Contribution ID: f65a8454-5f41-4191-9694-1953de9797fc
Date: 26/11/2022 16:00:31

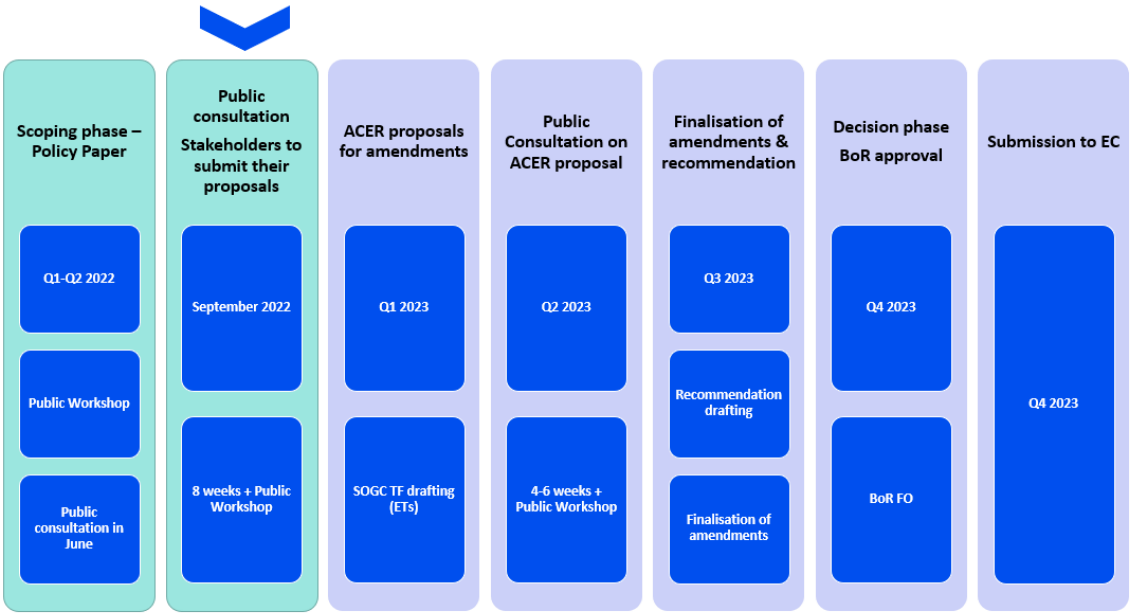
Proposals for amendments to the Requirements for Generators

Fields marked with * are mandatory.

Introduction

Important developments in the policies of decarbonisation of the European Union (EU) energy and transport sectors have taken place since the inception of the development of the first European Grid Connection Network Codes (GC NCs) in 2012.

In the framework of the Grid Connection European Stakeholder Committee (GC ESC), the European Commission proposed for ACER to initiate the process towards the amendment of the existing GC NCs in September 2022. The amendment process, as presented to the GC ESC is outlined in the Figure below:



Following the scoping phase, ACER published the Policy Paper on the revision of the network code on requirements for grid connection of generators and the network code on demand connection in September 2022. The Policy Paper aims to transparently indicate to stakeholders the key policy areas in which amendments are to be expected. Moreover, the Paper draws on the alternative policy options and provides recommendations and proposed actions for the amendment process.

Access the ACER Policy Paper on the revision of the NC RfG and NC DC

This consultation aims at gathering, from all interested stakeholders, concrete proposals for amendments to the Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a **Network Code on Requirements for Grid Connection of Generators** ('NC RfG').
For amendment proposals concerning Network Code on Demand Connection, please go to the form: **NC DC**.

Responses to this consultation should be submitted by 28 November 2022 23:59 CET.

ACER is highly committed in processing personal data in a lawful way.
Find out more how we process your data: https://www.acer.europa.eu/the-agency/about-acer/data-protection

* Name of the stakeholder:

ENTSO-E

* Contact person:

[redacted]

* Contact person's email address:

[redacted]

* Country of the stakeholder's headquarters or main country of operation:

Belgium

* Type of the stakeholder:

- ○ Generator (including association)
- ○ Consumer (including association)
- ◉ Transmission system operator (including association)
- ○ Distribution system operator (including association)
- ○ Manufacturers (including association)
- ○ Academia/research institution
- ○ Regulatory authority
- ○ Other (please, elaborate)

Please, elaborate on your answer above, if necessary:

* Do you consent to the publication of the stakeholder's name?

- ◉ Yes
- ○ No

* Do you consent to the publication of provided answers?

- (●) Yes
- ( ) No (please, note that your answer, without your name and organization, may be shared with the EU institutions and national authorities, drafting team members, and other persons or entities involved in the European Grid Connection Network Codes amendment process)

Instructions

Stakeholders are invited to submit their amendment proposals to the RfG articles that they consider should be revised in a two-step process:
1. by inserting the proposed amendments in the provided Word file
2. by motivating/reasoning the proposed amendments through this online consultation form.

Both steps are mandatory for all amendment proposals.

(Where no amendment is proposed, the article text in the word file can be left unaltered and the cells in the consultation form can be left blank.)

The mandatory steps for submitting amendment proposals are detailed below. At the end of this section, you can find an example showing how to submit your proposals.

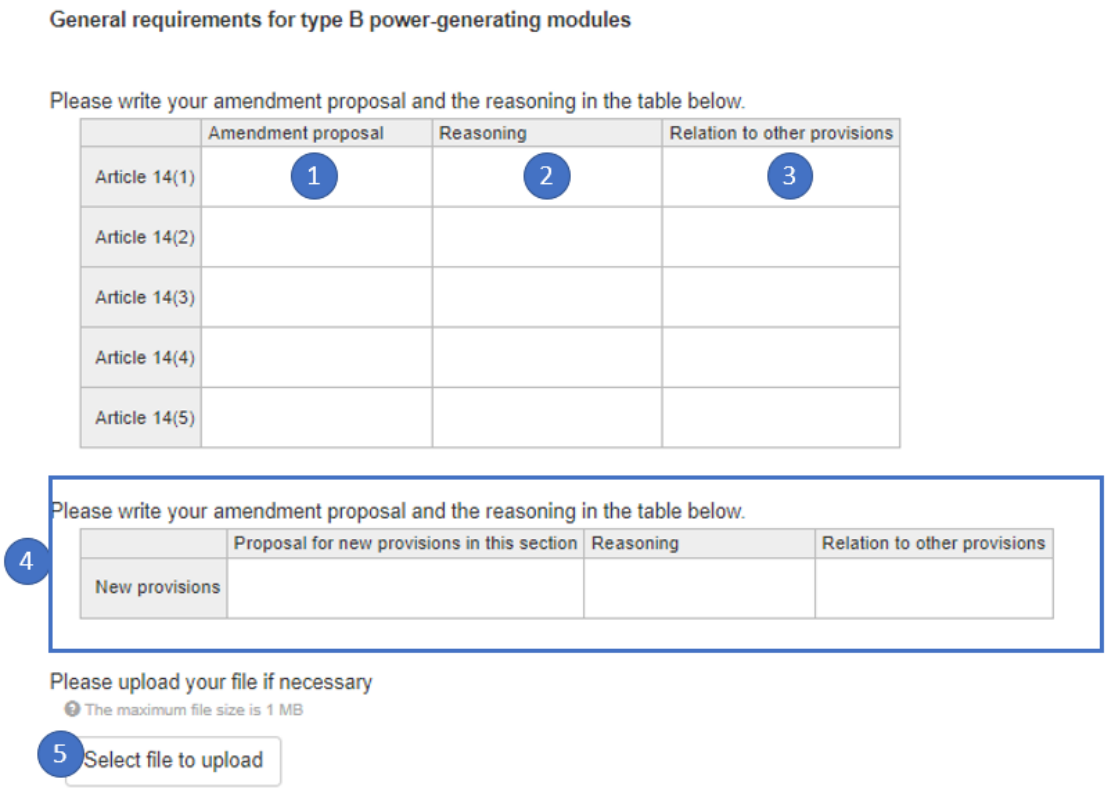
Step 1

Please include all your amendment proposals in the **Word file provided below using the Track Changes mode**. Once you edit the file and rename it with your stakeholder's name ("NC_RfG_stakeholder_name"), please upload it in the last section of this form (FILE UPLOAD)

Download the Word file (NC RfG)

Step 2

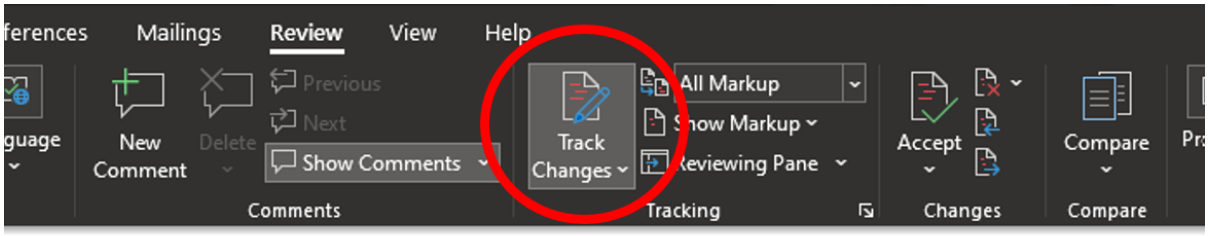
In addition, please use this form to motivate/reason your proposals, following the instructions:



1. Propose an amended wording of the relevant provision, as you provided in the Word file.
2. Provide the motivation/reasoning behind your proposal.
3. Indicate (if any) which other provisions of the NC RfG are impacted and may need to be amended following your proposal.
4. Provide (if any) your proposals for adding new provisions to the relevant section of the Regulation, as you provided in the Word file.
5. Upload figures or tables if necessary; text inputs should be provided directly in the consultation form.

Example

Stakeholder XYZ would like to propose an amendment to Article 27 of NC RfG. In their view, the meaning of the word "respectively" in this article is not clear. Following a two-step process, the stakeholder downloads the Word file from the **Instruction** section, turns on the Track Changes mode and edits the text (first step).



Article 27

System restoration requirements applicable to AC-connected offshore power park modules

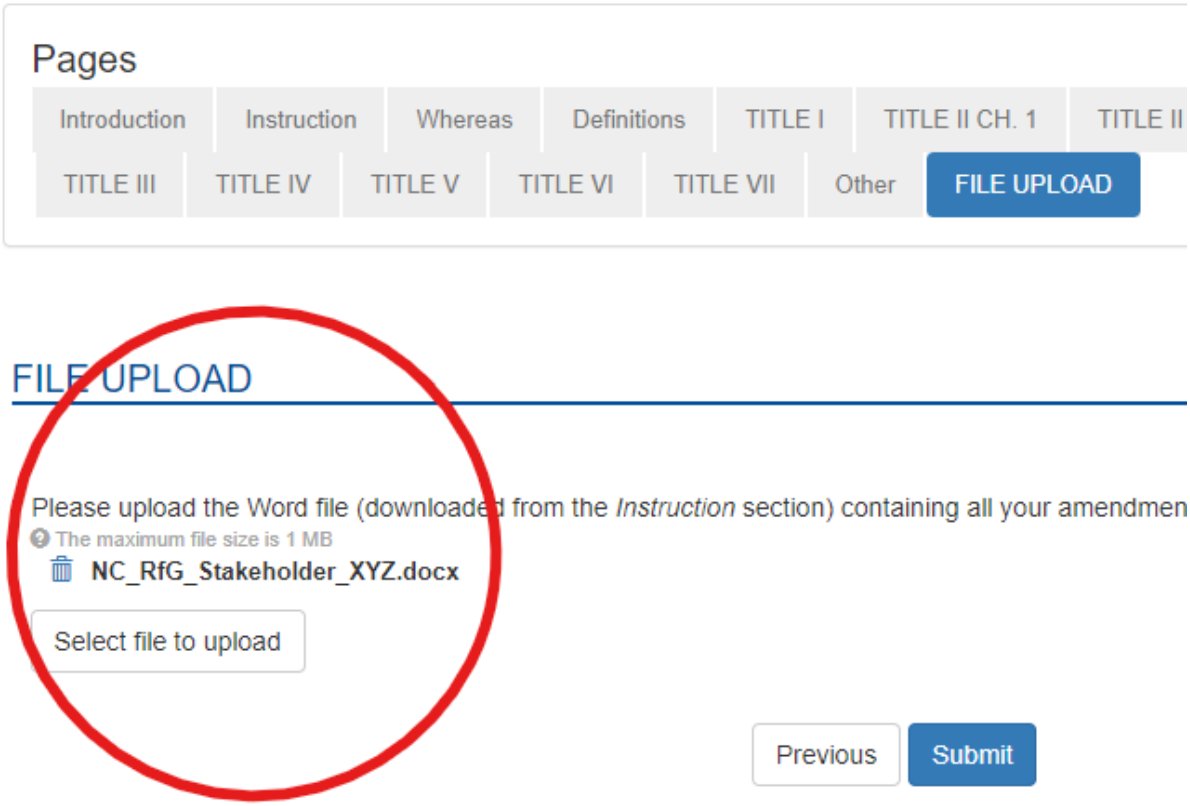
The system restoration requirements laid down ~~respectively~~ in Article 14(4) and Article 15(5) shall apply to AC-connected offshore power park modules types B and C, respectively.

