not accepted. By this recommendation it is allowed to specified longer minimum time periods for "bottleneck" parts of a synchronous area. A list of involved areas is not required by NC RfG. Any legal debate/justification is subject to the national implementation.
VGB	general	8.At page 8: A frequency threshold of 52.0 Hz for continental Europe is higher than the threshold of 51.5 Hz imposed by the RfG NC. This would mean a violation of the EU legislation and requires an amendment of the network code because no member state can impose more stringent requirements than those imposed by the EU."	Accepted. Accepted. The recommendation for CE SA frequency ranges has been changed unintentionally. The frequency ranges recommendation from previous version of the IGD are still valid for Continental Europe in case of power-generating facilities.
Caterpillar (Electric Power Division)	general	The proposal on page 8 to operate at 52 Hz for 60 minutes in Continental Europe (CE) seems to be an excessive time compared with the other regions. This will drive generating unit design changes and oversized machines. 52 Hz for 15 minutes as required in Great Britain (GB) and Baltic regions is considered more reasonable. Is it possible to reconsider the time duration, and align with the GB requirement?	Accepted with changes. Accepted. The recommendation for CE SA frequency ranges has been changed unintentionally. The frequency ranges recommendation from previous version of the IGD are still valid for Continental Europe in case of power-generating facilities.
Vestas	editorial	"...frequency ranges required for facilities..." instead of "...frequency ranges requiredcapability for facilities..." | Proposed change: "...frequency ranges required for facilities..."	Accepted.
Vestas	editorial	"…NC DCC…" instead of "…NC DC…" | Proposed change: "…NC DCC…"	Not accepted. The title of the Regulation is "Network Code on Demand Connection" which is abbreviated as NC DC. The NC DCC implies the word "Code" twice.
Vestas	editorial	"…NC DCC…" instead of "…NC DC…" | Proposed change: "…NC DCC…"	Not accepted.
Vestas	editorial	"…NC DCC…" instead of "…NC DC…" | Proposed change: "…NC DCC…"	Not accepted.
Vestas	technical	Proposal of "90 minutes" minimum time for operation for frequency range 51.0 Hz - 51.5 Hz not in line with NC RfG, Article 13 (1). See table "Synchronous area CE" | Proposed change: Remove proposal of "90 minutes" minimum time for operation for frequency range 51.0 Hz - 51.5 Hz for synchronous area CE	Accepted. Accepted. The recommendation for CE SA frequency ranges has been changed unintentionally. The frequency ranges recommendation from previous version of the IGD are still valid for Continental Europe in case of power-generating facilities.

Vestas	technical	Proposal of "60 minutes" minimum time for operation for frequency range 51.5 Hz - 52.0 Hz not in line with NC RfG, Article 13 (1). See table "Synchronous area CE" | Proposed change: Remove proposal of "60 minutes" minimum time for operation for frequency range 51.5 Hz - 52.0 Hz for synchronous area CE	Accepted. Accepted. The recommendation for CE SA frequency ranges has been changed unintentionally. The frequency ranges recommendation from previous version of the IGD are still valid for Continental Europe in case of power-generating facilities.
Vestas	technical	Proposal of "20 seconds" minimum time for operation for frequency range 47.0 Hz - 47.5 Hz not in line with NC RfG, Article 13 (1). See table "Synchronous area IE/NI" | Proposed change: Remove proposal of "20 seconds" minimum time for operation for frequency range 47.0 Hz - 47.5 Hz for synchronous area IE/NI	Not accepted. It is the national need of the Ireland and Northern Ireland for their small synchronous area. Recommendation for frequency ranges is aligned with the Great Britain synchronous area. The proposals for IE / Northern Ireland indeed go beyond the current RfG provisions, but a system need has been identified and the extended ranges have been proposed to the national authorities for approval (see footnote in the IGD).
Vestas	technical	Proposal of "15 minutes" minimum time for operation for frequency range 51.5 Hz - 52.0 Hz not in line with NC RfG, Article 13 (1). See table "Synchronous area IE/NI" | Proposed change: Remove proposal of "15 minutes" minimum time for operation for frequency range 51.5 Hz - 52.0 Hz for synchronous area IE/NI	Not accepted. It is the national need of the Ireland and Northern Ireland for their small synchronous area. Recommendation for frequency ranges is aligned with the Great Britain synchronous area. The proposals for IE / Northern Ireland indeed go beyond the current RfG provisions, but a system need has been identified and the extended ranges have been proposed to the national authorities for approval (see footnote in the IGD).

Compliance Verification – Compliance Testing and Use of Equipment Certificates

(this section was introduced on 7 Oct. 2021)

Commenter	Type of comment	Comment	Remarks
ENA/GEODE	clarification	The text clearly assumes project development and timings that are appropriate for Type D PGMs. The structure and wording is often not correct for Type A. For example on p2 "applicable compliance tests, modelling and simulations during the operational notification issuing process." is not accurate for Type A where the PGM has been type tested or has an Eq C. In such cases the test will have all been done in advance of the operational notification and there is no modelling or simulations. This implicit structure for Type D leads to confusion in a number of places throughout the document.	Not accepted. Introduction is more in general overview not so much type specific.
ENA/GEODE	technical	Certification of simulation model – top of p3 – although it is desirable that the simulation model is certified by an authorized body this is not an RfG requirement so the IGD should not state it in this way.	Accepted with changes. since "Should" is used, it is not mandatory. Propose to remove anything about simulation in this IDG and address this to the IGD on simulation. All the details concerning the use of simulation models will be addressed in the IGD on Compliance Verification - use of simulation models, which is currently under development.
ENA/GEODE	editorial	It would make sense to include the key from figure 1 here adjacent to the unnumbered diagrams (why are these not figure 1 and figure 2).	Accepted with changes. Do we add Figure 1 and Figure 2 to the diagrams?? Figure and table text to be added in all the document for easier referencing.
ENA/GEODE	clarification	Not clear what this means: "A Demand Unit certificate is valid until the Single Point of connection and certify the compliance with the requirements in the single point of connection itself". In particular "until" applies only to time, not location or topography.	Accepted. until to be replaced with "up to"
ENA/GEODE	technical	Note 1 is written to apply to Type A only - but there is no reason why this has to be limited to Type A. Small Type B could certainly be treated in the same way.	Not accepted. "and in some simplified cases" can be small Type B.

ENA/GEODE	technical	Type A PGM. There is no RfG requirement that supports this statement "but the RSO shall specify if an EqC can be used to certify a specific kind of equipment in the publicly available document conditions and procedures for the use of relevant equipment certificates issued by an authorised certifier." If the PGF owner has a relevant EqC of the right scope, the RSO has to accept it. At the end of that section the text refers to compliance simulations – there are none specified in the RfG for type A. Type B, C,D. The first paragraph is not strictly true. It is likely to be the practical outcome in many cases, but there is no legal reason why most, or even all, of the RfG requirements for Type B PGMs cannot be tested and certified in the factory.	Accepted with changes. Partly accepted - text section must be reviewed and corrected as proposed. The same action must be taken on the text section for B, C and D.
ENA/GEODE	technical	"As part of the FON, the RSO and the facility owner should reach an agreement on how the compliance will be monitored over the life time of the generator, taking into account possible changes in generator software, hardware and also changes in the connection point characteristics like short circuit power and frequency impedance characteristics". Why in the FON? It could be elsewhere. There is no RfG requirement for this. It could well be in the connexion agreement, or even, as in GB, in the Grid Code.	Not accepted. It is more a recommendation than requirement since in FON stage compliance monitoring could be done. It might be an idea to remove anything on monitoring and address this to the 3rd IGD.
ENA/GEODE	technical	"The detailed list of accepted EqCs must be specified by the RSO at national level." – there is no RfG requirement for this; it is not clear what it means. Also RSOs do not have national jurisdiction in many member states.	Accepted with changes. Partly accepted - text section must be reviewed and clarified as requested. The RSO has the legal rights according to the NC RfG - the NRA must approve their requirements, but its still the RSO that have the legal rights to specify the grid connection requirements.
ENA/GEODE	technical	The label for this table is misleading – there is nothing mandatory in the RfG for compliance tests. Also it does not seem right to have a M in the the EqC columns for Type B for reactive power control, for post fault active power recovery or for ffci. These are all options for the RSO to choose to apply or not. If M means mandatory where the RSO requires the capability that would be OK – but maybe a different letter to differentiate it from the M where the RfG mandates it?	Accepted with changes. M means Mandatory when such requirement is applied. Major overhaul of the table seems reasonable. Disagree that there is no Mandatory requirements and capability must be demonstrated - by test and relevant EqC.
ENA/GEODE	technical	As for p16, Tripping to house load for type B is not mandatory and it is not clear where in the RfG POD requirements are for Type B.	Accepted. Correct. For Type B Black Start, Houseload and POD should be deleted from the table, since RfG does not require them.
ENA/GEODE	technical	EqCs might be used for Demand Units – it is very hard to conceive of them being appropriate for transmission connect distribution or transmission connected demand facilities.	Not accepted. Article 24.3.c of DCC states: ''transmission-connected demand facilities, transmission-connected distribution facilities and transmission-connected distribution systems, where these are relied upon as part of the evidence of compliance'' This EqCs are also allowed to be used instead of part of the tests required in such cases (Articles 37 to 41)