Article 28

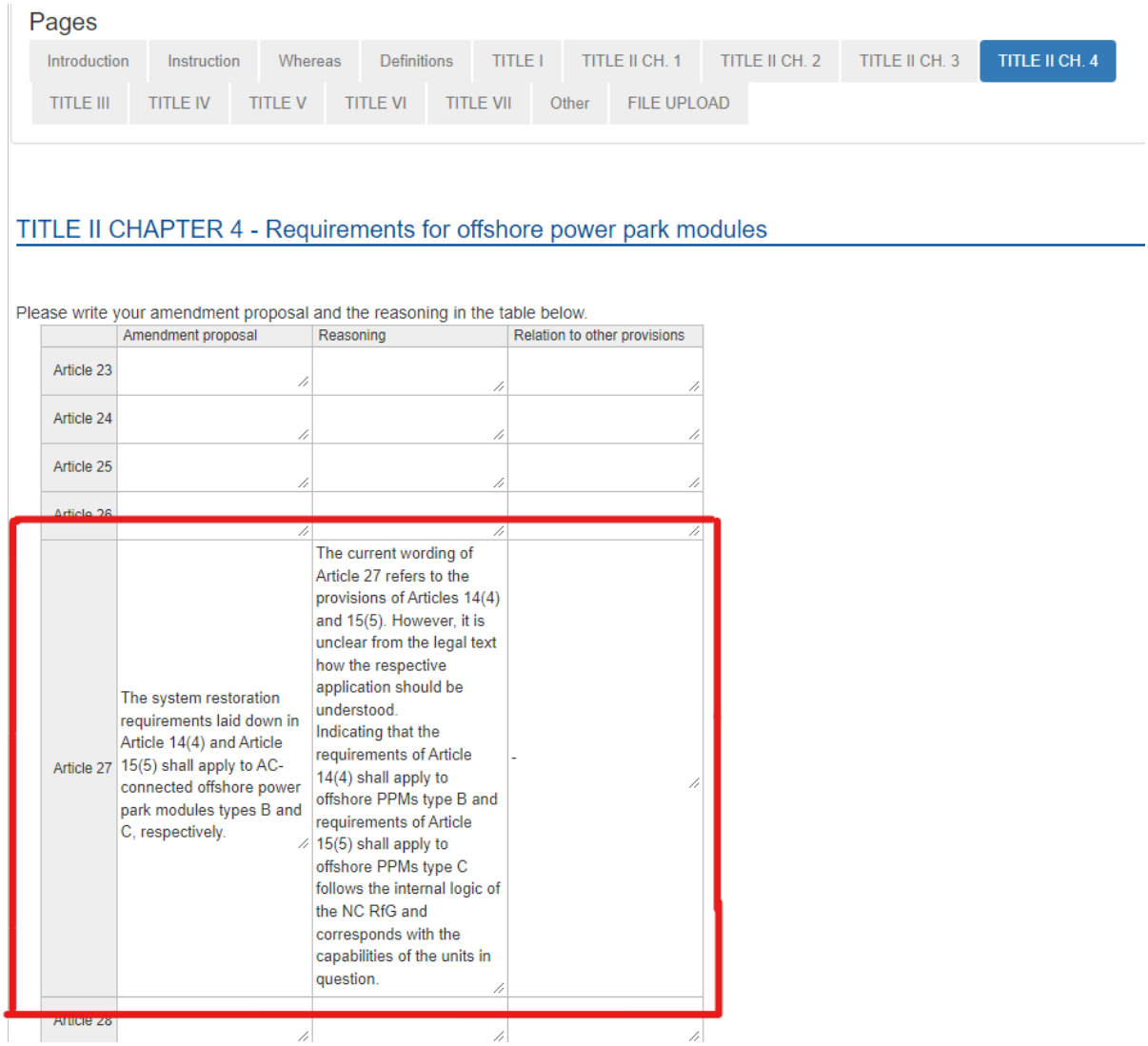
General system management requirements applicable to AC-connected offshore power park modules

The general system management requirements laid down in Article 14(5), Article 15(6) and Article 16(4) shall apply to AC-connected offshore power park modules.

After saving the edited file on their device under the name "*NC_RfG_Stakeholder_XYZ*", the stakeholder uploads it in the **FILE UPLOAD** section.



The stakeholder proceeds to motivate/reason their proposal. As they would like to propose an amendment to Article 27 of NC RfG, they enter **TITLE II CHAPTER 4** Section and insert the proposed amended wording and the reasoning (second step). As the proposed amendment of Article 27 does not affect other provisions, they leave the last column blank.



As the survey is long,
1. you have the possibility to edit your answer after submission. When clicking on "submit", you will be given a contribution ID, which you can then use to access your contribution here. This allows you to proceed in steps.
2. we kindly suggest that you download the entire survey as .pdf (link on the right), prepare your answers and then upload them at once in the EU Survey Tool, to avoid a session timeout on submission.

The maximum length of each cell is 5000 characters. This is the maximum technical limit set by the EUsurvey tool, which cannot be increased.

Whereas Section

Please write your amendment proposal and the reasoning in the table below.

Numbers in the first column correspond with the recitals of the NC RfG Whereas section

	Amendment proposal	Reasoning	Relation to other provisions
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			
(9)			
(10)			
(11)			
(12)			
(13)			
(14)			
(15)			
(16)			
(17)			
(18)			
(19)			
(20)			
(21)			
(22)			
(23)			
(24)			
(25)			

(26)			
(27)			
(28)			
(29)			
(30)			
(31)			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new recitals	Reasoning	Relation to other provisions
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 49: The penetration of energy storage devices at EU level is increasingly rising. Forecasts on the storage capacity are a magnitude of scale larger than for other emerging technologies. As such, energy storage devices need to fulfil certain technical requirements with cross-border relevance to support the system and avoid possible issues and threats. Currently, the three European Connection Network Codes (RfG, HVDC and DCC) explicitly exclude storage technologies other than in respect of Pumped Storage. Therefore, a contribution to the EU level security of supply and sustainability is required. • Batteries can be used to merge capabilities for PPM • But not for SPGM because of 'indivisible set of installations' • If the interpretation is confirmed, this constitutes to a discrimination For these reasons, the following is recommended: 1. Proposals of the EG Storage were taken over to the extent	Additional reasonings: 1. With regard to ENTSO-E Amendment 49: In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of	

New recitals	considered sensible by CAT 2. Electricity Storage Modules (ESM) are to be considered as PGMs. Therefore, they are either a SPGM/PPM. 3. General rules for SPGM/PPM are applied. 4. Additionally, the amendments account for some ESM characteristics such as limited energy reservoir or the possibility to switch from generation to consumption mode. Further information can be found on the final report by the Storage Expert Group, which can be found (https://www.entsoe.eu/Documents/Network codes documents/GC ESC/STORAGE /Final_Report_STORAGE__%2Bsupporting_material__-_phase_2.zip) • Improved wording to explicitly stated that a certain response time applies. • Added accountability for switching time. 2. With regard to ENTSO-E Amendment 9: The general intention of the NC concerning the minimum capabilities is explained in a new “whereas”. Network operator does not expect grid users to behave unexpectedly	renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-	Cross references: 1. With regard to ENTSO-E Amendment 49: Storage Requirements. 2. With regard to ENTSO-E Amendment 9: Requested behaviour outside a defined requirement of the NC

	outside of the minimum capability defined in this NC. In a case where grid users have a different possible and an acceptable way to behave outside of the requirements defined in this NC, interest of society should be privileged. As an example, in exceptional temperature conditions, when maximum steady-state loading is reached, derating is preferred over full disconnection. A similar behaviour would be expected for reactive power capability defined in NC for a given voltage range. Outside of this voltage range, NC requirement are not explicitly specified but interest of society would benefit for reduced reactive power support rather than no reactive power support, because nothing is requested by the NC. It is however acknowledged that a legally binding requirement covering such an intention is complex as one cannot expect grid user to know what is the best for society. Therefore, an approach in a “whereas” is proposed to offer a guideline in bilateral agreement between grid user and network operator. In the context of reactive power capability, the request of	discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. 2. With regard to ENTSO-E Amendment 9: Outside defined capability required by the NC, unless explicitly defined otherwise, the PGM should try to support the		

	demonstration/information exchange of technical capability of the PGM is added in article 45 (testing) and 52 (simulation). It is indeed of upmost importance that network planning and design take into account the expected behaviour of the grid users to take decision in interest of society. Information exchange between grid user and Network operator is therefore needed. Similar amendments are proposed to NC HVDC.	system which it best of its capability. If the “whereas” is not amended PGMs wouldn’t have a requirement in exceptional system states.	

Definitions (Article 2)

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 2(1)			
Article 2(2)			
Article 2(3)			
Article 2(4)			
Article 2(5)			
Article 2(6)			
Article 2(7)			
Article 2(8)			
Article 2(9)			
Article 2(10)			
Article 2(11)			
Article 2(12)			
Article 2(13)			
Article 2(14)			

Article 2(15)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 1: The notion of interface seems to be understood in a different way by different member states, especially in the case of installations covering both generation and demand as well as in the case of closed distribution systems or several generators connected at the same busbar. There may also be differences in interpretation between onshore and offshore systems. The lack of harmonization of this key concept of the NC impacts the clarity and implementation of requirements from the NC such as categorization of units, FRT profiles and reactive power requirements among others. The simple change proposed solves most of the issues by clarifying the need to have an agreed physical point of electrical connection (for example potentially the substation bay, busbar clamps, or HV side of a transformer) at which requirements need to be met and compliance verified. It is likely that in some cases this will also be the ownership boundary for equipment between the generator and system operator.	Additional reasonings: 1. With regard to ENTSO-E Amendment 1: If the amendment is not implemented the issues of clarity would remain and a lack of harmonisation in the implementation of the definitions in connection procedures would lead to a continued lack of transparency and harmonisation across member states.	Cross references: 1. With regard to ENTSO-E Amendment 1: Art. 2.15 Definition of Connection Point

Article 2(16)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 2: Pmax is not the net power at the connection point but it is the output power of the generator less auxiliary power and losses (in dedicated infrastructure such as step-up, feeders of wind farms, …), where this is inseparable from the generator output. The requirements applied to the plant are proportional to the size of the generating unit and they are not affected by the presence or by demand behind a connection point. A similar approach is proposed for the definition of maximum consumption capacity where it is the maximum continuous active power which can be consumed by an electricity storage module, less any demand or losses associated solely with facilitating the operation of that electricity storage module as specified in the connection agreement or as agreed between the relevant system operator and the power-generating facility owner.	Additional reasonings: 1. With regard to ENTSO-E Amendment 2: If the amendment is not implemented, the Pmax definition will remain ambiguous and subject to differences in interpretation and therefore a lack of harmonisation as it could refer to several quantities within the PGM (Pgross, Pmax, Pnet at connection point…).	Cross references: 1. With regard to ENTSO-E Amendment 2: Art. 2.16 Definition of Pmax
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 50: The definitions used in the network code to categorize a PGM as a SPGM or PPM are based on the		

Article 2(17)	wording “non-synchronously connected"" and ""connected through power electronics"" for PPMs and “generate electrical energy such that the frequency of the generated voltage, the generator speed and the frequency of network voltage are in a constant ratio and thus in synchronism” for SPGMs. The categorization is straightforward in the context of conventional thermal plant incorporating synchronous generation (i.e. SPGM), or in the context of full-size converter wind farms or PV inverters (i.e. PPM). However, for some other technologies (Asynchronous generator, DFAG, ...) interpretation in the application of the network code is more ambiguous. Therefore, these technologies could potentially fall into either SPGM or PPM categorisation depending on national interpretation and implementation of the NC which was not the intention. The wording “which is not a synchronous power-generating module and” is added in the definition of PPM to clarify that if a PGM does not fall into the	Additional reasonings: 1. With regard to ENTSO-E Amendment 50: If the amendment is not implemented the issues of clarity would remain and a lack of harmonisation in the implementation of the definitions in connection procedures would lead to a continued lack of transparency and harmonisation across member states.	Cross references: 1. With regard to ENTSO-E Amendment 50: SPGM vs PPM

	definition of SPGM (“the frequency of the generated voltage, the generator speed and the frequency of network voltage are in a constant ratio and thus in synchronism”) then it is by default a PPM. This will clarify unambiguously that DFIG & induction generators are PPMs. The coherence of the NC requirements for DFAG being categorized as PPMs has also been reassessed. It is confirmed that DFAG have technical capabilities closer to those of a full converter installation than a SPGM.		
Article 2(18)			
Article 2(19)			
Article 2(20)			
Article 2(21)			
Article 2(22)			
Article 2(23)			
Article 2(24)			
Article 2(25)			
Article 2(26)			
Article 2(27)			
Article 2(28)			
Article 2(29)			
Article 2(30)			
Article 2(31)			
Article 2(32)			

Article 2(33)			
Article 2(34)			
Article 2(35)			
Article 2(36)			
Article 2(37)			
Article 2(38)			
Article 2(39)			
Article 2(40)			
Article 2(41)			
Article 2(42)			
Article 2(43)			
Article 2(44)			
Article 2(45)			
Article 2(46)			
Article 2(47)			
Article 2(48)			
Article 2(49)			
Article 2(50)			
Article 2(51)			
Article 2(52)			
Article 2(53)			
Article 2(54)			
Article 2(55)			
Article 2(56)			
Article 2(57)			
Article 2(58)			
Article 2(59)			
Article 2(60)			
Article 2(61)			

Article 2(62)			
Article 2(63)			
Article 2(64)			
Article 2(65)			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new definitions	Reasoning	Relation to other provisions
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 49: The penetration of energy storage devices at EU level is increasingly rising. Forecasts on the storage capacity are a magnitude of scale larger than for other emerging technologies. As such, energy storage devices need to fulfil certain technical requirements with cross-border relevance to support the system and avoid possible issues and threats. Currently, the three European Connection Network Codes (RfG, HVDC and DCC) explicitly exclude storage technologies other than in respect	Additional reasonings: 1. With regard to ENTSO-E Amendment 49: In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection	

New definitions	of Pumped Storage. Therefore, a contribution to the EU level security of supply and sustainability is required. • Batteries can be used to merge capabilities for PPM • But not for SPGM because of 'indivisible set of installations' • If the interpretation is confirmed, this constitutes to a discrimination For these reasons, the following is recommended: 1. Proposals of the EG Storage were taken over to the extent considered sensible by CAT 2. Electricity Storage Modules (ESM) are to be considered as PGMs. Therefore, they are either a SPGM/PPM. 3. General rules for SPGM/PPM are applied. 4. Additionally, the amendments account for some ESM characteristics such as limited energy reservoir or the possibility to switch from generation to consumption mode. Further information can be found on the final report by the Storage Expert Group, which can be found (https://www.entsoe.eu/Documents/Network codes documents/GC ESC/STORAGE /Final_Report_STORAGE__%	to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network	Cross references: 1. With regard to ENTSO-E Amendment 49: Storage Requirements.

	2Bsupporting_material__-_phase_2.zip) • Improved wording to explicitly stated that a certain response time applies. • Added accountability for switching time.	and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time.	

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE I - General provisions

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 49: The penetration of energy storage devices at EU level is increasingly rising. Forecasts on the storage capacity are a magnitude of scale larger than for other emerging technologies. As such, energy storage devices need to fulfil certain technical requirements with cross-border relevance to support the system and avoid possible issues and threats. Currently, the three European Connection Network Codes (RfG, HVDC and DCC) explicitly exclude storage technologies other than in respect	Additional reasonings: 1. With regard to ENTSO-E Amendment 49: In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection	

Article 1	of Pumped Storage. Therefore, a contribution to the EU level security of supply and sustainability is required. • Batteries can be used to merge capabilities for PPM • But not for SPGM because of 'indivisible set of installations' • If the interpretation is confirmed, this constitutes to a discrimination For these reasons, the following is recommended: 1. Proposals of the EG Storage were taken over to the extent considered sensible by CAT 2. Electricity Storage Modules (ESM) are to be considered as PGMs. Therefore, they are either a SPGM/PPM. 3. General rules for SPGM/PPM are applied. 4. Additionally, the amendments account for some ESM characteristics such as limited energy reservoir or the possibility to switch from generation to consumption mode. Further information can be found on the final report by the Storage Expert Group, which can be found (https://www.entsoe.eu/Documents/Network codes documents/GC ESC/STORAGE /Final_Report_STORAGE__%	to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network	Cross references: 1. With regard to ENTSO-E Amendment 49: Storage Requirements.

	2Bsupporting_material__-_phase_2.zip) • Improved wording to explicitly stated that a certain response time applies. • Added accountability for switching time.	and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time.	
	Aim of the proposal: 1. With regard	Additional reasonings: 1. With regard to ENTSO-E Amendment 49: In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-	

Article 3	to ENTSO-E Amendment 49: The penetration of energy storage devices at EU level is increasingly rising. Forecasts on the storage capacity are a magnitude of scale larger than for other emerging technologies. As such, energy storage devices need to fulfil certain technical requirements with cross-border relevance to support the system and avoid possible issues and threats. Currently, the three European Connection Network Codes (RfG, HVDC and DCC) explicitly exclude storage technologies other than in respect of Pumped Storage. Therefore, a contribution to the EU level security of supply and sustainability is required. • Batteries can be used to merge capabilities for PPM • But not for SPGM because of 'indivisible set of installations' • If the interpretation is confirmed, this constitutes to a discrimination For these reasons, the following is recommended: 1. Proposals of the EG Storage were taken over to the extent considered sensible by CAT 2. Electricity Storage Modules (ESM) are to be considered as PGMs. Therefore, they are either a	discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection	Cross references: 1. With regard to ENTSO-E Amendment 49: Storage Requirements.

	SPGM/PPM. 3. General rules for SPGM/PPM are applied. 4. Additionally, the amendments account for some ESM characteristics such as limited energy reservoir or the possibility to switch from generation to consumption mode. Further information can be found on the final report by the Storage Expert Group, which can be found (https://www.entsoe.eu/Documents/Network codes documents/GC ESC/STORAGE /Final_Report_STORAGE__%2Bsupporting_material__-_phase_2.zip) • Improved wording to explicitly stated that a certain response time applies. • Added accountability for switching time.	requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-	

		owners may unnecessarily waste time.	
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 3: The CNC do not apply to existing facilities of the Transmission and Distribution Systems unless the facility is modified to such an extent that its connection agreement must be substantially revised in accordance with the procedure detailed in each of the CNC. For these reasons, the following is recommended, in line with the final report of the EG CSM (Criteria for Significant Modernisation): 1. The wording of the NCs was examined and compared with the general terminology relating to modification of equipment, particularly drawing on the definitions of EN13306. This provided a clear background in ensuring that no nuance of the wording in the NCs was overlooked. 2. Provides key electrical characteristics by which significant changes should be identified. 3. Amend Article 4 and 5 of the network codes to minimize legal uncertainties.		

Article 4	Compared to proposal of the expert group, this amendment proposes: - to use the wording “substantially” instead of “materially” to be more coherent with current version of RfG and to have an non-ambiguous translation to the different EU national languages. - to move the definition of “substantial alteration” (initial as a new point article 4.1.c towards a new sub-point (iv) within article 4.1. a. The motivation is that the points “a” and “b” represent the second part of the sentence “Existing power-generating modules are not subject to the requirements of this Regulation, except where:”. A point “c” would be a third exception while it is a clarification of the concepts used in point “a”. In addition, generally it is important that the PGM-owner informs the TSO before the modernization takes place. The current wording in Art. 4.1.a might be interpreted such that RfG applies to existing units only if electrical and grid-dynamic interaction have substantially been altered by the modernization. The proposed modification ensures that the decision by the	Additional reasonings: 1. With regard to ENTSO-E Amendment 3: 1. The concept of substantial modification is understood differently in several countries. 2. The implementation of substantial modification is applied differently in several countries. Implications of not implementing the changes to the proposal from the EG may be that many stakeholders argue that no modernization took place because the characteristics have not been altered. It’d be a missed opportunity to have more units compliant with RfG.	Cross references: 1. With regard to ENTSO-E Amendment 3: Art. 4.1 (a) Concept of substantial modification

	TSO/NRA whether RfG applies can be done in advance. Additionally, a change of voltage levels should be part of the exhaustive list of substantial alterations in Art. 4.1.a.iv (4.1.c in EG proposal); Errors: 1. “required” has been deleted in Art. 4.1.a.iv (4.1.c in EG proposal) because the operationally required Q might significantly deviate from the technical Q-capability.		
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 3: The CNC do not apply to existing facilities of the Transmission and Distribution Systems unless the facility is modified to such an extent that its connection agreement must be substantially revised in accordance with the procedure detailed in each of the CNC. For these reasons, the following is recommended, in line with the final report of the EG CSM (Criteria for Significant Modernisation): 1. The wording of the NCs was examined and compared with the general terminology relating to modification of equipment, particularly drawing on the		

	definitions of EN13306. This provided a clear background in ensuring that no nuance of the wording in the NCs was overlooked. 2. Provides key electrical characteristics by which significant changes should be identified. 3. Amend Article 4 and 5 of the network codes to minimize legal uncertainties. Compared to proposal of the expert group, this amendment proposes: - to use the wording “substantially” instead of “materially” to be more coherent with current version of RfG and to have an non-ambiguous translation to the different EU national languages. - to move the definition of “substantial alteration” (initial as a new point article 4.1.c towards a new sub-point (iv) within article 4.1. a. The motivation is that the points “a” and “b” represent the second part of the sentence “Existing power-generating modules are not subject to the requirements of this Regulation, except where:”. A point “c” would be a third exception while it is a clarification of the concepts used in point “a”. In addition, generally it is important		

Article 5	that the PGM-owner informs the TSO before the modernization takes place. The current wording in Art. 4.1.a might be interpreted such that RfG applies to existing units only if electrical and grid-dynamic interaction have substantially been altered by the modernization. The proposed modification ensures that the decision by the TSO/NRA whether RfG applies can be done in advance. Additionally, a change of voltage levels should be part of the exhaustive list of substantial alterations in Art. 4.1.a.iv (4.1.c in EG proposal); Errors: 1. “required” has been deleted in Art. 4.1.a.iv (4.1.c in EG proposal) because the operationally required Q might significantly deviate from the technical Q-capability. 2. With regard to ENTSO-E Amendment 5: Article 38 of NC HVDC is clear ""The categorisation in Article 5 of Regulation (EU) 2016 /631 shall apply to DC-connected power park modules."" but Article 5 of RfG was written before existence of NC HVDC. It is proposed to clarify the text by adding after “power-generating	Additional reasonings: 1. With regard to ENTSO-E Amendment 3: 1. The concept of substantial modification is understood differently in several countries. 2. The implementation of substantial modification is applied differently in several countries. Implications of not implementing the changes to the proposal from the EG may be that many stakeholders argue that no modernization took place because the characteristics have not been altered. It’d be a missed opportunity to have more units compliant with RfG. 2. With regard to ENTSO-E Amendment 5: It would be still unclear if offshore PPMs were covered by the RfG categorization. 3. With regard to ENTSO-E Amendment 6: If the amendment is not implemented installation of small and particularly renewable energy generators may be impeded, and that efficiencies at complex industrial sites with local generation may be lost; in addition, it is likely that the number of legal disputes and derogation requests caused by this issue will continue to grow.	Cross references: 1. With regard to ENTSO-E Amendment 3: Art. 4.1 (a) Concept of substantial modification 2. With regard to ENTSO-E Amendment 5: Art. 5.1 Are offshore PPMs covered by this categorization? 3. With regard to ENTSO-E Amendment 6: Art. 5.2 Determination of Significance – Voltage Criteria

	modules” “, including the DC-connected power park modules” to leave out any ambiguity. Specified the reference to the requirements by adding ‘defined’. 3. With regard to ENTSO-E Amendment 6: In the implementation of RfG it has been observed that small generation units that are connected within a larger generation/demand site are often faced with challenges in their categorisation due to the site connection voltage; also in some cases specific geographical conditions may mean that smaller units are connected at higher voltages than would be expected. RfG was intended to place requirements on generators proportionate to their size and capability and there is not a universal need to place the most onerous requirements on these smaller units. The Mixed Customer Sites Expert Group was formed to assess a solution to this issue and develop a full report including precise wording of the proposed change and justification which was accepted by the Stakeholder Committee: https://eepublicdownloads.azureedge.net/cleandocuments			

	/Network%20codes%20documents /GC%20ESC/MSC /GC_ESC_EG_Mixed_Customer_Sites_part_2_final_report.pdf The text to be amended is included in the annex to this report (pp 25-26). The solution is based on the establishment of a further capacity threshold, on a national basis, above which the additional voltage criteria will apply. Below this threshold categorisation of generators will be on the basis of their size alone. This will allow a solution to most cases of miscategorisation of small generators to type D caused by an unusual connection voltage while retaining the ability to derive proportionate operational support from transmission connected generation. The need to retain national oversight is respected as the default value of this threshold will be 10 MW, but it can be varied on a national basis from this starting point down to the higher of 5 MW or the national B/C threshold (if this is lower than 10 MW) or up to the national C/D threshold.		
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 49: The penetration of energy storage		

	devices at EU level is increasingly rising. Forecasts on the storage capacity are a magnitude of scale larger than for other emerging technologies. As such, energy storage devices need to fulfil certain technical requirements with cross-border relevance to support the system and avoid possible issues and threats. Currently, the three European Connection Network Codes (RfG, HVDC and DCC) explicitly exclude storage technologies other than in respect of Pumped Storage. Therefore, a contribution to the EU level security of supply and sustainability is required. • Batteries can be used to merge capabilities for PPM • But not for SPGM because of 'indivisible set of installations' • If the interpretation is confirmed, this constitutes to a discrimination For these reasons, the following is recommended: 1. Proposals of the EG Storage were taken over to the extent considered sensible by CAT 2. Electricity Storage Modules (ESM) are to be considered as PGMs. Therefore, they are either a SPGM/PPM. 3. General rules for SPGM/PPM	Additional reasonings: 1. With regard to ENTSO-E Amendment 49: In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in	

	are applied. 4. Additionally, the amendments account for some ESM characteristics such as limited energy reservoir or the possibility to switch from generation to consumption mode. Further information can be found on the final report by the Storage Expert Group, which can be found (https://www.entsoe.eu/Documents/Network codes documents/GC ESC/STORAGE /Final_Report_STORAGE__%2Bsupporting_material__-_phase_2.zip) • Improved wording to explicitly stated that a certain response time applies. • Added accountability for switching time. 2. With regard to ENTSO-E Amendment 7: PGMs are covered by article 6. Referring to “power-generating modules” and not explicitly to “offshore power-generating modules” creates confusion in the applicability of this article. Additionally, the NC RfG is not of application to industrial sites but to “power-generating modules embedded in the networks of industrial sites”	electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the	

Article 6	Finally, with the addition of storage within the scope of the RfG and within the scope of this article, changes in title are needed. For these reasons, it is proposed to rename the title of the article to highlight that it is application for - offshore power-generating modules (in line with wording used in Article 6.1) - pump-storage power-generating modules (in line with wording used in Article 6.2) - power-generating modules embedded in the networks of industrial sites (in line with wording used in with Article 6.3) - combined heat and power facilities (in line with wording used in with Article 6.4 and 6.5) - electricity storage modules (in line with wording used in a new Article 6.6 as proposed: Storage Requirements) Note also the link in clarifying that the determination of significance as set out in article 5.2 also applies to DC connected PGMs and PPMs as set out in the NC HVDC article 38. 3. With regard to ENTSO-E Amendment 8: The review of the technical requirements, which is defined by NC RfG with regard to	requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. 2. With regard to ENTSO-E Amendment 7: The applicability of the NC RfG could be unclear and	Cross references: 1. With regard to ENTSO-E Amendment 49: Storage Requirements. 2. With regard to ENTSO-E Amendment 7: Art. 6 Requirements of article 6 are only applicable to offshore PGMs and not all PGMs 3. With regard to ENTSO-E Amendment 8: Art. 6.2: Explicit the fact that all requirements for pumped-hydro PGMs shall be fulfilled in both generating and pumping operation mode

	their applicability to Pump Storage Hydro power generating modules, has demonstrated that a distinction between the relevant generation technologies and the operation modes is necessary for assessing and evaluating whether these requirements can be reasonably applied. An Expert group was established to clarify the issues. The results were summarised in a report and can be concluded as follows: - The request for fulfilling all relevant requirements in both generating and pumping mode is not feasible in its generality. It is therefore recommended when revising NC RfG to distinguish better between the different operation modes and to state explicitly which requirements shall apply in each mode emphasizing the limitations in pumping mode. - The NC RfG principle of distinguishing between synchronous power generating modules and power park modules can in principle be applied to Pump Storage Hydro power generating modules as well. It could however be stated, to which category the relevant generation technologies are assigned. It might be	lead to legal dispute. Based on the other changes proposed in the article, not changing the title as well would make NC text incoherent. 3. With regard to ENTSO-E Amendment 8: Regarding the definition of requirements for pump-hydro storage, several issues had been raised by stakeholders during the national implementation of the CNCs; including as a result of a stakeholder survey to identify priority topics for which future revisions to the CNCs could be considered. Without taking into account the recommendations of the EG, problems during national implementation would continue to exist.	

	necessary to assign one technology as synchronous power generating module for some requirements and as power park modules for others.		
Article 7			
Article 8			
Article 9			
Article 10			
Article 11			
Article 12			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new articles in this section	Reasoning	Relation to other provisions
New articles			

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE II CHAPTER 1 - General Requirements

General requirements for type A power-generating modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 11: The existing frequency requirements in Irish national Grid Code are as shown below: • 47.0 Hz -> 47.5 Hz for 20 seconds • 47.5 Hz -> 49.5 Hz for 60 minutes • 49.5 Hz -> 50.5 Hz indefinitely • 50.5 Hz -> 52.0 Hz for 60 minutes It is more stringent that the NC table for Ireland between 47 & 47.5 Hz and between 51.5 & 52Hz The issue is that Article 13 of the RfG only covers the frequency requirements from 47.5 Hz -> 51.5 Hz. Due to the nature of Irish system, Eirgrid needs to apply Grid Code requirements from 47.0 Hz -> 47.5 Hz and 51.5 Hz -> 52.0 Hz. Please note that similar requirements will also be needed for DCC and HVDC. Eirgrid needs to rely on article 13.1. b (agreement with producers) For these reasons, the following is recommended: The values in the RfG will be aligned with the values in the Irish NC. 2. With regard to ENTSO-E Amendment 13: The value of the		

Article 13(1)	rate-of-change-of-frequency (RoCoF) as set out in 13(1)(b) is defining a level of resilience against fast frequency changes. Every trip at RoCoFs smaller than the value as defined in 13(1)(b) is jeopardizing this level of resilience and thus endangering system stability. Therefore, every scheme using RoCoF as a trigger criterium for disconnection (e.g. loss of mains protection based on RoCoF), has to respect resilience level defined in 13(1)(b). This means, that its trigger must be set above the RoCoF as defined in 13 (1)(b). 3. With regard to ENTSO-E Amendment 59: It is admitted that the time windows used to define the RoCoF is as important as the value defined for the RoCoF. The NC RfG leaves this value to be defined at national level, the NC DCC define a value of 500ms and the NC HVDC defines a value of 1000ms for the same system need. In addition, it is reported by stakeholders that the duration of the variation of the frequency, the sequence of RoCoF as well as the presence of oscillation of frequency within the measurement window of the RoCoF impact the	Additional reasonings: 1. With regard to ENTSO-E Amendment 11: The values regarding the frequency ranges do not correspond to the RfG specification. 2. With regard to ENTSO-E Amendment 13: A RoCoF, triggering loss of mains protection at values below the one as defined in 13(1)(b), is jeopardising grid stability. 3. With regard to ENTSO-E Amendment 59: A lack of harmonisation of the implementation of the definitions in connection procedures leads to lack of transparency and lack of capability to compare implementation of threshold in different member states. Frequency withstand capabilities are key for the design of a synchronous area robustness and lack of strong collaboration in the NC implementation could lead to inefficient effort from some member state. Furthermore, the IGD recommends another format for implementation the code that the most straightforward understanding of the NC wording. This could further impact the lack of transparency of the NC implementation. If this proposal is		