ENA/GEODE	editorial	Para numbered 1. What is Article 30ff?	Not accepted. The ff abbreviation means following, it refers to following Articles of the code (in that Title III, chapter 1 section), where equipment certificates are also mentioned.
ENA/GEODE	clarification	Note 2: I do not think this is right - or at least not expressed clearly. If the scope of the EqC is appropriate then the RSO shall accept the EqC. Certainly somethings might not be appropriately covered by the scope of any EqC, in which case the RSO can seek additional tests/information etc.	Not accepted. That is correct, the recognition, in general, of the validity of the certificate is mentioned before, but the scope of the certificate may not be appropriate for the specific environment. In such cases, the full substitution of the requirement simulations will not apply, as it is stated in the last sentence.
ENA/GEODE	technical	Top line on side should probably be on site. Please confirm that the references to Art 44(1) and 47(1) are correct. These are easily tested on site. "Compliance tests and simulations are not required by the provisions of the EU regulation 2016/631 but possible to execute based on the art. 42 (2) (b) which authorizes RSO to require additional or alternatives tests, if information provided by the power-generating owner is not sufficient." This is only true if the scope of the EqC is not fully appropriate. Otherwise the RSO does not have the right to ask this; the RfG allows the PGF owner to rely on the EqC (Art 41.1). At the bottom of the page "… certificates are to be used by…" would be better as "… certificates can be used…" Top para – Art 41.3 assigns this right to the RSO, not the TSO ; Accreditation of third parties – it is not clear what this section is saying. Suggest it needs more elaboration and it is not clear that there is any obligation here for RSOs to identify advantages and disadvantages. Grey block text – is there any difference between a product certificate and an EqC? The phrase "…equipment entitled by the EqC would be better as "…equipment within the scope of the EqC"	Accepted with changes. Correct, it is on site. The references are correct, they refer to type B and D. Maybe we should be including also reference to type C ((art. 45 (1) and art. 48 (1)). The sentence "if information provided by the power-generating owner is sufficient" refers precisely to the case that the EqC is not fully appropriate for that case, so it results insufficient. OK: "can be used" instead of "are to be used" OK: "RSO" instead of "TSO" Advantages and disadvantages shall be addressed in order to choose the most suitable compliance verification scheme. OK: "referred in" instead of "entitled by"

Orgalim	general	This is a document subjected to a very comprehensive revision, including the title. Of course, there could be many comments to the proposed schemes, but as general comments, we would highlight: o The general revision is positive. The document is easier to read (first version was quite confusing), the scope is better organized, the definitions are more detailed… o The content has been updated in order to reflect the final role of certificates in the compliance verification process (as highlighted by the change in title). The earlier edition reflected the doubts about that was being adopted, and now the IGD is showing actual trends. You can agree or disagree, but the landscape offered is more adapted to the situation, and explains the available country codes. o Positive aspects: clear statement about that double verification process must be avoided, better description of the official documents in any stage of the facility's life and how they are related with testing and certification process. o Clear information about the performance parameters that must be verified (mandatory) and those that are eligible for the countries o But in the old document there was some information about the previous implemented process in some countries (Germany, Spain, France and Italy). This information is not included in the new draft for comments. It would be useful not only to maintain the (of course, updated) information but even to include annexes with the process defined for the most relevant markets.	Accepted. In general positive feedback on revised IGD.

WindEurope	general	Repeated from previous IGD but very relevant also to this one: WindEurope welcomes this opportunity to provide feedback on the revision of Implementation Guidance Documents. Overall, the revision is very relevant and will certainly improve the application of various aspects of grid connection requirements at national level. However, the NC RfG (or EU directive) has been published in 2016 and national implementation should have been finalised two years later. The objective of these IGDs was to support national implementation. Nonetheless, certain aspects of national implementation have already been finalised, so revisions come too late in the process regarding these aspects. In certain cases, such as for example frequency range and exhaustive requirements, it may no more be relevant to update the IGDs but rather to consider this revised content for an RfG update overall (RfG V2.0). In other cases, such as compliance assessments, simulations, tests, and equipment certificate the discussion at national level is still open thus the respective IGD revisions (e.g., on compliance verification) will indeed support the national processes and hopefully harmonize those across the different member states. This IGD has undergone a very comprehensive revision including the title. IECRE WG010 commented it last year and ENTSO-E has already adopted certain comments. The general revision is positive. The document is easier to read (first version was quite confusing), the scope is organized in a better way and the definitions are more detailed. The document defines the terms and various definitions which are used in compliance verification. This is very relevant and useful as in many Members States the compliance verification topic is still open and these aspects have a big impact on many relevant parties e.g., manufacturers and PPM owners/ developers. In specific this IGD may require manufacturers to perform type tests, model validation and certification, defining the point of certification/evaluation/verification and the point of connection. All these aspects will have an impact on the different projects (design, equipment, timelines…). A positive aspect is that this IGD also introduces the Unified Modelling Language (UML) and proves how useful certification is as part of the compliance verification process. Indeed, the revised IGD now reflects the actual role of certificates in the compliance verification process (as also highlighted in the title). The previous version reflected doubts about that role while the revised IGD shows actual trends, is more adapted to the situation and explains the available country codes. However, the previous version also contained information about the former processes in certain countries. Such information was very useful but is not included in the revised version. It would be very much appreciated if the revised version could contain annexes outlining such processes in a couple of countries (Germany, France, Italy, Spain…). However, even though the revised version contains more detailed definitions, several aspects of compliance verification are still not sufficiently clarified. Many different terms are still used e.g. equipment, unit, type, facility, module which makes it hard to define a clear approach for a PPM project. The defined certificates include system certificate, component certificate, module certificate, unit certificate and demand unit certificate. All these certificates are essentially equipment certificates (EqC).	Accepted with changes. The very positive feedback to several of the improvements in the present document created for guiding the European TSOs on compliance verification using testing and applying Equipment Certificates is well appreciated. Concerning the lack of clarity on terms and definitions applied in the document is one of the results we expect to harvest by joining forces with our colleagues in the global standardisation bodies accredited laboratories and the industrial interest organisations like WindEurope during the next 6 months. The overall target is to obtain consensus within ENTSO-E and the European standardisation bodies on a European harmonized guideline for verifying compliance to the European harmonized regulations on grid connection requirements. Based on such a harmonized guideline its our vision that the accredited laboratories will be able to issue complete Equipment Certificates useful for paving the way for cost efficient integration of renewable energy sources into the European grid system. The overall target is to reduce integration cost by creating a smooth compliance verification process accepted by all TSOs in Europe and still maintaining a very high level of system security in our fully interconnected European electricity grid system. The part of our vision is also to get away from the various national compliance verification requirements and procedures by create a harmonized compliance verification guideline for the benefit of all Europeans by lowering the cost for integration of renewables by providing a cost efficient way for the compliance verification.

		The mandatory and non-mandatory requirements for equipment certification as well as compliance verification were not aligned with the RfG guidelines and therefore needed confirmation. The terms such as validation, assessment and verification were inappropriately used which made the document complex to understand. It also required reference to other documents such as NC RfG, NC HVDC, etc. for validation. This issue had been communicated by IECRE WG010 to ENTSO-E. There are some additional positive aspects such as a clear statement that the double verification process must be avoided, better description of the official documents in any stage of the facility's life and how they are related with testing and certification process, clear information about the performance parameters that must be verified (mandatory) and those that are eligible in the different countries.	