	PGM withstand capability. An IGD has been established which recommends other ways to defined the PGM withstand of a system frequency excursion. Such element should be included in a revision of the NC. AND It remains unclear, which non-exhaustive requirements shall be specified exhaustively during national implementation and which will be specified at operational timescales (e.g. adjustable vs. fixed parameter values) The system split events of 2021 have been monitored in detail. Even so, the initial power imbalances have been undemanding, it could clearly be seen, that local RoCoF values can be severely higher than the average within an islanded system. A common study of the German TSO (LoGlo study) shows, that local values of 2 Hz/s can be expected for an average of 1 Hz/s over 500 ms. That validates the existing approach. Moreover the differences of local RoCoF stress increase for smaller time periods. To increase transparency and system security a RoCoF withstand capability of 4 Hz/s over 250 ms should be	not implemented in NC RfG, there would be no transparency on realistic RoCoF values in case of a global scenario of 1 Hz/s (which today is the design criteria for the defence plan, according to SG SPD). In the consequence, neither testing could be conducted nor robustness and therefore support in case of global severe system spilts expected. The unexpected disconnection due to high RoCoFs could lead to a lack of controlled active power support and an lack of local voltage support (leading to severe overvoltages) and therefore to an ineffective defence plan. 4. With regard to ENTSO-E Amendment 61: Future systems will face increasing transits and decreasing system inertia. These two aspects are increasing the risk of overshoots above 51.5 Hz in case of system splits. If the proposed modification is not accepted, the system resilience in terms of surviving system splits will decrease or requirements that are more stringent and other measures have to put in place regarding time behaviour of LFSM-O and inertia.	Cross references: 1. With regard to ENTSO-E Amendment 11: Art. 13.1 (a): Frequency range of Ireland synchronous area 2. With regard to ENTSO-E Amendment 13: Minimum Df/dt for loss of mains 3. With regard to ENTSO-E Amendment 59: RoCoF-withstand capability below 500 ms 4. With regard to ENTSO-E Amendment 61: Art. 13.(a)(i) Extension of frequency range in Table 2

	introduced. 4. With regard to ENTSO-E Amendment 61: When a system split is occurring, frequency in the overfrequency island can transiently overshoot before it is stabilized to a value according to the droop settings (a simulation plot is attached below). If, during that transient, all generation is tripped due to transient over-frequency, the island will black out, even if it would have been possible to stabilize the frequency below 51.5 Hz. This system behaviour will be aggravated with decreasing system inertia. The proposed modification delays the tripping of the generation during the transient and therefore prevents the island from blacking out. By this, it is increasing system resilience. It should be possible for both, PPM and SPGM to withstand this short frequency transient. The adverse effect of tripping to houseload becoming more difficult has to be accepted, but can partly be mitigated.		
		Additional reasonings: 1. With regard to ENTSO-E Amendment 48: Priority of constraint management is described in the	

	Aim of the proposal: 1. With regard to ENTSO-E Amendment 48: Many national grid codes already have requirements for local constraint management. In some situations, in the grid, it would be helpful if the LFSM-O function does not have priority in every case, as constraint management in this case has an advantage for grid stability. On the other side in a Load driven congestion in distribution system mitigated by PGM during an overfrequency event, LFSM-O is decreasing the active power output and thus driving the line into overloading. LFSM-O has to be blocked by the congestion management signal The DSO with the relevant TSO shall define the framework condition for the use of this function. It is necessary to provide the possibility for the TSO to block the LFSM-O function. 2. With regard to ENTSO-E Amendment 49: The penetration of energy storage devices at EU level is increasingly rising. Forecasts on the storage capacity are a magnitude of scale larger than for other emerging technologies. As	IGD on Limited frequency sensitive mode, so stakeholders will continue to use IGD recommendations. 2. With regard to ENTSO-E Amendment 49: In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a	

Article 13(2)	such, energy storage devices need to fulfil certain technical requirements with cross-border relevance to support the system and avoid possible issues and threats. Currently, the three European Connection Network Codes (RfG, HVDC and DCC) explicitly exclude storage technologies other than in respect of Pumped Storage. Therefore, a contribution to the EU level security of supply and sustainability is required. • Batteries can be used to merge capabilities for PPM • But not for SPGM because of 'indivisible set of installations' • If the interpretation is confirmed, this constitutes to a discrimination For these reasons, the following is recommended: 1. Proposals of the EG Storage were taken over to the extent considered sensible by CAT 2. Electricity Storage Modules (ESM) are to be considered as PGMs. Therefore, they are either a SPGM/PPM. 3. General rules for SPGM/PPM are applied. 4. Additionally, the amendments account for some ESM characteristics such as limited	non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the	Cross references: 1. With regard to ENTSO-E Amendment 48: Art. 13.2 Priority of LFSM-O 2. With regard to ENTSO-E Amendment 49: Storage Requirements. 3. With regard to ENTSO-E Amendment 51: Art. 13.2.(c) Frequency range and droops

	energy reservoir or the possibility to switch from generation to consumption mode. Further information can be found on the final report by the Storage Expert Group, which can be found (https://www.entsoe.eu/Documents/Network codes documents/GC ESC/STORAGE /Final_Report_STORAGE__%2Bsupporting_material__-_phase_2.zip) • Improved wording to explicitly stated that a certain response time applies. • Added accountability for switching time. 3. With regard to ENTSO-E Amendment 51: Frequency is shared in the same synchronous area, thus it is important to have the same behaviour. LFSM-O is an important function to keep the frequency constant in a synchronous area. It is therefore also important that the function is used in the same way by all TSOs in a synchronous zone so that there is no unwanted interference. To ensure this, frequency ranges and droops must be harmonised.	more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. 3. With regard to ENTSO-E Amendment 51: If the amendment is not implemented, it has the following implications: As frequency is shared across a synchronous area, implementation of the LFSM-O needs to be fully harmonized across the synchronous area. Different parameterisation of the LFSM-O function in the MS can lead to undesired impacts on the frequency, which then lead to disturbances with regard to the	

		frequency stability.	
Article 13(3)			
Article 13(4)			
Article 13(5)			
Article 13(6)			
Article 13(7)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 14: Automatic reconnection may be required for two reasons: - switching 'on' the power generating unit to work (synchronization) - switching 'on' the power generating unit to work after disturbance The existing RfG already formulates requirements for this, but the requirements are not clearly defined from each other. The two ""switching on's"" are something really different concerning frequency stability. Whereas the normal starting operation occurs under stable system conditions, the coming back after a disturbance is under semi-stable conditions. For the sake of stability, this needs to be clarified. For these reasons, the following is recommended First, the requirements for the	Additional reasonings: 1. With regard to ENTSO-E Amendment 14: Due to the unclear definition, it would be possible that these functions are interpreted differently and that different functions are implemented as a result. Harmonisation is not possible without clarification	Cross references: 1. With regard to ENTSO-E Amendment 14: Art. 13.7 (automatic connection) & Art. 14.4.a (Reconnecting to the network after an incidental disconnection) is unclear in the context of autonomous PGM (e.g. type A and some type B)

	technical capabilities that a PGM must have in order to be able to connect are described. Then, the parameters can then be set by the TSO within this framework. In addition, ""automatic"" is replaced by ""autonomous"" to make it clear that reconnection should take place without a further signal from the TSO. In 13.7 and 14.4 it shall be clearly described in which situations the autonomous connection should take place. Wording improvement for Article 14 regarding relevant system operator.		

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 54: FRT: The number of installed Type A generation has reached a level where the operation of this equipment has a major impact on system security. In most MS this concerns mainly PV systems of the PPM type A. As elaborated in the EG BftA, FRT requirements for PPM type A should therefore be mandatory. As the type A SPGM penetration is not comparable to the general and expected future type A PPM penetration the need for FRT requirements for type A SPGM is currently sufficient to include as a ""non-mandatory requirement"" in the RfG. For system security reasons, like preventing large-scale loss of generation, it is proposed to extend the FRT requirement to type A PPMs. This requirement demands the ability of the PPM to remain connected to the system during faults within a defined voltage-time profile, and thus avoiding disconnection of the power generating module. The enacted version of NC RfG	Additional reasonings: 1. With regard to ENTSO-E Amendment 54: Seeing the expected growth of Type A PPM generating modules, it is perceived that robustness to fault is needed from these PGMs. Without such requirement, NC RfG overall goal of system/x-border security cannot be	

	includes ranges of voltage and time that have led to a wide variety of national FRT profiles, depending on the protection schemes predominant at the national level where the distributed installed capacity also needs to be considered carefully. Acknowledging the mass production of type A generating modules, the recommendation for type A PPM FRT capabilities is an exhaustive requirement as a harmonised and predefined voltage-time profile as illustrated in figure. PFAPR: In combination with the FRT requirement, it is essential that the maximum time in which the active power from the PPMs affected by a fault shall recover, understanding that even if they stay connected, they may reduce their active power during, and just after, the clearance of the fault. 2. With regard to ENTSO-E Amendment 60: The meaning of Art. 15 is to request stability of the unit in different modes of operation (interconnected system, island system and houseload) and the stability of the units during switching from one mode of operation to another without relying on information provided by the RSO (e.g. position	achieved. Contribution to the EU level security of supply and sustainability, with a high potential of Type A PV generation development, risk of increasing the overall probability of contingency events exceeding the designed assumptions of the reference case for loss of generation => increase risk of load shedding => security of supply reduced. Efficiency of applying FRT to type A PPM will depend on the protection scheme within the different areas. This requirement does not increase the overall cost for Type A power park modules. On the opposite, this requirement has a cost impact on certain small synchronous power generating modules, of which installed capacity and the anticipated development are much more limited. Therefore one may consider to request FRT capability for Type A power park modules only. 2. With regard to ENTSO-E Amendment 60: The issue in the current requirements is categorized as 'Unclarity/New Needs' The Amendment 31 to 15.5.b.iii does not adequately describe the necessary behaviour of PGM with regard to the different modes of operation. Due to the lack of requirements for the stable controller behaviour, a

New provisions	signals of the system operator's switchgear). However, the Amendment 31 to 15.5. b.iii does not sufficiently describe the necessary behaviour of PGMs with regard to the different modes. For the fault case, stable controller behaviour must be required from the PGM with regard to voltage and frequency control. Both simulations and on-site measurements of real events show that power plants that are compliant with grid codes cannot yet guarantee stable control behaviour in the entire system. In addition, the required damping has not yet been sufficiently determined. Therefore, in addition to the requirements for the individual PGM, verification is required that a PGM has a stable control behaviour in combination with other PGMs in the overall system. In addition to the change in chapter 15.5.b.ii, changes are therefore necessary in the corresponding chapters on frequency and voltage control. Furthermore, the verification of compliance with these requirements must be described for the behaviour of each PGM in the overall system. 3. With regard to ENTSO-E Amendment 34: The steady-state	danger to the system as a whole cannot be excluded, even if each PGM is compliant with the requirements of the RfG on its own. The substitution of conventional transmission-connected generation, where (based on expertise and/or specific requirements) a stable controller design is required today, by distributed generation leads to: * A decrease of stable controllers; * The introduction of (mostly) instable controllers; * Reduction of stability margin, due to interaction of those. Consequence: * the system defence plan might not work even so LFSM and other measures seem to be sufficient,; * stable island operation including distributed and/or renewable generation might not be possible; * in the long run even interconnected operation might become sensitive (small signal stability). This is due to the fact, that the “grid” (passive voltage source) in compliance tests, in real life is only the parallel operation of all the other generators. 3. With regard to ENTSO-E Amendment 34: Due to the increasing volume of distribution-connected power generating modules, in cases	Cross references: 1. With regard to ENTSO-E Amendment 54: New Needs: FRT withstand capability and PFAPR for Type-A PPM 2. With regard to ENTSO-E Amendment 60: Stable PGM Control 3. With regard to ENTSO-E Amendment 34: Voltage ranges

	voltage ranges (RfG Art. 16.2), within which power generating modules shall be capable of staying connected to the network and operating either unlimited or limited in time, are only defined for type D. The absence of these definitions for type A, B & C entails the risk, that power generating modules may disconnect, if steady-state voltage deviate from the nominal value, which may happen under normal or disturbed system operating conditions. The relevant ranges at distribution levels shall be agreed with DSOs to adequately consider the operational practice. For these reasons, the following is recommended to add a non-exhaustive requirement to define steady-state voltage ranges in article 13.10. Similar changes are proposed for DC-connected power park modules in article 40 of HVDC code. Coordination with amendment 58, on FRT ranges (0,85 pu – 1,1 pu), is required. Coordination with amendment 6 on Determination of significance (voltage criteria, according to EG MCS) results in transferring provision 2.a.i and voltage table 6.1 from Article 16 to Article 13.	of steady-state low or high voltage a large total capacity of power generation modules may disconnect rather simultaneously during such an event, even if it regionally limited. Such disconnection would a. aggravate the voltage problem and b. could trigger a larger load imbalance with a corresponding frequency problem.	

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

General requirements for type B power-generating modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 14(1)			
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 49: The penetration of energy storage devices at EU level is increasingly rising. Forecasts on the storage capacity are a magnitude of scale larger than for other emerging technologies. As such, energy storage devices need to fulfil certain technical requirements with cross-border relevance to support the system and avoid possible issues and threats. Currently, the three European Connection Network Codes (RfG, HVDC and DCC) explicitly exclude storage	Additional reasonings: 1. With regard to ENTSO-E Amendment 49: In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a	

Article 14(2)	technologies other than in respect of Pumped Storage. Therefore, a contribution to the EU level security of supply and sustainability is required. • Batteries can be used to merge capabilities for PPM • But not for SPGM because of 'indivisible set of installations' • If the interpretation is confirmed, this constitutes to a discrimination For these reasons, the following is recommended: 1. Proposals of the EG Storage were taken over to the extent considered sensible by CAT 2. Electricity Storage Modules (ESM) are to be considered as PGMs. Therefore, they are either a SPGM/PPM. 3. General rules for SPGM/PPM are applied. 4. Additionally, the amendments account for some ESM characteristics such as limited energy reservoir or the possibility to switch from generation to consumption mode. Further information can be found on the final report by the Storage Expert Group, which can be found (https://www.entsoe.eu/Documents/Network codes documents/GC ESC/STORAGE	non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the	Cross references: 1. With regard to ENTSO-E Amendment 49: Storage Requirements.