IECRE WG 010 (Convener)	clarification	1) We recommend, that tables in the current proposal should be aligned with existing RfG. Example: Islanding operation seems contradictory. In general, we would recommend to better differentiate between what is mandatory according to current NC RfG and what is not so. 2) Difference of EqCand Type Certificate / Testing: should be addressed in the tables: either – there should be a note stating that the M is only mandatory / relevant if this specific equipment is relevant to provide the functionality / capability or – the tables must differentiate between module / type / plant etc. 3) In the table(s) of page 16 ff there is use of different terms: "EqC TESTING", "EqCSimulation", "Compliance Verification Tests" we recommend to align the language used of NC RfG (title IV, chapter 2 ff) and to add definitions in case of doubt. 4) In case tables page 17 ff refer to complementary verification test on a project level: We recommend to introduce the following formulation: "With regard to the complementary compliance verification tests on voltage control mode, reactive power control mode and power factor control mode, the relevant SO may select only one of the three control options for testing."	Accepted. Agree with all suggestions as: 1. island operation mode is optional Art 15 (5) b) i, "power-generating modules shall be capable of taking part in island operation if required by the relevant system operator in coordination with the relevant TSO". 2 and 3 we will perform modification in text/table 4 - the formulation was accepted "With regard to the complementary compliance verification tests on voltage control mode, reactive power control mode and power factor control mode, the relevant SO may select only one of the three control options , for testing"
EUTurbines	general	General Note 1 It is recommended to add more prominently for each table that "the plant owner, in coordination with the RSO, may select one optimal compliance verification method (e.g. not perform a simulation if can perform a meaningful test.)" and to utilize existing test verification (e.g. eventually limited to test carried out). The reasoning is that, the cost of some simulation is very important, very site specific, and has a real impact onto plant owner economic. The time to instruct those simulation long, with due discussion to be led about about the credibility of a model (and the inherent, residual unknown of considering models with little real event data to calibrate). It is very often better to perform a test if practicable, giving sometime a solid evidence of the capability. Similarly, some test are deemed intrusive and prone to consume life of the asset, and one may provide good enough simulation in lieu of test. This proposal goes along the same direction of another sentence in the IGD, which may be also further highlighted "Double certification should be avoided, meaning that for a component for which is provided a valid equipment certificate, the RSO should avoid requiring the on-site test."	Accepted. We agree that double certification should be avoided and with the formulation: "the plant owner, in coordination with the RSO, may select one optimal compliance verification method either by tests or by simulation"

EUTurbines	general	General Note 2 It is recommended to introduce the concept of families and variants. This definition are embedded and in use in regulation (they are not defined by certifying body). The IGD can simply mention such concept on how this play in the verification process (rather than providing a definition) and referring to countries' definition (like Germany, Italy etc.). An harmonized definition could be recommended (and associated follow-up action among stakeholder).	Not accepted. not clear proposal. If refer to: 1- families of PGM - the EqC can be issue on a type of a series of equipment 2 - families of EqC issue by country (MS) can be possible but is not mandatory to be, because a non-exhaustive parameters can be present in many MS but not in all, and a TSO can accept a EqC which provide a larger (but not limited) performance than TSO required. The IGD require only to have a EqC which prove minimum requirement (non exhaustive parameters) for a MS but not impose to have EqC dedicated to MS
EUTurbines	general	General Note 3 It seems that the certification process is a bit missing in the IGD description. For example, when a generating unit has no certificate, but an equipment certificate is requested before connection, the system operator shall permit the generating unit to connect to the grid with the purpose of completing the certification process and a maximum time shall be permitted to complete the certification procedure. This can go for example with emission of a preliminary certification based on documentation and then with the complete certification after the tests at site are completed (e.g. like in Germany). This is becoming common practice due the problems faced in the early certification process-	not accepted. notification process is not the goal of IGD. The description cannot be applicable for all situations as: for class A, is not ION period of time, EqC is a condition for FON, directly. For B,C,D class, it can be a situation in which technical data highlight a non compliance. If EON is accepted without be sure that the EqC will confirm that the equipment will pass the requirements, the risk is high also for owner and for RSO.An example can be PGM manufactured 3 years ago, without any respect of RfG requirements. Your proposal can be accepted only temporary (1 year) or in cases decided by RSO in order to give time to manufacturers to align them products to new requirements. it is proposed to extend the Energizing ON approach, normally applied to type C and D, to smaller type A nd B - IGD to be integrated accordingly

VGB	general	1.VGB has formulated comments at the ENTSO-E document "GENERAL GUIDANCE ON COMPLIANCE VERIFICATION - TESTING AND APPLYING EQUIPMENT CERTIFICATES (EQC)" dated 15 June 2020 by a mail sent to ENTSO-E on 30 October 2020. The large majority of the submitted comments (e.g. comments at the tables) are not inserted in this IGD. VGB has never received a reply that comments were refused. What is the value of an ENTSO-E workshop if comments are not seriously taken into account by ENTSO-E? Will the same occur with the comments formulated during this public consultation?	accepted. All comments that have been noted down or collected by ENTSO-E in relevant discussions/GC ESC meetings/dedicated workshops have been carefully considered and many incorporated to the draft IGD that has been launched for public consultation. ENTSO-E is committed to reply transparently to all feedback received within an official public consultation. For all the other occasions, ENTSO-E tries to provide replies and arguments maintaining an open dialogue with the relevant stakeholders. That has been done collectively or through bilateral exchanges e.g. recent Stakeholders' workshop on 19.11.2020. If of course either due to time constraints or technical issues some replies were not provided before the official public consultation, stakeholders were invited to submit (officially now) their comments
VGB	general	2.The amount of comments is so high that a second public consultation is needed. It is possible that by modifying a sentence, new problems are created.	Not accepted. a second round of public consultation is not possible. The IGD is a non-binding guidance including TSOs interpretation of the CNC implementation process.
VGB	clarification	3.On page 2-3 is stipulated : "The simulation model should to be certified by an authorised body." Such certification is not common for large synchronous generators. VGB thinks that the IEEE models are not certified by a European authorised body. As example note that IEEE models are used to define the settings of the PSS and of the AVR to mitigate inter-area oscillations.	Not accepted. we are aware that certification through an authorized body is not possible for all the the type of equipment. For this reason we included the verb "should" and not "shall". This means that the certification of the models should be pursued whenever possible, when it is not a different agreement should be reached between the facility owner and the RSO.
VGB	general	4.No reference is made to the outcome of expert groups CSM and ISSM. It was agreed to respect the outcome of the ISSM and CSM expert group	Not accepted. As announced in the GC ESC meetings, the outcomes of the EG CSM and EG ISSM will be considered in the development of the next two IGDs on Compliance verification, covering compliance monitoring and compliance verification through simulation models.
VGB	editorial	5.On page 6 in the sentence "Double certification and double testing should be avoided, meaning that for a component for which is provided a valid equipment certificate, the RSO should avoid requiring the site test." the word "should" must be replaced by "must".	Not accepted. the word "should" is used in order to indicate that in case of specific needs related to site specifics characteristics that could require additional site tests in order to demonstrate compliance.

VGB	editorial	6.On page 7 in the sentence "the Relevant SO have a right to accept the use of the different types of equipment certificates" the words "have a right" should be changed in "is obliged"	Not accepted. the sentence reflects the terminology included in the Art 32.2.d "The relevant system operator shall have the right to request that the power-generating facility owner include the following in the PGMD…equipment certificates issued by an authorised certifier in respect of power-generating modules, where these are relied upon as part of the evidence of compliance;"
VGB	clarification	7.On page 8, an alternative for the described Compliance Verification Programme is the use of a list with equipment accepted by the RSO as compliant. See also the sentence on page 15: "The detailed list of accepted EqCs must be specified by the RSO at national level."	Not accepted. the compliance verification programme shall include the list of EqCs to be presented, following the specifications for the PGMD made available by the RSO.
VGB	technical	8.The sentence on page 10 "The information above related to the type A generators is not applicable to other types as B, C and D, which need significant site-specific supporting compliance evidence in addition to the type tests performed once for the type of module during e.g. its unit certification process." means a violation of RfG Art.44.1, 45.1 and 46.2. Those articles allow the use of certificates for those type of PGMs. If a certificate covers all requirements of the RfG NC, NO site-specific compliance evidence is imposed.	Not accepted. the general use of the EqCs shall be specified by the RSO as per the Art 41.3.g which states: " The relevant system operator shall make publicly available a list of information and documents to be provided as well as the requirements to be fulfilled by the power-generating facility owner within the framework of the compliance process. The list shall cover at least the following information, documents and requirements:... conditions and procedures for the use of relevant equipment certificates issued by an authorised certifier by the power-generating facility owner" all the subsequent articles underlie to the application of Art 41.3.g. this means that the application of EqCs in the cases depicted by Art.44.1, 45.1 and 46.2 must be first specified by the RSO.this means that in case the RSO highlight the need to run site test to demonstrate the compliance, the use of EqC might not be permitted.

VGB	technical	9.On page 10 the underlined sentence "For type A the installation document shall include the Equipment Certificates and other additional information such as source (e.g. PV) and kW rating. The RSO will decide if the execution of compliance tests and compliance simulations on side, are required in compliance monitoring process." Is unacceptable and in conflict with the RfG NC Art. 40.1. See also other statements in this IGD, e.g. the last sentence on page 10.	Not accepted. Art 40.1: "The power-generating facility owner shall ensure that each power-generating module complies with the requirements applicable under this Regulation throughout the lifetime of the facility. For type A power-generating modules, the power-generating facility owner may rely upon equipment certificates, issued as per Regulation (EC) No 765/2008" the term "may" indicates the possibility, well described in the RfG, for the use of EqCs in the compliance verification process. However, as clearly stated in Art. 41.3.g, the conditions and procedures for their use. The RSO has the right, when specifies this conditions and procedures, to specify too the additional documentation to be presented in the PGMD.
VGB	clarification	10.The words used in the title of the table on page 16 (EqC Testing – EqC backed by a test EqC backed by a simulation) need more explanation. Why are those words inserted here? We believe that the certifying body has to decide if tests and/or simulations are appropriate while respecting the provisions of the RfG NC.	Not accepted. This means that each requirement needs to be assessed by means of testing (EqC T) and/or simulation (Eqc S). It is not up to the CB to decide which is the appropriate way, it is specified in title iv of RfG
VGB	technical	11.The table on page 16 imposes testing for topics that are not possible or in violation with the RfG NC or contradicted in other paragraphs of this IGD. a.LFSM-O tests are mandatory and on page 24-25 is stated "For type B, and by default to the type C and D synchronous PGMs and PPMs the certificates can be used to demonstrate the compliance with relevant requirements which can be not tested in real life/on side (art. 44(1) and art. 47(1)), …" Art.44.1 & 47.1 describe LFSM-O compliance. b.Active power controllability for a type A is not imposed by RfG NC (only cease injection) c.A test "island operation" is only possible if the RSO is willing to create an island with the tested PGM and real load. See RfG NC definition 43 : 'island operation' means the independent operation of a whole network or part of a network that is isolated after being disconnected from the interconnected system, having at least one power-generating module or HVDC system supplying power to this network and controlling the frequency and voltage d.It is only possible to test the "Post Fault Active Power Recovery" if the RSO will create a three-phase-fault. Will all RSOs do this? e.Fast Fault Current injection is not imposed for SPGM, only for PPMs	Not accepted. This means that instead running onsite tests in the PGM, it would be accepted that equipment certificates of the individual components of PGM are used to demonstrate compliance.

VGB	clarification	12.Regarding the table on page 17 : a.What is "Frequency Restoration"? b.Black start and houseload are not imposed for type B by RfG NC. c.What is "Power Damping Control" d.Why does Synthetic Inertia not apply for a type C? e.This IGD has to specify the circumstances to impose the topics with a "O" in order to obtain a European level playing field.	Accepted. a) This is related to articles 45.4 / 48.5 , 15.2.e and clearly refers to those generators participating in secondary/tertiary control b)Agree; this needs to be corrected c)Please, read article 21. Anyway, needs to be corrected since it applies to C and D, not B d)it is a mistake e)disagree; this is a not binding document and it is not the purpose to over-regulate national practices
VGB	clarification	13.Regarding the table on page 18 a.Same comments as above for page 17 b.The sentence "Concerning the specific compliance verification tests accepted by the RSO will have a variability depending on generation module type and applied technology." This issue should be the goal of this IGD.	Accepted. We need to review the table in the same way as the previous comment, as you spotted relevant mistakes
VGB	clarification	14.What is the added value of those tables? It is a repetition of the provisions in the RfG NC and they do not provide any additional information. It would be better to specify exactly what has to be verified for certificates and what has to be tested / simulated for an on-site compliance verification.	Not accepted. Some stakeholders claimed for summary tables and we took the time to do it.
VGB	editorial	15.Regarding the requirements for HVDC (page 22) : Simulations for Interaction Studies and Simulation Models according to the HVDC NC Art. 29 and Sub Synchronous Torsional Interaction according to HVDC Art. 31 are missing in the table.	Accepted. The table gathers all compliance testing and simulations in title iv, but we take on board the suggestion.
VGB	clarification	16.On page 23 : the reference to IECRE is too limited. What to do with SPGMs?	Accepted. Accepted by EA should be more general.
VGB	clarification	17.On page 24 : the underlined sentence is not clear and is a contradiction with RfG NC : Note 2: as by definition, a equipment certificate provides a statement of the compliance to standards with a standardised environment (e.g. testing provisions). Therefore, the assessment of the equipment behaviour and characteristics within specific project environments (e.g. a specific power-generating module / facility) has always to be evaluated on a site-specific analysis. Hence, the full substitution of required simulations by equipment certificates may be not eligible.	Not accepted. Needs more details about the contradiction
VGB	technical	18.On page 25 the sentence "For type B, C, D synchronous PGMs and PPMs, the software tool used (EMT based or RMS based) should be coordinated in advanced with the RSO in order to allow sharing files containing simulation data" imposes actions not allowed by the majority of OEM due to intellectual property legislation and free trade regulation. This requirement has to be modified according to the outcome of the expert group ISSM.	Not accepted. Disagree. It is in line with RfG provision in 15.6.c: the request by the relevant system operator referred to in point (i) shall be coordinated with the relevant TSO. It shall include: — the format in which models are to be provided, — the provision of documentation on a model's structure and block diagrams,

VGB	editorial	19.On page 25 the meaning of the sentence "In general, for type B, C and D PGMs it is allowed to use the equipment, in the notification process." Is not clear. Is the word "certificates" forgotten in this sentence?"	Accepted. Agree, "certificates" is missing
Caterpillar (Electric Power Division)	clarification	Comments regarding definition section in IGD: We support the EUGINE proposal for an EU level accepted PGM certificate, and propose the following could be added to the existing UML diagrams: • Facility certificate: the certificate issued for local installation, such as demand facility, generation facility and HVDC facility. The national requirements, local site conditions and equipment localised settings are investigated to guarantee compliance. • PGM Certificate: European certificate issued for manufactures. PGM can be tested individually at a test bench by standard conditions. The certificate indicates module capability, such as reactive power ranges, frequency ranges etc. • Component certificate: European certificate issued for manufactures or suppliers. Component can be tested with help of simulator or as a component in PGM. The certificate indicates component capability, its interface to other components, applicable devices, etc.	not accepted. It is no clear if EU level accepted certificate include all non exhaustive requirements or the larger values for non exhaustive parameters or only the exhaustive parameters.