	/Final_Report_STORAGE__%2Bsupporting_material__-_phase_2.zip) • Improved wording to explicitly stated that a certain response time applies. • Added accountability for switching time.	more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time.	
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 16: [Chararcter limit of ACER Survey tool reached, please refer to aim included in content for amending the Article 16(3)] 2. With regard to ENTSO-E Amendment 17: [Chararcter limit of ACER Survey tool reached, please refer to aim included in content for amending the Article 16(3)] 3. With regard to ENTSO-E Amendment 55: In the case of fault		

	in the power system the situation right before fault clearance could have very low voltages at a given location. In this pre-fault clearance situation, power generating modules are injecting a large share of reactive current to support grid voltage. However, just after fault clearance, the voltage can recover very quickly, sometime towards values greater that 1.1pu. Power generating modules have to withstand this overshoot of voltage which will last until voltage support of power generating modules reaches a new steady-state situation (probably with reactive current absorption). On the other hand, in case of asymmetrical faults, depending on the method chosen for the grounding of neutral points of transformer of the power system, voltage could rise above nominal voltage in healthy phases during the fault (prior to fault clearing). For these two reasons, it is important that power generating modules stay connected during these overvoltage situations as they contribute to both frequency stability and voltage support. In case of disconnection, voltage will degrade even more, impacting	Additional reasonings: 1. With regard to ENTSO-E Amendment 16: If the amendment is not implemented a risk of non-uniform interpretation of this NC, non-level playing field for stakeholders and legal dispute at time of connection would remain. 2. With regard to ENTSO-E Amendment 17: If the amendment is not implemented a risk of issue, similar to the south Australia blackout could be existing in EU. 3. With regard to ENTSO-E Amendment 55: The issue in the current requirements is	

Article 14(3)	other equipment's connected to the network. It is important to note that this requirement is separate from requirement on FRT capability as overvoltages are not synchronized with voltage dip. As an illustration, several situations can be encountered: - the overvoltage of one phase will arise during the fault on the other phases - the overvoltage will arise after fault clearing - the overvoltage arise after equipment switching or tripping and is therefore not related to fault. Further analysis and justification can be found in the article "RELEVANCE OF HIGH-VOLTAGE-RIDE-THROUGH CAPABILITY AND TESTING", CIRED June 2015, here: (http://cired.net/publications /cired2015/papers /CIRED2015_1391_final.pdf). Furthermore a benchmarking of other grid codes shows that system needs has been acknowledged in other power systems or even at national level in some EU countries: 4. With regard to ENTSO-E Amendment 58: [Chararcter limit of	categorized as 'New Needs'. If the amendment is not implemented, it has the following implications - contribution to the EU level security of supply and sustainability. With a high potential of Type A PV generation development, risk of increasing the overall probability of contingency events exceeding the designed assumptions of the reference case for loss of generation => increase risk of load shedding => security of supply reduced. 4. With regard to ENTSO-E Amendment 58: If the amendment is not implemented, a mismatch could exist between the steady-state voltage stability requirements and the end of the fault-ride-through voltage requirements. The expected behaviour of the power generating units would not be defined leading to a risk of disconnection of these power generating units after stabilizing from a fault. This legal ambiguity could then have major impact on the stability of the power system which should be avoided. 5. With regard to ENTSO-E Amendment 54: Seeing the expected growth of Type A PPM	Cross references: 1. With regard to ENTSO-E Amendment 16: Art.14.3 & Art.16.3 Fault Ride Through non-exhaustive requirement 2. With regard to ENTSO-E Amendment 17: Art. 14.3 & Art. 16.3 - New needs: Lack of requirement for consecutive faults 3. With regard to ENTSO-E Amendment 55: New needs: Lacks of HVRT requirements 4. With regard to ENTSO-E Amendment 58: Art.16: FRT ranges 5. With regard to ENTSO-E Amendment 54: New Needs: FRT withstand capability and PFAPR for Type-A PPM

	ACER Survey tool reached, please refer to aim included in content for amending the Article 16(3)] 5. With regard to ENTSO-E Amendment 54: FRT: The number of installed Type A generation has reached a level where the operation of this equipment has a major impact on system security. In most MS this concerns mainly PV systems of the PPM type A. As elaborated in the EG BftA, FRT requirements for PPM type A should therefore be mandatory. As the type A SPGM penetration is not comparable to the general and expected future type A PPM penetration the need for FRT requirements for type A SPGM is currently sufficient to include as a ""non-mandatory requirement"" in the RfG. For system security reasons, like preventing large-scale loss of generation, it is proposed to extend the FRT requirement to type A PPMs. This requirement demands the ability of the PPM to remain connected to the system during faults within a defined voltage-time profile, and thus avoiding disconnection of the power generating module.	generating modules, it is perceived that robustness to fault is needed from these PGMs. Without such requirement, NC RfG overall goal of system/x-border security cannot be achieved. Contribution to the EU level security of supply and sustainability, with a high potential of Type A PV generation development, risk of increasing the overall probability of contingency events exceeding the designed assumptions of the reference case for loss of generation => increase risk of load shedding => security of supply reduced. Efficiency of applying FRT to type A PPM will depend on the protection scheme within the different areas. This requirement does not increase the overall cost for Type A power park modules. On the opposite, this requirement has a cost impact on certain small synchronous power generating modules, of which installed capacity and the anticipated development are much more limited. Therefore one may consider to request FRT capability for Type A power park modules only.		

	The enacted version of NC RfG includes ranges of voltage and time that have led to a wide variety of national FRT profiles, depending on the protection schemes predominant at the national level where the distributed installed capacity also needs to be considered carefully. Acknowledging the mass production of type A generating modules, the recommendation for type A PPM FRT capabilities is an exhaustive requirement as a harmonised and predefined voltage-time profile as illustrated in figure. PFAPR: In combination with the FRT requirement, it is essential that the maximum time in which the active power from the PPMs affected by a fault shall recover, understanding that even if they stay connected, they may reduce their active power during, and just after, the clearance of the fault.		
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 14: Automatic reconnection may be required for two reasons: - switching 'on' the power		

Article 14(4)	generating unit to work (synchronization) - switching 'on' the power generating unit to work after disturbance The existing RfG already formulates requirements for this, but the requirements are not clearly defined from each other. The two ""switching on's"" are something really different concerning frequency stability. Whereas the normal starting operation occurs under stable system conditions, the coming back after a disturbance is under semi-stable conditions. For the sake of stability, this needs to be clarified. For these reasons, the following is recommended First, the requirements for the technical capabilities that a PGM must have in order to be able to connect are described. Then, the parameters can then be set by the TSO within this framework. In addition, ""automatic"" is replaced by ""autonomous"" to make it clear that reconnection should take place without a further signal from the TSO. In 13.7 and 14.4 it shall be clearly described in which situations the	Additional reasonings: 1. With regard to ENTSO-E Amendment 14: Due to the unclear definition, it would be possible that these functions are interpreted differently and that different functions are implemented as a result. Harmonisation is not possible without clarification 2. With regard to ENTSO-E Amendment 20: With the reduction of the system strength (low short-circuit level), robustness of the controller of the PGMs should be ensured in case of outage in the network (including switch to houseload and islanded mode).	Cross references: 1. With regard to ENTSO-E Amendment 14: Art. 13.7 (automatic connection) & Art. 14.4.a (Reconnecting to the network after an incidental disconnection) is unclear in the context of autonomous PGM (e.g. type A and some type B) 2. With regard to ENTSO-E Amendment 20: Art. 14.4.c - New Needs: Robustness of PGM in islanded or weak network mode for type B

	autonomous connection should take place. Wording improvement for Article 14 regarding relevant system operator. 2. With regard to ENTSO-E Amendment 20: Stability of the PGM in the case of reduction of the system strength (low short-circuit level), robustness of the controller of the PGMs should be ensured in case of outage in the network (including switch to houseload and islanded mode). For these reasons, the following is recommended: Article rewriting		

Article 14(5)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 15: The term ""unit"" is only used in the RfG in connection with a single wind turbine. It does not occur in any other context. ""transformer detection"" is adequately defined as a single term. Therefore, the term ""unit"" is removed. 2. With regard to ENTSO-E Amendment 18: The text “periodical data exchange (with time stamping)“ is left out of the article. Instead a reference to the SO GL is made. The existing text of (ii) is left completely as data provision is also addressed in SO GL. New text for (ii) is drafted. Periodic data with a timestamp is a different type of real-time data, so we suggest removing this term. It is also imprecise in the context of solutions specified in SO GL The real-time data exchange capability should be determined by the NC RfG (see i)). The information content (data range) of real-time data as well as structural and scheduled data is determined by SO GL and related documents (for the real-time data exchange see Art.47.1 of SO GL)	Additional reasonings: 1. With regard to ENTSO-E Amendment 15: The inconsistency in the terminology in the RfG would remain. 2. With regard to ENTSO-E Amendment 18: Due to the unclear definition, it would be possible that the meaning of ""periodically with time stamping"" information are interpreted differently. Harmonisation is not possible without clear understanding of data exchange based on the categories as specified in SO GL.	Cross references: 1. With regard to ENTSO-E Amendment 15: Art. 14.5.b – unit transformer protection 2. With regard to ENTSO-E Amendment 18: Art. 14.5.d– Capabilities (Connection requirement) of periodical data exchange linked with operation requirements

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
New provisions			

Please upload figures or tables if necessary

The maximum file size is 1 MB

dcaf9e1c-1277-4bb9-a098-00dcd81c2bf2
/Illustrations_supporting_argumentation_of_amendments_NC_RfG_Articles_14_and_16.docx

Please upload figures or tables if necessary

The maximum file size is 1 MB

4b261be5-5813-4311-88b9-38b4a0f3bc32
/Illustrations_supporting_argumentation_of_amendments_NC_RfG_Articles_14_on_HVRT.docx

Please upload figures or tables if necessary

The maximum file size is 1 MB

General requirements for type C power-generating modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 15(1)			
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 21: This is an essential point to maintain frequency stability. LFSM-U threshold should be harmonized at synchronous area level and aligned between FSM and LFSM-U also the response time for LFSM-U is not defined. To ensure a harmonized and stable behaviour dynamic parameters need to be defined. Delay for active power response is a crucial parameter for stopping and preventing the change of frequency during system incidents. Due to this, it is important that this parameter is as small as possible, especially for a PPM's. 2. With regard to ENTSO-E Amendment 22: Currently, the possibility to block of LFSM-U are not defined LFSM-U can cause overloading in distribution grids, which can lead to disconnection of lines. This can result in disconnection of customers. This is a strong impact compared to the little contribution of LFSM-U of the few local PGM to	Additional reasonings: 1. With regard to ENTSO-E Amendment 21 (reasoning embedded in Amendment 22): Response time is not defined as should be as it is for	

	the system-wide frequency stability. Therefore, blocking of LFSM-U only for the real-time use in case of local congestion management is made possible. The action of the congestion management is reducing the active power infeed of the PGM in steady state normal operation. In an underfrequency event, LFSM-U is increasing the active power output and thus driving the line into overloading. LFSM-U has to be blocked by the congestion management signal. The DSO with the relevant TSO shall define the framework condition for the use of this function. The priority of constraint management is described in an IGD but should be reflected in the NC for its applicability in DSO grids 3. With regard to ENTSO-E Amendment 23: Frequency is common parameter for whole synchronous area, the stability of this global variable is strongly linked to the insensitivity and to the dead band. For safety reason this variable needs to be as smaller as possible. 4. With regard to ENTSO-E Amendment 24: Delay for active	FSM modes. Without such requirements, system robustness and efficiency of the requested action can not be ensured which can lead to unrobustness and instability. 2. With regard to ENTSO-E Amendment 22: There is a risk of power unit tripping due to local constraint. This tripping has counterproductive effect because it increases the risk of frequency deviation caused by losing production. Frequency support versus risk of generation trip as a consequence of network constraint should be carefully addressed. 3. With regard to ENTSO-E Amendment 23: Frequency is a more common variable than dead band and insensitivity needs to be harmonized through the synchronous area. 4. With regard to ENTSO-E Amendment 24: For a safety reason, it is important to avoid any delay in active power response, because it implies impacts to the stability of frequency. 5. With regard to ENTSO-E Amendment 25: Without modification, the TSO shall define (considering 200 mHz for the full	Cross references: 1. With regard to ENTSO-E Amendment 21: Art 15.2. c: LFSM-U – Response time and threshold

Article 15(2)	power response is a crucial parameter for stopping and preventing the change of frequency during system incidents. Due to this, it is important that this parameter is as small as possible, especially for a PPM's. 5. With regard to ENTSO-E Amendment 25: The highest values of droop is important to require a value of FSM in the entire ranges. The current upper droop value of 12% is not sufficient to cover the minimum range of active power related to to Pmax which is below 3.3% 6. With regard to ENTSO-E Amendment 26: Frequency is a cross-border parameter, therefore the period of full active power frequency response provision needs to be uniform in a synchronous area. The duration of full active power frequency response is not specified in the actuel version of RFG, thus the specification of this period shall be coordinated between the TSOs of the same synchronous area. 7. With regard to ENTSO-E Amendment 27: The wording of the article 15.2.d.vii regarding the maximum admissible choice of full activation time allows the TSO to	FSM activation): - active power range between 3,3% (at s=12%) and 20% (at s=2%) - droop between 4% (at 10% active power ranges related to Pmax) and 27% (at 1,5% active power ranges related to Pmx). 6. With regard to ENTSO-E Amendment 26: There is a risk of oscillations in grid between different member states due to asymetrical market rules. This contribute lack of market rule harmonization under the same european market. In contradiction with the whereas of the RFG. And this leads to a contradiction with SOGL. 7. With regard to ENTSO-E Amendment 27: Is an error in the need to be fixed, thus the TSO can require a faster response as suggested by IGD. 8. With regard to ENTSO-E Amendment 28: This issue in the current requirements is an 'Error', it must be fixed so that all parameters need to be notified by the NRA. 9. With regard to ENTSO-E Amendment 49:[Chararcter limit of ACER Survey tool reached, please refer to reasonings included in	2. With regard to ENTSO-E Amendment 22: Art 15.2.c: Priority of LFSM-U 3. With regard to ENTSO-E Amendment 23: Art. 15.2 Frequency response insensitivity 4. With regard to ENTSO-E Amendment 24: Art. 15.2.c & 15.2. d: Allowable delay for activation of FSM. 5. With regard to ENTSO-E Amendment 25: Art. 15.2 Droop 6. With regard to ENTSO-E Amendment 26: Art. 15.2.d.v Duration of the FSM support 7. With regard to ENTSO-E Amendment 27: Art. 15.2 Full activation time of FSM support 8. With regard to ENTSO-E Amendment 28: Art. 15.2.d.vii Notification of parameters 9. With regard to ENTSO-E Amendment 49: Storage Requirements. 10. With regard to ENTSO-E Amendment 51: Art. 13.2.(c) Frequency range and droops 11. With regard to ENTSO-E Amendment 53: New Table and update of Figure 5 in Paragraph in Art. 15.2.d 12. With regard to ENTSO-E Amendment 60: Stable PGM Control

	require longer activation time. The IGD suggests the TSO to require faster response in case of local needs (e.g. 10s for GB and 15s for IE/NI). The current wording of RfG is in contradiction with what IGD suggests. Alignment with Irish Grid Code. 8. With regard to ENTSO-E Amendment 28: FCR parameters have to be notified to the NRA, with this version not all parameters are notified. 9. With regard to ENTSO-E Amendment 49: [Chararcter limit of ACER Survey tool reached, please refer to reasonings included in content for amending the Article 3] 10. With regard to ENTSO-E Amendment 51: Frequency is shared in the same synchronous area, thus it is important to have the same behaviour. LFSM-O is an important function to keep the frequency constant in a synchronous area. It is therefore also important that the function is used in the same way by all TSOs in a synchronous zone so that there is no unwanted interference. To ensure this, frequency ranges and droops must be harmonised. 11. With regard to ENTSO-E	content for amending the Article 3] 10. With regard to ENTSO-E Amendment 51: If the amendment is not implemented, it has the following implications: As frequency is shared across a synchronous area, implementation of the LFSM-O needs to be fully harmonized across the synchronous area. Different parameterisation of the LFSM-O function in the MS can lead to undesired impacts on the frequency, which then lead to disturbances with regard to the frequency stability. 11. With regard to ENTSO-E Amendment 53: As frequency is shared across a synchronous area, implementation of FSM, LFSM-O and LFSM-U needs to be fully harmonized across the synchronous area. Different parameterization of this different frequency control functions in the MS can lead to undesired impacts on the frequency, which then lead to disturbances with regard to the frequency stability. 12. With regard to ENTSO-E Amendment 60: [Character limit of ACER Survey tool reached, please refer to reasonings included in content for amending the Article 47]	