Caterpillar (Electric Power Division)	clarification	Modifications on Tables regarding mandatory testing: "If a CERTIFIED and properly validated model for Type B and C units is available for the particular generating set, testing for Types B and C should NOT be mandatory. The testing should only be used for model validation and certification. The FRT capability of the units can be better assessed via simulations with the actual characteristics defined by local site conditions." The proposal is to modify the "Mandatory Requirements for Equipment Certification" table on page 16, as follows: 1) Original Text: Island Operation Comment: the test definition is unclear yet, there are no reference documents. The test definition should be verified and confirmed as a suitable solution before becoming mandatory requirement. Modification suggestion: remove mandatory tests (C, D). 2) Original Text: Post fault active power recovery Comment: the test is part of FRT tests. Since FRT is not mandatory, the post fault active power recovery should be simulated by validated model. Modification suggestion: remove mandatory tests (B,C). 3) Original Text: Fast fault current injection Comment: the test is part of FRT tests. Since FRT is not mandatory, the Fast fault current injection should be simulated by validated model. Modification suggestion: remove mandatory tests (B,C). add as a mandatory simulation (C, D)	Accepted with changes. partial accepted 1- Island Operation is not mandatory requirement, but if it is required, the certification will be provided either by tests or by simulation for class B and C 2-Post fault active power recovery - is part of FRT certification - the same validation will be provided either by tests or by simulation for class B and C 3-Fast fault current injection - accepted All the details related to the simulation models will be covered in the dedicated IGD on Compliance Verification - use of Simulation models. for this reason the tables will include only the details concerning the requirements which verification can be demonstrated through testing.
EUGINE – the European Engine Power Plants Association	general	General comment A transition period is not defined. Each country needs time to implement the IGD requirements. The manufactures/operators, in turn, need at least one year after national requirements are published to adapt to them. We suggest that each country should allow at least a one-year transition period after a new grid code is published or updated. Manufactures/operators are permitted to fulfil new guidelines earlier, and should not be obliged to fulfil older guidelines as soon as new ones are published.	Not accepted. not accepted. The CNC are in force from 2016 and all National requirements (non exhaustive parameters) are known from at least 2018. The notification procedure and compliance process are also defined by CNCs from 2016. All manufacturers and stakeholders was interested on all those process form the writing CNC period (before 2016). We assume that the basic requirements are know and no transient period is necessary.

EUGINE – the European Engine Power Plants Association	technical	Comment 1: Module and Unit definition According to several codes, when dealing with SPGMs the definition of Module and Unit are the same. The UK G99 for instance gives clear examples as to HOW each technology should be treated. In addition, in the EN 50549-2:2019 you can find the following definition and example for generating MODULE under section 3.2.1: "3.2.1 Generating module: "Either a generating unit of synchronous generating technology or the sum of all generating units of non-synchronous generating technology connected to a common point of connection including all elements needed to feed electric power to the distribution grid." Based on those examples, SPGMs and PPMs should be treated differently when it comes to "unit" and "module".	Not accepted. Module is used in the context of power-generating module which means either a synchronous power-generating module or a power park module acc. to RfG art. 2(5). A PPM means a unit or ensemble of units generating electricity acc. to RfG art. 2(17). Which means an aggregation of unit to a module and for sure is more often applicable to PPMs than for SPGMs. So why should be there a distinction between SPGMs and PPMs when it comes to unit or module?
EUGINE – the European Engine Power Plants Association	clarification	Comment 2: Regarding the "definitions" section in IGD We believe the schematics found in the definitions section are incomplete and could be modified to help understand the different types of certificates. The different types of certificates could for example be more clearly related to the UML diagram (further details have been provided by email). Additionally, we see necessary to include examples of what "component certificates" are in the schematics (Actual examples to help understand what is considered a component, e.g. AVR, speed controller, converter, etc). The concept "Unit certificate" should better explain what "an aggregation of components" means. For example, a "unit" could be a single gas engine generation set (motor + controller + Generator + AVR + Auxiliaries). A clear example should be given here. We also believe the "module certificate" concept is incorrect (based on the "module" and "unit" definitions discussed in the previous point), as in some countries (like the UK), a module is NOT a generation facility when it is referred to synchronous units. In those cases, "module" and "unit" would be the same. This should be reflected in the definition.	accepted. The definition section represents a general approach to the different types of certificates. For sure UML presentation is also applicable to the interdependencies of different sets of certificates. By this way a specialization of component certificates to e.g. AVR, speed controllers, converters etc. can be presented graphically. It has been left out in order to avoid the "claim of comprehensiveness". Same for unit certificate. Regarding a module is NOT a generation facility when it is referred to synchronous units it is referred to RfG art.2(9): a SPGM means an indivisible set of installations which can generate electrical energy. Examples to be included in the IGD in order to better clarify the nature of the different kind of certificates

EUGINE – the European Engine Power Plants Association	general	Comment 3: regarding responsibility of testing procedure The document states the following: "Methodology, how to check the capability, have to be specify in certification program by the certification body". We believe that the methodologies and pass criteria should be either defined by the grid operator in question or based on existing standards (such as the upcoming IEC 50549-10). The certification body should only be responsible of carrying out the checks based on pre-existing documentation created for the explicit purpose of verifying that a certain technology can fulfil the requirements. This will avoid having multiple methodologies to test the same requirements, while also avoiding the use of PPM specific methodologies for testing SPGMs and vice versa.	not accepted. A harmonization of standards with focus on test methodology for each requirements is useful, and ENTSO E acts in this direction. The grid operator have not in his duties to elaborate/define test methodologies or pass criteria for certification bodies. It is worthy to start a harmonisation certification program for all certification bodies in order to have same methodologies for certification.

EUGINE – the European Engine Power Plants Association	general	Comment 4: introduction of the FAMILY concept for SPGMs Similar to what is found in the German TR 3 or Spanish Technical Supervision of Conformity Norm, when SPGMs share similar characteristics (such as the same prime mover technology, same unit controller, same AVR, same type of generator, etc), the verification procedure applied in a particular unit should be VALID for OTHER similar units within a pre-specified power range (to be defined by each member state) as long as the "similarity" conditions are met. This is of particular interest to manufacturers that have HUNDREDS of combinations of different sized prime movers (engines in our case) and generators. We would propose the introduction of a concept for SPGMs that can be standardized in all EU states and could be worded as follows: "Generating modules are considered in the same family as long as they share the following characteristics: "• Same unit controller model "• Same or greater Unit controller software version (with no changes on relevant functions for grid parallel operation and requirement fulfilment) "• Same AVR model and same or greater software version (with no changes on relevant functions for grid parallel operation and requirement fulfilment) "• Same generator alternator technology (synchronous generator alternator), based on definition according to IEC 63400. "The brand (manufacturer), construction (salient pole or round rotor) associated to the synchronous generator is not relevant for this definition because the active and reactive power response of the unit solely depend on the unit's controller and AVR. The excitation system shall be the same for all units considered within the family (either static, rotating, permanent magnets, etc as defined in IEEE 421)" A similar concept could be created for PPMs.	Not accepted. A "family concept" in the context of this IGD exceeds the scope of the IGD. A "family concept" is not foreseen in the RfG and therefore not implemented in the IGD.
EUGINE – the European Engine Power Plants Association	general	Comment 5: FRT simulation validated model A validated model certified by an authorized body with testing performed by an independent testing laboratory or institute based on an FRT profile defined within the NC RfG should be accepted in all EU states. This would imply including at EU level a procedure to validate FRT testing (when performed); the proposal made in Germany in the TR4 (tolerance criteria and methodology) and IEC 61400-27 (methodology) could be applied at EU level (this has already been adopted in Spain and Italy). The advantage of this will be that once a unit or module has received a certification for the model in a EU state, it could be used in others without incurring in additional costs and work for each manufacturer while still guaranteeing the accuracy and validity of the models.	Not accepted. The German TR4 test criteria are strongly related to PPMs on unit certificate level. There FRT test profiles are meaningful in manufacturers' workshops and model validation can be directly performed. A generalization of test profiles to individual SPGMs type C/D can't be applied due to system perturbation. So the proposal can only be related to PPMs. all the topics related to the simulation models will be assessed in the dedicated IGD on Compliance Verification - use of simulation models.

EUGINE – the European Engine Power Plants Association	clarification	Comment 6: Modifications on Tables regarding mandatory testing If a CERTIFIED and properly validated model for Type B and C units is available (as proposed in the previous point) for the particular generation set, testing for Types B and C should NOT be mandatory. The testing should only be used for model validation and certification. The FRT capability of the units can be better assessed via simulations with the actual characteristics defined by local site conditions. The proposal is to modify the "Mandatory Requirements for Equipment Certification" table on page 16, as follows: 1) Original Text: Island Operation Comment: the test definition is unclear yet, there are no reference documents. The test definition should be verified and confirmed as a suitable solution before becoming a mandatory requirement. Modification suggestion: remove mandatory tests (C, D). 2) Original Text: Post fault active power recovery Comment: the test is part of FRT tests. Since FRT is not mandatory, the post fault active power recovery should be simulated by validated model. Modification suggestion: remove mandatory tests (B,C). 3) Original Text: Fast fault current injection Comment: the test is part of FRT tests. Since FRT is not mandatory, the Fast fault current injection should be simulated by validated model. Modification suggestion: remove mandatory tests (B,C). Add as a mandatory simulation (C, D)	Not accepted. Comprehensible proposal. FRT capabilities of type C/D for the same reason as commented above can only be assessed by simulation models which then are validated during commissioning. all the topics related to the simulation models will be assessed in the dedicated IGD on Compliance Verification - use of simulation models. the details related to the simulation models included in the tables will be moved in the dedicated IGD.
Vestas	general	Table of Contents is missing | Proposed change: Add Table of Contents	Not accepted. The IGDs have a generic structure which not includes a ToC. It might be discussed between the IGD editors if a ToC could make sense.
Vestas	general	Figure too blurry to read | Proposed change: Insert figure in higher resolution	Accepted. A figure with a higher resolution will be included in the final IGD.
Vestas	technical	Contrary to definition of "Compliance Testing (CT)" where it says: "Compliance tests are executed as site test by PGM owner" (see page 2) as well as: "The responsibility for performing the CT procedures, test specifications and any related effort to fulfil the CT requirements is allocated to the facility owner" (see page 8) | Proposed change: Physical tests in accredited testing house, or as an onsite test carried out by PGM owner	Accepted with changes. Physical tests performed by accredited testing house, or as an onsite tests must be carried out according to test procedures prepared by the PGM owner and approved by the RSO.

Vestas	technical	CT for Type B and C PPMs is described in NC RfG, Articles 47 and 48. | Proposed change: Selected criteria only drawn from articles 47 and 48.	Accepted with changes. The IGD contains the proposed correction but the sentence is not very clear. So the text must be reviewed and corrected. New text proposal: Chapter 4 – Compliance Testing for Offshore Power Park Modules Selected criteria only drawn from article 44 to article 48. (Note: DC connected offshore PPMs are covered under the NC HVDC 2016/1447)
Vestas	technical	Only Articles reated to CT are listed in this paragraph | Proposed change: EU Regulation 2016/1447 (NC HVDC) Title VI Compliance: Chapter 2 – Compliance testing	Accepted. Proposal accepted
Vestas	technical	CT for HVDC systems, DC-connected PPMs and remote-end HVDC converter units is described in NC HVDC, Articles 71 and 72. | Proposed change: Article 71 – Compliance testing for HVDC systems Article 72 – Compliance testing for DC-connected PPMs and remote end HVDC convertor units	Accepted with changes. EU Regulation 2016/1447 (NC HVDC) Title VI Compliance: Chapter 2 – Compliance Testing: Article 71 – Compliance testing for HVDC systems Article 72 – Compliance testing for DC-connected PPMs and remote end HVDC convertor units
Vestas	editorial	"on site" instead of "on side" | Proposed change: "The RSO will decide if the execution of on site compliance tests and compliance simulations, are required…"	Accepted with changes. The RSO will decide if the execution of on site compliance tests and compliance simulations, are required…" May be the simulation should be removed in the sentence?
Vestas	technical	CS for HVDC systems, DC-connected PPMs and remote-end HVDC converter units is described in NC HVDC, Articles 73 and 74. | Proposed change: ...and studies demonstrating steady state and dynamic performance as required in articles 73 and 74.	Not accepted. The sentence is not found in the IGD so the comment seem s to be based on earlier version of the IGD.
Vestas	technical	CT for HVDC systems, DC-connected PPMs and remote-end HVDC converter units is described in NC HVDC, Articles 71 and 72. | Proposed change: ...plus details of any intended compliance tests according to article 71 (general HVDC systems) or article 72 (DC-connected PPMs).	Accepted with changes. … plus details of any intended compliance tests according to article 70 (general HVDC systems) or article 71 (DC-connected PPMs). The text should be correct to: ...plus details of any intended compliance tests according to NC HVDC article 71 or article 72.
Vestas	editorial	"EqC Simulation – EqC backed by a simulation" instead of "EqC backed by a simulation" | Proposed change: EqC Simulation – EqC backed by a simulation	Accepted with changes. EqC Simulation – EqC backed by a simulation Proposal: EqC Simulation – EqC verified by a simulation

Vestas	editorial	"EqC Testing" instead of "EqC TESTING" | Proposed change: EqC Testing	Accepted. Proposal accepted
Vestas	technical	Acc. to NC RfG, Article 54 (2), CS for LFSM-O is required for type B PPM. Why not mandatory in this IGD? See row "LFSM-O", column "EqC Simulation/B" | Proposed change: EqC Simulation "LFSM-O" mandatory for PGM Type B	Not accepted. Any CS recommendations must be removed and addressed in the 2nd IGD
Vestas	technical	Why CT mandatory ("M") for PGM Type B? Wording acc. to NC RfG, Article 20 (2) (a) is as follows: 'with regard to reactive power capability, the relevant system operator shall have the right to specify…' See row "Reactive power capability", column "EqC Testing/B" | Proposed change: EqC Testing "Reactive power capability" not mandatory for PGM Type B	Accepted with changes. Table to be reviewed. Type B should not be included.
Vestas	technical	Why CT mandatory ("M") for PGM Type A and B? Acc. to NC RfG, Article 48 (2), CT for Active Power Controllability is required for type C and D PPM. Therefore CT should not be required for type A and B. See row "Active Power Controllability", column "EqC Testing/A" and "EqC Testing/B" | Proposed change: EqC Testing "Active Power Controllability" not mandatory at all	Accepted with changes. Table to be reviewed. Instead of "M" it might be specified as "C". If it exists the capability must be verified.
Vestas	technical	Why is CS mandatory ("M") for "Active Power Controllability" at all? NC RfG, Articles 51, 52, 53, 54, 55 and 56 does not specify CS for Active Power Controllability. CS requirements and success criteria are not available! See row "Active Power Controllability", column "EqC Simulation/C" and "EqC Simulation/D" | Proposed change: EqC Simulation "Active Power Controllability" not mandatory for PGM Type C and D	Not accepted. Any CS recommendations must be removed and addressed in the 2nd IGD
Vestas	technical	Why is CS mandatory ("M") for "Voltage Control Mode" at all? NC RfG, Articles 51, 52, 53, 54, 55 and 56 does not specify CS for Voltage Control Mode. CS requirements and success criteria are not available! See row "Voltage Control Mode", column "EqC Simulation/C" and "EqC Simulation/D" | Proposed change: EqC Simulation "Voltage Control Mode" not mandatory at all	Not accepted. Any CS recommendations must be removed and addressed in the 2nd IGD

Vestas	technical	Why is CS mandatory for "Reactive Power Control Mode" at all? NC RfG, Articles 51, 52, 53, 54, 55 and 56 does not specify CS for Reactive Power Control Mode. CS requirements and success criteria are not available! See row "Reactive Power Control Mode", column "EqC Simulation/C" and "EqC Simulation/D" | Proposed change: EqC Simulation "Reactive Power Control Mode" not mandatory at all	Not accepted. Any CS recommendations must be removed and addressed in the 2nd IGD
Vestas	technical	Why is CS mandatory for "Power Factor Control Mode" at all? NC RfG, Articles 51, 52, 53, 54, 55 and 56 does not specify CS for Power Factor Control Mode. CS requirements and success criteria are not available! See row "Power Factor Control Mode", column "EqC Simulation/C" and "EqC Simulation/D" | Proposed change: EqC Simulation "Power Factor Control Mode" not mandatory at all	Not accepted. Any CS recommendations must be removed and addressed in the 2nd IGD
Vestas	technical	Island Operation is a non-mandatory requirement due to the following wording acc. to NC RfG, Article 15 (5) (b): 'power-generating modules shall be capable of taking part in island operation IF required by the relevant system operator…' See also IGD 'Making non-mandatory requirements at European level mandatory at national level', Annex II 'RfG non-mandatory requirements' See row "Island Operation" | Proposed change: Remove "Island Operation" from table "MANDATORY REQUIREMENTS FOR EQUIPMENT CERTIFICATION (EqC)"	Accepted with changes. Table to be reviewed. The "M" might be an "C" instead.
Vestas	editorial	"Post-Fault Active Power Recovery" instead of "Post Fault Active Power Recovery" | Proposed change: Post-Fault Active Power Recovery	Accepted. Proposal accepted
Vestas	technical	Why is CT mandatory ("M") for "Post-Fault Active Power Recovery" at all? NC RfG, Articles 44, 45, 46, 47, 48 and 49 does not specify CT for Post-fault active power recovery. CT requirements and success criteria are not available! See row "Post-Fault Active Power Recovery", column "EqC Testing/B" and "EqC Testing/C" | Proposed change: EqC Testing "Post-Fault Active Power Recovery" not mandatory at all	Accepted with changes. Table to be reviewed. The "M" might be an "C" instead.