	Amendment 53: Frequency is shared in the same synchronous area, thus it is important to have the same behaviour regarding the frequency control functions to maintain frequency stability. LFSM-U and LFSM-O thresholds should be harmonized at synchronous area level and aligned with FSM settings. To ensure a harmonized and stable behaviour dynamic parameters need to be defined. It is also important that the function is used in the same way by all TSOs in a synchronous zone so that there is no unwanted interference. To ensure this, frequency ranges and droops must be harmonised. 12. With regard to ENTSO-E Amendment 60: [Character limit of ACER Survey tool reached, please refer to reasonings included in content for amending the Article 47]		

Article 15(3)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 29: The system needs are that power generating modules shall stay connected and control voltage within defined ranges. Taking into account reactive power capabilities and voltage control capabilities of power generating units, an automatic disconnection is the worst for the system stability. No utilisation of such capability has been identified by TSO has used /needs in the future and for these reasons, the initial text of article 15.3 of NC RfG has been deleted	Additional reasonings: 1. With regard to ENTSO-E Amendment 29: Power generating modules owner might understand that they are expected to disconnect despite the absence of system need and would therefore not contribute to restore voltage to normal values within the defined ranges and aggravate a potential voltage issue.	Cross references: 1. With regard to ENTSO-E Amendment 29: Art. 15.3: Capability of disconnection at voltage values
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 29: The system needs are that power generating modules shall stay connected and control voltage within defined ranges. Taking into account reactive power capabilities and voltage control capabilities of power generating units, an automatic disconnection is the worst for the system stability. No utilisation of such capability has been identified by TSO has used /needs in the future and for these reasons, the initial text of article 15.3 of NC RfG has been deleted 2. With regard to ENTSO-E		

Article 15(4)	Amendment 30: The wording “regulating voltage dips” makes the requirement unclear. The proposed change in Article 15.4.a (v) refers to the automatic voltage regulation at the PoC and clarifies the purpose of the requirement, i.e. to keep the voltage value at the PoC within the limits in case of the voltage changes caused by demand connection. The proposed modification allows to make reference to minimum regulating level (defined for FSM only) or other regulating level for PGMs with black start capability shall be clearly specified (Article 15.4.a (vi)). 3. With regard to ENTSO-E Amendment 31: The article 15.4.b (iii) is removed to promote the controller stability being independent from the detection of island operation. The reason for amending the articles 15.4.b (ii), 15.4.b (iii), 15.4. b (iv) and 15.4.b (v) is the need to request stability of the frequency and voltage controls in island operation as well as during switching from interconnected operation to island operation, without relying on information provided by the RSO (e.g.	Additional reasonings: 1. With regard to ENTSO-E Amendment 29: Power generating modules owner might understand that they are expected to disconnect despite the absence of system need and would therefore not contribute to restore voltage to normal values within the defined ranges and aggravate a potential voltage issue. 2. With regard to ENTSO-E Amendment 30: If the amendment is not implemented, the issues of clarity would remain and a lack of harmonisation in the implementation of the requirement would lead to a continued lack of requirement understanding across member states. 3. With regard to ENTSO-E Amendment 31: If the change of Article 15.4.b (i) is not implemented, the inconsistency with NC ER code is maintained. If the amendments 15.4.b (ii), 15.4. b (iii), 15.4.b (vi), 15.4.b (v) and		

	switchgear position) or an internal method for detection. There are mutual benefits of these requirements with the general requirements and justification regarding the stability of controllers in interconnected operation as explained in the Amendment C12. The reason for adding the article 15.4.b (vi) is to increase the flexibility during the system restoration, therefore speed up the process of system restoration. This way, system operator can activate more generators in parallel to support active power balance and voltage in small islands. 4. With regard to ENTSO-E Amendment 32: Article 15.4.c (ii) This requirement has a wording issue: - “on the system operator's switchgear position signals;” should be changed to “on the position signals of the system operator's switchgear” Article 15.4.c (iv) The restoration of the network can be performed with the help from the power-generating units with black start capabilities. However, by introducing this amendment, the restoration of the network can also be started and supported by power-generating units with prolonged	15.4.b (vi) are not implemented, the system operation security and dynamic stability could be jeopardized. 4. With regard to ENTSO-E Amendment 32: Article 15.4.c.(ii) If the amendment is not implemented, the wording unclarity will remain. Article 15.4.c (iv) The restoration capability of the network will be limited only to the black start units. The support of the units with prolonged houseload operation can be very important to restoration after the black start.	Cross references: 1. With regard to ENTSO-E Amendment 29: Art. 15.3: Capability of disconnection at voltage values 2. With regard to ENTSO-E Amendment 30: Black Start Capability 3. With regard to ENTSO-E Amendment 31: Capability to take part in island operation 4. With regard to ENTSO-E Amendment 32: Quick re-synchronization capability

	houseload operation. Those are units that had been in normal operation, disconnected due to the event, but managed the switch to houseload operation. They are available virtually immediately after blackout (no blackstart required).		
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 31: The article 15.4.b (iii) is removed to promote the controller stability being independent from the detection of island operation. The reason for amending the articles 15.4.b (ii), 15.4.b (iii), 15.4. b (iv) and 15.4.b (v) is the need to request stability of the frequency and voltage controls in island operation as well as during switching from interconnected operation to island operation, without relying on information provided by the RSO (e.g. switchgear position) or an internal method for detection. There are mutual benefits of these requirements with the general requirements and justification regarding the stability of controllers in interconnected operation as explained in the Amendment C12. The reason for adding the article 15.4.b (vi) is to increase the		

	flexibility during the system restoration, therefore speed up the process of system restoration. This way, system operator can activate more generators in parallel to support active power balance and voltage in small islands. 2. With regard to ENTSO-E Amendment 32: Article 15.4.c (ii) This requirement has a wording issue: - “on the system operator's switchgear position signals;” should be changed to “on the position signals of the system operator's switchgear” Article 15.4.c (iv) The restoration of the network can be performed with the help from the power-generating units with black start capabilities. However, by introducing this amendment, the restoration of the network can also be started and supported by power-generating units with prolonged houseload operation. Those are units that had been in normal operation, disconnected due to the event, but managed the switch to houseload operation. They are available virtually immediately after blackout (no blackstart required). 3. With regard to ENTSO-E Amendment 34: The steady-state voltage ranges (RfG Art. 16.2),	Additional reasonings: 1. With regard to ENTSO-E Amendment 31: If the change of Article 15.4.b (i) is not implemented, the inconsistency with NC ER code is maintained. If the amendments 15.4.b (ii), 15.4. b (iii), 15.4.b (vi), 15.4.b (v) and 15.4.b (vi) are not implemented, the system operation security and dynamic stability could be jeopardized. 2. With regard to ENTSO-E Amendment 32: Article 15.4.c.(ii) If the amendment is not implemented, the wording unclarity will remain. Article 15.4.c (iv) The restoration capability of the network will be limited only to the black start units. The support of the units with prolonged houseload operation can be very important to restoration after the black start. 3. With regard to ENTSO-E Amendment 34: Due to the increasing volume of distribution-connected power generating modules, in cases of steady-state low or high voltage a large total capacity of power generation modules may disconnect rather simultaneously during such an	

Article 15(5)	within which power generating modules shall be capable of staying connected to the network and operating either unlimited or limited in time, are only defined for type D. The absence of these definitions for type A, B & C entails the risk, that power generating modules may disconnect, if steady-state voltage deviate from the nominal value, which may happen under normal or disturbed system operating conditions. The relevant ranges at distribution levels shall be agreed with DSOs to adequately consider the operational practice. For these reasons, the following is recommended to add a non-exhaustive requirement to define steady-state voltage ranges in article 13.10. Similar changes are proposed for DC-connected power park modules in article 40 of HVDC code. Coordination with amendment 58, on FRT ranges (0,85 pu – 1,1 pu), is required. Coordination with amendment 6 on Determination of significance (voltage criteria, according to EG MCS) results in transferring provision 2.a.i and voltage table 6.1 from Article 16 to Article 13.	event, even if it regionally limited. Such disconnection would a. aggravate the voltage problem and b. could trigger a larger load imbalance with a corresponding frequency problem. 4. With regard to ENTSO-E Amendment 60: The issue in the current requirements is categorized as 'Unclarity/New Needs' The Amendment 31 to 15.5. b.iii does not adequately describe the necessary behaviour of PGM with regard to the different modes of operation. Due to the lack of requirements for the stable controller behaviour, a danger to the system as a whole cannot be excluded, even if each PGM is compliant with the requirements of the RfG on its own. The substitution of conventional transmission-connected generation, where (based on expertise and/or specific requirements) a stable controller design is required today, by distributed generation leads to: * A decrease of stable controllers; * The introduction of (mostly) instable controllers; * Reduction of stability margin, due	Cross references: 1. With regard to ENTSO-E Amendment 31: Capability to take part in island operation 2. With regard to ENTSO-E Amendment 32: Quick re-synchronization capability 3. With regard to ENTSO-E Amendment 34: Voltage ranges 4. With regard to ENTSO-E Amendment 60: Stable PGM Control

	4. With regard to ENTSO-E Amendment 60: The meaning of Art. 15 is to request stability of the unit in different modes of operation (interconnected system, island system and houseload) and the stability of the units during switching from one mode of operation to another without relying on information provided by the RSO (e.g. position signals of the system operator's switchgear). However, the Amendment 31 to 15.5.b.iii does not sufficiently describe the necessary behaviour of PGMs with regard to the different modes. For the fault case, stable controller behaviour must be required from the PGM with regard to voltage and frequency control. Both simulations and on-site measurements of real events show that power plants that are compliant with grid codes cannot yet guarantee stable control behaviour in the entire system. In addition, the required damping has not yet been sufficiently determined. Therefore, in addition to the requirements for the individual PGM, verification is required that a PGM has a stable control behaviour in combination with	to interaction of those. Consequence: * the system defence plan might not work even so LFSM and other measures seem to be sufficient,; * stable island operation including distributed and/or renewable generation might not be possible; * in the long run even interconnected operation might become sensitive (small signal stability). This is due to the fact, that the “grid” (passive voltage source) in compliance tests, in real life is only the parallel operation of all the other generators.		

	other PGMs in the overall system. In addition to the change in chapter 15.5.b.ii, changes are therefore necessary in the corresponding chapters on frequency and voltage control. Furthermore, the verification of compliance with these requirements must be described for the behaviour of each PGM in the overall system.		
Article 15(6)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 33: The specification on the model type (black box, open source, generic, etc.) and quality to fit purposes of model use (interaction studies, system integration, compliance simulation, etc.) are lacking. This is mainly an issue for PPM but also for SPGM (e.g. multi-mass shaft model for SSTI studies)	Additional reasonings: 1. With regard to ENTSO-E Amendment 33: TSOs will still have difficulties to get models that fit the purpose (interaction studies, system studies, compliance verification). For the connection of new generating units it will be almost impossible to perform the necessary analyses related to the grid caused by the lack of correct and detailed models.	Cross references: 1. With regard to ENTSO-E Amendment 33: Art. 15.6.c: Simulation Models

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
New provisions			

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

General requirements for type D power-generating modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 16(1)			
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 34: The steady-state voltage ranges (RfG Art. 16.2), within which power generating modules shall be capable of staying connected to the network and operating either unlimited or limited in time, are only defined for type D. The absence of these definitions for type A, B & C entails the risk, that power generating modules may disconnect, if steady-state voltage deviate from the nominal value, which may happen under normal or disturbed system operating conditions. The relevant ranges at distribution levels shall be agreed with DSOs to adequately consider the operational practice. For these reasons, the following is recommended to add a non-exhaustive requirement to define steady-state voltage ranges in article 13.10. Similar changes are proposed for DC-connected power park modules in article 40 of HVDC code. Coordination with amendment 58, on FRT ranges (0,85 pu – 1,1 pu),		

Article 16(2)	is required. Coordination with amendment 6 on Determination of significance (voltage criteria, according to EG MCS) results in transferring provision 2.a.i and voltage table 6.1 from Article 16 to Article 13. 2. With regard to ENTSO-E Amendment 57: NC's ranges go beyond the standards which is not cost-effective and could lead to non-harmonized control and knowledge of the capabilities. For these reasons, the following is recommended NC RfG voltage ranges differ from the ones form the standards due to use of the per-unit system for entire group of voltages (<300 kV or >300 kV) per synchronous area. Having the requirements amended in proper way will mitigate the risks and implications entirely. It is proposed to align the NC with the capability defined by standards when it does not affect system needs (<400kV) and keep the NC requirement associated to 400kV with exception of Baltic SA where value is also modified due to the fact it goes beyond standard values as well. For the unlimited values, the voltage range are then defined for	Additional reasonings: 1. With regard to ENTSO-E Amendment 34: Due to the increasing volume of distribution-connected power generating modules, in cases of steady-state low or high voltage a large total capacity of power generation modules may disconnect rather simultaneously during such an event, even if it regionally limited. Such disconnection would a. aggravate the voltage problem and b. could trigger a larger load imbalance with a corresponding frequency problem. 2. With regard to ENTSO-E Amendment 57: The issue in the current requirements is categorized as 'Mismatch with Standard' If the amendment is not implemented, NC's ranges go		

	each voltage level below 400kV to the capability that can achieved taking into account the capability requested in the existing NC and the capability demonstrated by existing standards. For the time limited operation, as these are not explicitly covered by standards, the NC existing NC requirements are kept. The same aforementioned modifications of voltage ranges in RFG (Table 6.1 and Table 6.2) are also done in DCC (Annex II) and HVDC code (Annex III). 3. With regard to ENTSO-E Amendment 58: The voltage recovery requirement of the FRT profile should match the time-limited requirement of the voltage withstand capability. This need is important to ensure stability of the power system. In the context of article 16 (above 110 kV), it is therefore proposed to ensure alignment between the values of the non-exhaustive requirements of Article 13(10) and 16(3)a by making, in the context of the FRT profile a reference to Article 13(10). Uclear in Table 3.1.1 is changed from 0.7-0.9 pu to 0.7-0.85 pu due to harmonisation with Urec2 which is 0.85 now. In the context of	beyond the standards and as a consequence they are not cost-effective and they could lead to non-harmonized control and knowledge of the capabilities. 3. With regard to ENTSO-E Amendment 58: If the amendment is not implemented, a mismatch could exist between the steady-state voltage stability requirements and the end of the fault-ride-through voltage requirements. The expected behaviour of the power generating units would not be defined leading to a risk of disconnection of these power generating units after stabilizing from a fault. This legal ambiguity could then have major impact on the stability of the power system which should be avoided.	Cross references: 1. With regard to ENTSO-E Amendment 34: Voltage ranges 2. With regard to ENTSO-E Amendment 57: Art. 16.2 Mismatch between voltage range and material standards 3. With regard to ENTSO-E Amendment 58: Art.16: FRT ranges

	Article 14 (below 110kV), it is proposed to make a reference to a new article which answers the cross-border need to have voltage withstand capability defined for all voltage levels. The voltage range under which a power-generating module is capable of staying connected to the network and operating shall include specification of minimum time periods during which a power-generating module must be capable of operating for voltages deviating from the reference 1 pu value at the connection point without disconnecting from the network. That minimum time has to be in line with the minimum time that corresponds with voltage recovery during the FRT. This new requirement for voltage range ensures the capability of small units to stay connected at the voltage range specified by the relevant system operator, in coordination with the relevant TSO.		
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 16: Wording of the current version of the NC leads to non-uniform interpretation of this NC during national implementation.		