Vestas	technical	Fast Fault Current Injection is a non-mandatory requirement due to the following wording acc. to NC RfG, Article 20 (2) (b) is as follows: 'the relevant system operator in coordination with the relevant TSO shall have the right to specify that a power park module be capable of providing fast fault current…' See also IGD 'Making non-mandatory requirements at European level mandatory at national level', Annex II 'RfG non-mandatory requirements' See row "Fast Fault Current Injection" | Proposed change: Remove "Fast Fault Current Injection" from table "MANDATORY REQUIREMENTS FOR EQUIPMENT CERTIFICATION (EqC)"	Accepted with changes. The comment seems to address another version than the published for consultation.
Vestas	editorial	"verified by testing" instead of "verified by tested" | Proposed change: M: mandatory requirement to be verified by testing and/or simulations.	Accepted. Proposal accepted
Vestas	editorial	"EqC Testing" instead of "EqC TESTING" | Proposed change: EqC Testing	Accepted. Proposal accepted
Vestas	technical	Acc. to NC RfG, Article 45 (4), 46 (1), 48 (5) and 49 (1), CT for Frequency restoration may be required for type C and D but not for type B. See row "Frequency restoration", column "EqC Testing/B" | Proposed change: EqC Testing "Frequency restoration" not optional for PGM Type B	Accepted with changes. The comment seems to address another version than the published for consultation. Page number is not correct. Table to be reviewed. Type B should not be included.
Vestas	clarification	Acc. to NC RfG, Article 45 (4) and 48 (5), CT for Frequency restoration may be required for type C and D SPGM and PPM. The test shall be deemed successful if the results, for both dynamic and static parameters, comply with the requirements of point (e) of Article 15(2). But in Article 15 (2) (e) requirements and success criteria are not specified. See row "Frequency restoration", column "EqC Testing/C" and "EqC Testing/D" | Proposed change: Adding a general note that the RSO need to specify detailed requirements and success criteria for non-exhaustive requirements as part of CNC national implementation. In addition reference to "IGD on Parameters of Non-exhaustive requirements"	Accepted. The comment seems to address another version than the published for consultation. Page number is not correct. Accepted in principle but the solution might be different than proposed.

Vestas	technical	Why is CS optional ("O") for "Frequency restoration" at all? NC RfG Articles 51, 52, 53, 54, 55 and 56 does not specify CS for Frequency restoration. CS requirements and success criteria are not available! See row "Frequency restoration", column "EqC Simulation/B", "EqC Simulation/C" and "EqC Simulation/D" | Proposed change: EqC Simulation "Frequency restoration" not optional at all	Not accepted. The comment seems to address another version than the published for consultation. Page number is not correct. Any CS recommendations must be removed and addressed in the 2nd IGD
Vestas	technical	Why is CT optional ("O") for "Black Start Capability" for PGM Type B? Acc. to NC RfG, Article 45 (5), 46 (1), CT for Black start capability may be required for type C and D SPGM but not for type B. See row "Black Start Capability", column "EqC Testing/B" | Proposed change: EqC Testing "Black Start Capability" not optional for PGM Type B	Accepted with changes. The comment seems to address another version than the published for consultation. Table to be reviewed. Type B should not be included.
Vestas	technical	Why is CS conditional ("C") for "Black Start Capability" at all? NC RfG Articles 51, 52, 53, 54, 55 and 56 does not specify CS for Black start capability. CS requirements and success criteria are not available! See row "Black Start Capability", column "EqC Simulation/C" and "EqC Simulation/D" | Proposed change: EqC Simulation "Black Start Capability" not conditional at all	Not accepted. The comment seems to address another version than the published for consultation.
Vestas	technical	Island Operation is a non-mandatory requirement due to the following wording acc. to NC RfG, Article 15 (5) (b): 'power-generating modules shall be capable of taking part in island operation IF required by the relevant system operator…' See also IGD 'Making non-mandatory requirements at European level mandatory at national level', Annex II 'RfG non-mandatory requirements' | Proposed change: Add "Island Operation" to table "NON-MANDATORY REQUIREMENTS FOR EQUIPMENT CERTIFICATION (EqC)"	Accepted with changes. The comment seems to address another version than the published for consultation.
Vestas	technical	Why is CT optional ("O") for "Tripping to houseload" for PGM Type B? Acc. to NC RfG, Article 45 (6) and 46 (1), CT for Tripping to houseload may be required for type C and D SPGM but not for type B. See row "Tripping to houseload", column "EqC Testing/B" | Proposed change: EqC Testing "Tripping to houseload" not optional for PGM Type B	Accepted with changes. The comment seems to address another version than the published for consultation. Table to be reviewed. Type B should not be included.

Vestas	technical	Why is CS conditional ("C") for "Tripping to houseload" at all? NC RfG Articles 51, 52, 53, 54, 55 and 56 does not specify CS for Tripping to houseload. CS requirements and success criteria are not available! See row "Tripping to houseload", column "EqC Simulation/C" and "EqC Simulation/D" | Proposed change: EqC Simulation "Tripping to houseload" not conditional at all	Accepted with changes. The comment seems to address another version than the published for consultation. The CS specification must be removed here and addressed to the 2nd IGD.
Vestas	technical	Fast Fault Current Injection is a non-mandatory requirement due to the following wording acc. to NC RfG, Article 20 (2) (b) is as follows: 'the relevant system operator in coordination with the relevant TSO shall have the right to specify that a power park module be capable of providing fast fault current…' See also IGD 'Making non-mandatory requirements at European level mandatory at national level', Annex II 'RfG non-mandatory requirements' See row "Fast Fault Current Injection" | Proposed change: Add "Fast Fault Current Injection" to table "NON-MANDATORY REQUIREMENTS FOR EQUIPMENT CERTIFICATION (EqC)"	Accepted with changes. The comment seems to address another version than the published for consultation.
Vestas	technical	Why is CT optional ("O") for "Power Oscillation Damping Control (POD)" at all? NC RfG, Articles 44, 45, 46, 47, 48 and 49 does not specify CT for power oscillation damping control. CT requirements and success criteria are not available! See row "Power Oscillation Damping Control (POD)", column "EqC Testing/B", "EqC Testing/C" and "EqC Testing/D" | Proposed change: EqC Testing "Power Oscillation Damping Control (POD)" not optional at all	Accepted. The comment seems to address another version than the published for consultation. Table to be reviewed and corrected.
Vestas	technical	Why is CS optional ("O") for "Power Oscillation Damping Control (POD)" for PGM Type B? Acc. to NC RfG, Article 53 (2), 55 (7) and 56 (1), CS for POD may be required for type C and D but not for type B. See row "Power Oscillation Damping Control (POD)", column "EqC Simulation/B" | Proposed change: EqC Simulation "Power Oscillation Damping Control (POD)" not optional for PGM Type B	Accepted. The comment seems to address another version than the published for consultation. Table to be reviewed. Type B should not be included.

Vestas	technical	Why is CS conditional ("C") for "Synthetic Inertia" for PGM type B in this IGD, but not for type C? Acc. to NC RfG, Article 55 (5), CS for Synthetic inertia is required for type C and D PPM. But in Article 21 (2) requirements and success criteria are not specified. See row "Synthetic Inertia", column "EqC Simulation/C" | Proposed change: EqC Simulation "Synthetic Inertia" not conditional for PGM Type B but for PGM Type C	Accepted with changes. The comment seems to address another version than the published for consultation. All CS related recommendations must be removed and addressed to the 2nd IGD
Vestas	technical	Why are compliance verification tests mandatory ("M") for "Active Power Controllability" for PGM Type B? Acc. to NC RfG, Article 48 (2), CT for Active Power Controllability is required for type C and D PPM. Why complementary compliance verification tests are required here also for type B? See row "Active Power Controllability", column "B" | Proposed change: Compliance verification tests "Active Power Controllability" not mandatory for PGM Type B	Accepted. The comment seems to address another version than the published for consultation. Table to be reviewed. Type B should not be included.
Vestas	technical	Why are compliance verification tests optional ("O") for "Frequency restoration" for PGM Type B? Acc. to NC RfG, Article 45 (4) and 48 (5), CT for Frequency restoration may be required for type C and D SPGM and PPM. See row "Frequency restoration", column "B" | Proposed change: Compliance verification tests "Frequency restoration" not optional for PGM Type B	Accepted. The comment seems to address another version than the published for consultation. Table to be reviewed. Type B should not be included.
Vestas	technical	Why are compliance verification tests optional ("O") for "Black Start Capability" for PGM Type B? Acc. to NC RfG, Article 45 (5), 46 (1), CT for Black start capability may be required for type C and D SPGM but not for type B. See row "Black Start Capability", column "B" | Proposed change: Compliance verification tests "Black Start Capability" not optional for PGM Type B	Accepted with changes. The comment seems to address another version than the published for consultation. Table to be reviewed. Type B should not be included.
Vestas	technical	Island Operation is a non-mandatory requirement due to the following wording acc. to NC RfG, Article 15 (5) (b): 'power-generating modules shall be capable of taking part in island operation IF required by the relevant system operator…' See also IGD 'Making non-mandatory requirements at European level mandatory at national level', Annex II 'RfG non-mandatory requirements' | Proposed change: Add "Island Operation" to table "NON - MANDATORY REQUIREMENTS COMPLIANCE VERIFICATION TESTS"	Accepted. The comment seems to address another version than the published for consultation. Proposal accepted

Vestas	technical	Why are compliance verification tests optional ("O") for "Tripping to houseload" for PGM Type B? Acc. to NC RfG, Article 45 (6) and 46 (1), CT for Tripping to houseload may be required for type C and D SPGM but not for type B. See row "Tripping to houseload", column "B" | Proposed change: Compliance verification tests "Tripping to houseload" not optional for PGM Type B	Accepted. The comment seems to address another version than the published for consultation. Table to be reviewed. Type B should not be included.
Vestas	technical	Fast Fault Current Injection is a non-mandatory requirement due to the following wording acc. to NC RfG, Article 20 (2) (b) is as follows: 'the relevant system operator in coordination with the relevant TSO shall have the right to specify that a power park module be capable of providing fast fault current…' See also IGD 'Making non-mandatory requirements at European level mandatory at national level', Annex II 'RfG non-mandatory requirements' | Proposed change: Add "Fast Fault Current Injection" to table "NON - MANDATORY REQUIREMENTS COMPLIANCE VERIFICATION TESTS"	Accepted with changes. The comment seems to address another version than the published for consultation. Instead of "M" it might be specified as "C". If it exists the capability must be verified. This comments seems to be duplicated with the comment in row 149
Vestas	technical	Why are compliance verification tests optional ("O") for "Power Oscillation Damping Control (POD)" for PGM Type B? Acc. to NC RfG, Article 53 (2), 55 (7) and 56 (1), CS for POD may be required for type C and D but not for type B. See row "Power Oscillation Damping Control (POD)", column "B" | Proposed change: Compliance verification tests "Power Oscillation Damping Control (POD)" not optional for PGM Type B	Accepted with changes. The comment seems to address another version than the published for consultation. Table to be reviewed. Type B should be included.
Vestas	technical	Synthetic Inertia is a non-mandatory requirement due to the following wording acc. to NC RfG, Article 21 (2) (a) is as follows: 'the relevant TSO shall have the right to specify that power park modules be capable of providing synthetic inertia…' See also IGD 'Making non-mandatory requirements at European level mandatory at national level', Annex II 'RfG non-mandatory requirements' | Proposed change: Add "Synthetic Inertia" to table "NON - MANDATORY REQUIREMENTS COMPLIANCE VERIFICATION TESTS"	Not accepted. The comment seems to address another version than the published for consultation. The proposed correction are already implemented.
Vestas	general	Additional note related to "Compliance Verification Tests" | Proposed change: Add additional note below table: "The tests apply to the complete PGM which is either a generating unit (GU), if the PGM consists of only one GU, or an ensemble of multiple GU's."	Not accepted. Proposed additional note not clear and aligned with the applied acronyms.

Vestas	general	Additional note related to "Compliance Verification Tests" See also NC RfG, Article 48 (10) | Proposed change: Add additional note below table: With regard to the complementary compliance verification tests on voltage control mode, reactive power control mode and power factor control mode, the relevant SO may select only one of the three control options for testing.	Accepted with changes. Partly accepted but the complete table and related text must be reviewed an corrected. The comment seems to address another version than the published for consultation. Page number is not correct.
Vestas	technical	Consideration of component models (e.g. plant controller) besides unit models | Proposed change: ...may be based on validated unit and/or component models provided by equipment certificates...	Not accepted. The sentence is not found in the IGD so the comment seems to be based on earlier version of the IGD. The text in this paragraph must be reviewed and corrected.
Vestas	editorial	Unnecessary line break | Proposed change: Delete line break between "…statement of the compliance" and "to standards with a…"	Accepted with changes. Note 2 is proposed to be removed.
Vestas	editorial	"on site" instead of "on side" | Proposed change: "...requirements which can be not tested in real life/on site..."	Accepted with changes. For type B, and by default to the type C and D synchronous PGMs and PPMs the certificates can be used to demonstrate the compliance with relevant requirements which can be not tested in real life/on side (art. 44(1) and art. 47(1)), (art. 46 (2) and art 49 (2)). The sentence must be changed to: For type B, C and D SPGMs and PPMs Equipment Certificates can be used to demonstrate compliance to capability requirements which is complicated to test or tests could include risks of damaging the facility or grid components in case of on site test is applied. Requirements specified in NC RfG Article 15(2), Article 44(1), article 47(1), article 48 (3) and article 49 (2) could be verified by providing an EqC.

Vestas	technical	Additional note with regard to the simulations | Proposed change: Add additional note: "The use of simulation models based on the equipment source code is preferable."	Not accepted. This text section must be moved to the 2nd IGD: "With regard to the simulations: - For type B, C, D synchronous PGMs and PPMs instead of the relevant simulations RSO can use equipment certificates to verify PGM compliance with the relevant requirement (art. 51(1), art. 52 (1), art. 53 (1), art. 54 (1), art. 55 (1) and art 56 (2)). - For type B, C, D synchronous PGMs and PPMs, the software tool used (EMT based or RMS based) should be coordinated in advanced with the RSO in order to allow sharing files containing simulation data - Concerning the model validation, in order to accept the mismatch between simulations and measurements, it is advisable establishing variable thresholds of tolerance according to the different stages of the phenomena/test instead of a fixed tolerance. - In the evaluation of the model both a qualitative approach and a quantitative approach can be used. The qualitative approach is aimed to demonstrate the compliance to the requirements. The quantitative approach is aimed to detailing verify the model (or its component). The tolerances shall be such to permit the use of transfer function commonly in use in the industrial practice.'
Vestas	editorial	"…it is allowed to use equipment certificates…" instead of "…it is allowed to use the equipment…" | Proposed change: "In general, for type B, C and D PGMs it is allowed to use equipment certificates in the notification process."	Accepted with changes. "In general, for type B, C and D PGMs it is allowed to use equipment certificates in the notification verification process."
Vestas	editorial	"...equipment certificates..." instead of "...equipment, certificates..." | Proposed change: "...equipment certificates..."	Accepted. Proposal accepted

Vestas	editorial	"...compliance verification process…" instead of "verification compliance process" | Proposed change: "...compliance verification process..."	Accepted. Proposal accepted
Vestas	editorial	"...equipment certificates can be used instead of the relevant test or simulations exclusively if it is provided..." instead of "...equipment, can be used instead of the relevant test or simulations exclusively if It is provided..." | Proposed change: "...equipment certificates can be used instead of the relevant test or simulations exclusively if it is provided..."	Accepted with changes. Revised text proposal: For type B,C,D PGMs, EqC can be used instead of the required test exclusively if It is provided as a part of the compliance verification procedure elaborated by the TSO, an issued according to NC RfG article 41 (3)(g).