	If one take the example of Article 16, the expected implementation of the NC, coherent between table and figure, is as described in the figure below. The point Uclear, trec1, even if appearing on the same line in the table is not part of the requirement. An incoherent interpretation of the NC is provided in the figure below. It doesn't lead to the same requirement. It seems important that the text, figure and table are unambiguous, and for this reason, the link between time and voltage parameters should not appear in the tables but only in the figures. It is therefore proposed to split the tables into separate tables for voltage parameters and tables for time parameters. Same changes are performed for RfG Article 14 & for HVDC code. Note that some change are associated to amendment 48 of coherence between FRT profiles and time-limited requirement of the voltage withstand capability. 2. With regard to ENTSO-E			

Article 16(3)	Amendment 17: In the context of the black out in south Australia in September 2016, the lack of withstand capability generating units to successive faults has been identify as one of the event leading to the black out (see here:http://ttps /www.aemo.com.au/-/media/Files /Electricity/NEM /Market_Notices_and_Events /Power_System_Incident_Reports /2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf). This report concludes that “All on-line wind farms successfully rode through faults, until a pre-set limit which allows a maximum number of successful ride-through events was reached or exceeded,” […] “This resulted in sustained power reduction by Group A and B wind farms. The system-wide voltage instability commenced after sustained power reduction of 456 MW by nine wind farms. Fault-ride-through capability for repetitive fault should then be required and the limitation of this capability should be based on technical limitation measured in real-time (e.g. dissipation of energy or triggered vibration) and not by counting fault regardless of		Cross references: 1. With regard to ENTSO-E Amendment 16: Art.14.3 & Art.16.3 Fault Ride Through non-exhaustive requirement 2. With regard to ENTSO-E Amendment 17: Art. 14.3 & Art. 16.3 - New needs: Lack of requirement for consecutive faults 3. With regard to ENTSO-E Amendment 58: Art.16: FRT ranges

	the nature of the faults (i.e. single-phase or three-phase, ground faults or dips, …) For these reasons, a new article is proposed which defined an exhaustive capability of successive faults until an overall cumulative energy which, due to network faults, could not be fed into the network is reached. This value is proposed harmonized at EU level. Additionally, if a disconnection of the PGM is needed, it should be based on a real-time estimation of the effect of the accumulated energy on the thermal design limits of the installation or caused by shaft vibrations or the like that could have been excited by the sequence of network faults. 3. With regard to ENTSO-E Amendment 58: The voltage recovery requirement of the FRT profile should match the time-limited requirement of the voltage withstand capability. This need is important to ensure stability of the power system. In the context of article 16 (above 110 kV), it is therefore proposed to ensure alignment between the values of the non-exhaustive requirements of Article 13(10) and 16(3)a by making, in the context of the FRT	Additional reasonings: 1. With regard to ENTSO-E Amendment 16: If the amendment is not implemented a risk of non-uniform interpretation of this NC, non-level playing field for stakeholders and legal dispute at time of connection would remain. 2. With regard to ENTSO-E Amendment 17: If the amendment is not implemented a risk of issue, similar to the south Australia blackout could be existing in EU. 3. With regard to ENTSO-E Amendment 58: If the amendment is not implemented, a mismatch could exist between the steady-state voltage stability requirements and the end of the fault-ride-through voltage requirements. The expected behaviour of the power generating units would not be defined leading to a risk of disconnection of these power generating units after stabilizing from a fault. This legal ambiguity could then have major impact on the stability of the power system which should be avoided.	

	profile a reference to Article 13(10). Uclear in Table 3.1.1 is changed from 0.7-0.9 pu to 0.7-0.85 pu due to harmonisation with Urec2 which is 0.85 now. In the context of Article 14 (below 110kV), it is proposed to make a reference to a new article which answers the cross-border need to have voltage withstand capability defined for all voltage levels. The voltage range under which a power-generating module is capable of staying connected to the network and operating shall include specification of minimum time periods during which a power-generating module must be capable of operating for voltages deviating from the reference 1 pu value at the connection point without disconnecting from the network. That minimum time has to be in line with the minimum time that corresponds with voltage recovery during the FRT. This new requirement for voltage range ensures the capability of small units to stay connected at the voltage range specified by the relevant system operator, in coordination with the relevant TSO.		

Article 16(4)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 4: In the translation into Polish, "agreement" is often confused with "contract". Therefore, this wording which adheres to the original meaning of agreement as being an issue that is to be agreed is suggested instead to avoid the issue.	Additional reasonings: 1. With regard to ENTSO-E Amendment 4: Continued lack of clarity and difficulties in the Polish translation.	Cross references: 1. With regard to ENTSO-E Amendment 4: Art. 16.4. d Agreement vs TSO proposal or contract

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
New provisions			

Please upload figures or tables if necessary

The maximum file size is 1 MB

11426ce2-1b66-4461-9c72-f311b8802296

/Illustrations_supporting_argumentation_of_amendments_NC_RfG_Articles_14_and_16.docx

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE II CHAPTER 2 - Requirements for synchronous power-generating modules

Requirements for type B synchronous power-generating modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 17(1)			
Article 17(2)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 19: SPGMs have to be prevented from operating in under- and overexcitation in order to avoid angular instability or the surpass of thermal design limits. This can be achieved by simply disconnecting the SPGM in such situations. Typically, in these situations the grid voltage is either near its lower or its higher limit and therefore, the reactive power contribution from the SPGM is crucial for maintaining voltage stability. Therefore, losing the SPGM in such situations shall be avoided. The alternative to the disconnection is the controlled limitation of the excitation current. This is a standard feature of AVRs and is therefore available at no additional cost. Requesting this capability from Type B on is a low hanging fruit in terms of ensuring voltage stability. In line with the modification made in Article 19, the structure and wording of article 19.2 is modified. Article 19.2.a focuses on the		Cross references: 1. With regard to ENTSO-E Amendment 19: Art. 17.2.b, Art. 19.1 & Art. 19.2 : Lack of specifications of robustness of automatic control outside capability for type B 2. With regard to ENTSO-E Amendment 35: Art. 17.2.a & Art. 20.2.a: Reactive power capability

	functionalities of the AVR and article 19.2.b focuses on the coordination on parameter and settings. 2. With regard to ENTSO-E Amendment 35: Supply of reactive power is ambiguous and a clarification should be added so the requirement covers both “supply and absorb” which are both needed for the system. The word “provide” is the proposed to be replaced by “supply and absorb”. Changes are also made in Article 20.	Additional reasonings: 1. With regard to ENTSO-E Amendment 19: Within the proposed change, a risk exist in case of large-scale voltage deviation in the grid that a large share of type B SPGMs disconnect from the system and put the system at risk. 2. With regard to ENTSO-E Amendment 35: If the amendment is not implemented, the text of the article 17.2a will stay unclear and it can be interpreted far away from the original intention with the risk of not meeting system needs.	
Article 17(3)			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
New provisions	Aim of the proposal: [Creation of a new article named 'Requirements for type A synchronous power-generating modules' before current article 17] 1. With regard to ENTSO-E Amendment 54: FRT: The number of installed Type A generation has reached a level where the operation of this equipment has a major impact on system security. In most MS this concerns mainly PV systems of the PPM type A. As elaborated in the EG BftA, FRT requirements for PPM type A should therefore be mandatory. As the type A SPGM penetration is not comparable to the general and expected future type A PPM penetration the need for FRT requirements for type A SPGM is currently sufficient to include as a ""non-mandatory requirement"" in the RfG. For system security reasons, like preventing large-scale loss of generation, it is proposed to extend the FRT requirement to type A PPMs. This requirement demands the ability of the PPM to remain connected to the system during faults within a	Additional reasonings: [Creation of a new article named 'Requirements for type A synchronous power-generating modules' before current article 17] 1. With regard to ENTSO-E Amendment 54: Seeing the expected growth of Type A PPM generating modules, it is perceived that robustness to fault is needed from these PGMs. Without such requirement, NC RfG overall goal of system/x-border security cannot be achieved. Contribution to the EU level security of supply and sustainability, with a high potential of Type A PV generation development, risk of increasing the overall probability of contingency events exceeding the designed assumptions	

	defined voltage-time profile, and thus avoiding disconnection of the power generating module. The enacted version of NC RfG includes ranges of voltage and time that have led to a wide variety of national FRT profiles, depending on the protection schemes predominant at the national level where the distributed installed capacity also needs to be considered carefully. Acknowledging the mass production of type A generating modules, the recommendation for type A PPM FRT capabilities is an exhaustive requirement as a harmonised and predefined voltage-time profile as illustrated in figure. PFAPR: In combination with the FRT requirement, it is essential that the maximum time in which the active power from the PPMs affected by a fault shall recover, understanding that even if they stay connected, they may reduce their active power during, and just after, the clearance of the fault.	of the reference case for loss of generation => increase risk of load shedding => security of supply reduced. Efficiency of applying FRT to type A PPM will depend on the protection scheme within the different areas. This requirement does not increase the overall cost for Type A power park modules. On the opposite, this requirement has a cost impact on certain small synchronous power generating modules, of which installed capacity and the anticipated development are much more limited. Therefore one may consider to request FRT capability for Type A power park modules only.	Cross references: [Creation of a new article named 'Requirements for type A synchronous power-generating modules' before current article 17] 1. With regard to ENTSO-E Amendment 54: New Needs: FRT withstand capability and PFAPR for Type-A PPM

Please upload figures or tables if necessary

The maximum file size is 1 MB

Requirements for type C synchronous power-generating modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 18(1)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 36: There is an unregulated area between minimum voltage ranges when power generating unit must be capable to operate (table 6.1), and the voltage profile in U-Q /Pmax profile (figure 7 and figure 8) The outer envelope voltage range for the 110 kV and 220 kV levels is too narrow and does not match the voltage ranges as of Article 13 (10) (a) in the initial figure. Additionally, the definition of the voltage range represented in the figure is not clear. For these reasons, the following is recommended: - Removing the scale and instead link to the voltage ranges set out in Article 13(10)a. - Adapting the indicative figure so that it is clear that the voltage range represents the difference between the highest and lowest values at a certain value of Q /Pmax. - Amending the text in the same manner.	Additional reasonings: 1. With regard to ENTSO-E Amendment 36: Reactive power requirements are not set for the whole operational voltage range. This may lead to PGMs reaction insufficiently to high/low voltages.	Cross references: 1. With regard to ENTSO-E Amendment 36: Art. 18.2 & Art. 18.2.b as well Art. 21.3. b & Art. 21: Range of voltage without voltage regulation support
	Aim of the proposal: 1. With regard		

Article 18(2)	to ENTSO-E Amendment 36: There is an unregulated area between minimum voltage ranges when power generating unit must be capable to operate (table 6.1), and the voltage profile in U-Q /Pmax profile (figure 7 and figure 8) The outer envelope voltage range for the 110 kV and 220 kV levels is too narrow and does not match the voltage ranges as of Article 13 (10) (a) in the initial figure. Additionally, the definition of the voltage range represented in the figure is not clear. For these reasons, the following is recommended: - Removing the scale and instead link to the voltage ranges set out in Article 13(10)a. - Adapting the indicative figure so that it is clear that the voltage range represents the difference between the highest and lowest values at a certain value of Q /Pmax. - Amending the text in the same manner. 2. With regard to ENTSO-E Amendment 37: Change of Nordic synchronous area exhaustive range from 0,15 pu to 0,225 pu. For this reason, the following is recommended			

	• Harmonization of basic generator requirements. • Creating the possibility of utilizing already existing generator capabilities. • Harmonizing national requirements where TSO operate in both the CE and N synchronous areas. 3. With regard to ENTSO-E Amendment 38: Title of variable provided in table does not correspond to content of table. Table 8: “Maximum range of steady- state voltage level in PU”. => “Maximum range of steady-state voltage in PU” For this reason, the following is recommended: - The title “steady-state voltage level” is replaced by “steady-state voltage” to correct the error. Same changes are performed for RfG and HVDC code.	Additional reasonings: 1. With regard to ENTSO-E Amendment 36: Reactive power requirements are not set for the whole operational voltage range. This may lead to PGMs reaction insufficiently to high/low voltages. 2. With regard to ENTSO-E Amendment 37: • Un-utilized existing generator capability for voltage stability purpose. • Derogation only possible through NRA. 3. With regard to ENTSO-E Amendment 38: Error in the text.	Cross references: 1. With regard to ENTSO-E Amendment 36: Art. 18.2 & Art. 18.2.b as well Art. 21.3. b & Art. 21: Range of voltage without voltage regulation support 2. With regard to ENTSO-E Amendment 37: Art. 18.2.b, Table 8 as well Art. 21.3.b, Table 9 & Art. 25.5, Table 11: Maximum range of voltage level in PU 3. With regard to ENTSO-E Amendment 38: Art. 18.2 Maximum range of steady-state voltage level in PU

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
New provisions			

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Requirements for type D synchronous power-generating modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions

Article 19(1)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 19: SPGMs have to be prevented from operating in under- and overexcitation in order to avoid angular instability or the surpass of thermal design limits. This can be achieved by simply disconnecting the SPGM in such situations. Typically, in these situations the grid voltage is either near its lower or its higher limit and therefore, the reactive power contribution from the SPGM is crucial for maintaining voltage stability. Therefore, losing the SPGM in such situations shall be avoided. The alternative to the disconnection is the controlled limitation of the excitation current. This is a standard feature of AVRs and is therefore available at no additional cost. Requesting this capability from Type B on is a low hanging fruit in terms of ensuring voltage stability. In line with the modification made in Article 19, the structure and wording of article 19.2 is modified. Article 19.2.a focuses on the functionalities of the AVR and article 19.2.b focuses on the coordination on parameter and settings.	Additional reasonings: 1. With regard to ENTSO-E Amendment 19: Within the proposed change, a risk exist in case of large-scale voltage deviation in the grid that a large share of type B SPGMs disconnect from the system and put the system at risk.	Cross references: 1. With regard to ENTSO-E Amendment 19: Art. 17.2.b, Art. 19.1 & Art. 19.2 : Lack of specifications of robustness of automatic control outside capability for type B

Article 19(2)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 19: SPGMs have to be prevented from operating in under- and overexcitation in order to avoid angular instability or the surpass of thermal design limits. This can be achieved by simply disconnecting the SPGM in such situations. Typically, in these situations the grid voltage is either near its lower or its higher limit and therefore, the reactive power contribution from the SPGM is crucial for maintaining voltage stability. Therefore, losing the SPGM in such situations shall be avoided. The alternative to the disconnection is the controlled limitation of the excitation current. This is a standard feature of AVRs and is therefore available at no additional cost. Requesting this capability from Type B on is a low hanging fruit in terms of ensuring voltage stability. In line with the modification made in Article 19, the structure and wording of article 19.2 is modified. Article 19.2.a focuses on the functionalities of the AVR and article 19.2.b focuses on the coordination on parameter and settings.			

	2. With regard to ENTSO-E Amendment 62: System decarbonization poses a great challenge in terms of dynamic stability. Additionally, system enlargements (e.g. Ukraine-Moldova) could have a negative impact towards system oscillatory damping. Oscillatory stability has to be tackled from a system-wide perspective, as system damping can vary notably, depending on system power flows, system topology, type of load, demand, etc. Power system stabilisers (PSS) contribute to system damping if they are properly tuned. Adding stabilising power to the system would improve system stability and allow improvement of the power flow transfers throughout the system, easing market integration and system decarbonization. Based on the amendment proposal 6, a threshold in MW to be type D is defined in Art. 5.2. Hence, it is not needed anymore to define a minimum threshold in the content of Art. 19.2.b.iii	Additional reasonings: 1. With regard to ENTSO-E Amendment 19: Within the proposed change, a risk exist in case of large-scale voltage deviation in the grid that a large share of type B SPGMs disconnect from the system and put the system at risk. 2. With regard to ENTSO-E Amendment 62: System decarbonization would not be achieved in terms of security conditions form the oscillatory stability point of view, taking into account the system enlargements forecast and the displacement of synchronous generators by power plant modules. System enlargements (Ukraine-Moldova, Baltics…) and the real implementation of internal energy markets (maximizing power flows between countries) could be at risk if no additional measures for improving damping capabilities of the system are implemented.	Cross references: 1. With regard to ENTSO-E Amendment 19: Art. 17.2.b, Art. 19.1 & Art. 19.2 : Lack of specifications of robustness of automatic control outside capability for type B 2. With regard to ENTSO-E Amendment 62: Power System Stabilizers in SPGM
Article 19(3)			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
New provisions			

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE II CHAPTER 3 - Requirements for power park modules

Requirements for type B power park modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 20(1)			
Article 20(2)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 35: Supply of reactive power is ambiguous and a clarification should be added so the requirement covers both “supply and absorb” which are both needed for the system. The word “provide” is the proposed to be replaced by “supply and absorb”. Changes are also made in Article 20.	Additional reasonings: 1. With regard to ENTSO-E Amendment 35: If the amendment is not implemented, the text of the article 17.2a will stay unclear and it can be interpreted far away from the original intention with the risk of not meeting system needs.	Cross references: 1. With regard to ENTSO-E Amendment 35: Art. 17.2.a & Art. 20.2.a: Reactive power capability
Article 20(3)			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
	Aim of the proposal: [Creation of a new article named 'Requirements for type A power park modules' before current article 20] 1. With regard to ENTSO-E Amendment 54: FRT: The number of installed Type A generation has reached a level where the operation of this equipment has a major impact on system security. In most MS this concerns mainly PV systems of the PPM type A. As elaborated in the EG BftA, FRT requirements for PPM type A should therefore be mandatory. As the type A SPGM penetration is not comparable to the general and expected future type A PPM penetration the need for FRT requirements for type A SPGM is currently sufficient to include as a ""non-mandatory requirement"" in the RfG. For system security reasons, like preventing large-scale loss of generation, it is proposed to extend the FRT requirement to type A PPMs. This requirement demands the ability of the PPM to remain connected to the system during faults within a defined voltage-time profile, and thus		

New provisions	avoiding disconnection of the power generating module. The enacted version of NC RfG includes ranges of voltage and time that have led to a wide variety of national FRT profiles, depending on the protection schemes predominant at the national level where the distributed installed capacity also needs to be considered carefully. Acknowledging the mass production of type A generating modules, the recommendation for type A PPM FRT capabilities is an exhaustive requirement as a harmonised and predefined voltage-time profile as illustrated in figure. PFAPR: In combination with the FRT requirement, it is essential that the maximum time in which the active power from the PPMs affected by a fault shall recover, understanding that even if they stay connected, they may reduce their active power during, and just after, the clearance of the fault. 2. With regard to ENTSO-E Amendment 56: Unclarity and coherence between Guidelines and NC exist for the term synthetic inertia. The term synthetic inertia is used in a not consistent way. Moreover, it is unclear if inertial response from a	Additional reasonings: [Creation of a new article named 'Requirements for type A power park modules' before current article 20] 1. With regard to ENTSO-E Amendment 54: Seeing the expected growth of Type A PPM generating modules, it is perceived that robustness to fault is needed from these PGMs. Without such requirement, NC RfG overall goal of system/x-border security cannot be achieved. Contribution to the EU level security of supply and sustainability, with a high potential of Type A PV generation development, risk of increasing the overall probability of contingency events exceeding the designed assumptions of the reference case for loss of generation => increase risk of load shedding => security of supply reduced. Efficiency of applying FRT to type A PPM will depend on the protection scheme within the different areas. This requirement does not increase the overall cost for Type A power park modules. On the opposite, this requirement has a cost impact on certain small synchronous power generating modules, of which installed capacity and the anticipated	Cross references: [Creation of a new article named 'Requirements for type A power park modules' before current article 20] 1. With regard to ENTSO-E Amendment 54: New Needs: FRT withstand capability and PFAPR for Type-A PPM 2. With regard to ENTSO-E Amendment 56: New needs: Grid Forming Capabilities

	converter is meant or fast frequency response. The characteristics are different from a technical point of view. Recent studies have shown that a stable and robust power system operation of interconnected transmission systems can be ensured under the high penetration of non-synchronous power generation modules if grid forming capabilities are ensured during system operation. Grid forming capabilities for power park modules (PPMs) are required to ensure stable operation with the high penetration of non-synchronous generation. Grid-forming capability shall be described in the network codes to facilitate the aligned requirements' availability throughout European member states, in order to start and accelerate the process of grid-forming implementation. Further specifications in national implementations of the CNC requirements may depend on the location and urgency in each member state. For these reasons, we recommend to add a new provision in the NC RfG for grid forming capability followed by a provision for fast frequency control. We recommend this requirement to be non-mandatory	development are much more limited. Therefore one may consider to request FRT capability for Type A power park modules only. 2. With regard to ENTSO-E Amendment 56: The issue in the current requirements is categorized as " If the amendment is not implemented, it has the following implications Inconsistency between Guidelines and NC.		

	for type B, C, and D PPMs and not exhaustive for a transitional period of 3 years. The transitional period defines the longest period that the requirement will stay as non-mandatory requirement. We recommend that on a member state level, a NRA may make the transitional period shorter based on the urgency and system needs.		

Please upload figures or tables if necessary

The maximum file size is 1 MB

Requirements for type C power park modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 21(1)			
Article 21(2)			
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 36: There is an unregulated area between minimum voltage ranges when power generating unit must be capable to operate (table 6.1), and the voltage profile in U-Q /Pmax profile (figure 7 and figure 8) The outer envelope voltage range for the 110 kV and 220 kV levels is too narrow and does not match the voltage ranges as of Article 13 (10) (a) in the initial figure. Additionally, the definition of the voltage range represented in the figure is not clear. For these reasons, the following is recommended: - Removing the scale and instead link to the voltage ranges set out in Article 13(10)a. - Adapting the indicative figure so that it is clear that the voltage range represents the difference between the highest and lowest values at a certain value of Q /Pmax. - Amending the text in the same		

	manner. 2. With regard to ENTSO-E Amendment 37: Change of Nordic synchronous area exhaustive range from 0,15 pu to 0,225 pu. For this reason, the following is recommended • Harmonization of basic generator requirements. • Creating the possibility of utilizing already existing generator capabilities. • Harmonizing national requirements where TSO operate in both the CE and N synchronous areas. 3. With regard to ENTSO-E Amendment 39: The NC covers several control modes for PPM (Q = f(U), Q = const, cos(phi) = const), but lacks the control Q = f (P) which has significant added value for the power system. This control mode is mainly used in low and medium voltage networks. It is an easy way of providing the network with the ""right"" Q. As an example, the well known Cos(phi)=f(P) is a specific way to implement this such a control mode. This functionality is implemented in several LV and MV inverters today and ease the integration of decentralized	Additional reasonings: 1. With regard to ENTSO-E Amendment 36: Reactive power requirements are not set for the whole operational voltage range. This may lead to PGMs reaction insufficiently to high/low voltages. 2. With regard to ENTSO-E Amendment 37: • Un-utilized existing generator capability for voltage stability purpose. • Derogation only possible through NRA. 3. With regard to ENTSO-E Amendment 39: If the amendment is not implemented, the absence of such a control mode would require DSO to either limit integration of distributed generation, develop expensive reactive power management at system level or		

Article 21(3)	generation in the system. In case generation is high at the end of a feeder, voltage level tends rise which can be limited by having an inductive power factor. Vice-versa, in case of low generation at the end of a feeder, voltage is lower and can be supported by capacitive power factor. Additionally, because it is not based on a closed control loop including the measurement of network quantities network (i.e. voltage), it is a fairly simple mode to be implemented and does not tends to oscillate. Therefore, additional requirement is added in the NC to request an active power-related power factor control mode. The new added control mode is consistent with CENELEC standard. Changes associated to storage requirements (see highlights in cyan) are also present in this article but are detailed in another amendment. Finally, it must be noted that two different wording are used in the NC to describe “maximum reactive power”: “maximum reactive power” or “full reactive power”. In line with the wording used in the definition 56 (of “slope” in Art. 2),	require more complex Q = f(U) control mode to be delivered by PPM. 4. With regard to ENTSO-E Amendment 40: Networks will face huge changes in the near future. Reactive power management and voltage control is one of the fields, where many changes will be necessary, because the growing amount of distributed generation is resulting in a growing spread between load and generation cases, which is highly affecting the voltage behaviour. For being able to adapt to the new needs, it must be possible to adapt the Q-control strategy. If the amendment is not implemented, future grids will not be used optimally. 5. With regard to ENTSO-E Amendment 49: [Chararcter limit of ACER Survey tool reached, please refer to reasonings included in content for amending the Article 3] 6. With regard to ENTSO-E Amendment 60: [Chararcter limit of ACER Survey tool reached, please refer to reasonings included in content for amending the Article 47]	Cross references: 1. With regard to ENTSO-E Amendment 36: Art. 18.2 & Art. 18.2.b as well Art. 21.3. b & Art. 21: Range of voltage without voltage regulation support 2. With regard to ENTSO-E Amendment 37: Art. 18.2.b, Table 8 as well Art. 21.3.b, Table 9 & Art. 25.5, Table 11: Maximum range of voltage level in PU 3. With regard to ENTSO-E Amendment 39: Art. 21.3.d: Reactive & Voltage control modes 4. With regard to ENTSO-E Amendment 40: Art. 21.3.d: Capability to re-select control modes 5. With regard to ENTSO-E Amendment 49: Storage Requirements. 5. With regard to ENTSO-E Amendment 60: Stable PGM Control

	Art. 21.3.d.iv, Art. 21.3.d.vi, Art. 45.7.b.i, Art. 48.6.b, Art. 48.6.c.i. It is proposed to replace “full reactive power” by “maximum reactive power” in the section 21.3. d.v of this article. 4. With regard to ENTSO-E Amendment 40: The NC currently only describes the capability to be able to adapt to a setpoint. In parallel, the NC requires to have the capability to operate in different control modes, but it is not defined how and when a control mode is selected. To follow the evolution of the power system needs, it is expected that the capability to operate in a defined control mode could be activated and changed over the lifetime of the power plant. This change could even happen depending on the power system operating conditions. For this reason, the capability to re-select the control mode at a later stage shall be foreseen in the NC. 5. With regard to ENTSO-E Amendment 49: [Chararcter limit of ACER Survey tool reached, please refer to reasonings included in content for amending the Article 3] 5. With regard to ENTSO-E			

	Amendment 60: [Chararcter limit of ACER Survey tool reached, please refer to reasonings included in content for amending the Article 47]		

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 56: Unclarity and coherence between Guidelines and NC exist for the term synthetic inertia. The term synthetic inertia is used in a not consistent way. Moreover, it is unclear if inertial response from a converter is meant or fast frequency response. The characteristics are different from a technical point of view. Recent studies have shown that a stable and robust power system operation of interconnected transmission systems can be ensured under the high penetration of non-synchronous power generation modules if grid forming capabilities are ensured during system operation. Grid forming capabilities for power park modules (PPMs) are required to ensure stable operation with the high penetration of non-synchronous generation. Grid-forming capability shall be described in the network codes to facilitate the aligned requirements' availability throughout European member states, in order to start and accelerate the process of		

New provisions	grid-forming implementation. Further specifications in national implementations of the CNC requirements may depend on the location and urgency in each member state. For these reasons, we recommend to add a new provision in the NC RfG for grid forming capability followed by a provision for fast frequency control. We recommend this requirement to be non-mandatory for type B, C, and D PPMs and not exhaustive for a transitional period of 3 years. The transitional period defines the longest period that the requirement will stay as non-mandatory requirement. We recommend that on a member state level, a NRA may make the transitional period shorter based on the urgency and system needs. 2. With regard to ENTSO-E Amendment 52: Active power forced oscillations (i.e. not caused by the interaction with electrical system) have been measured on some recently installed offshore wind parks. These oscillations may also be present on onshore parks. Analysis has shown that the oscillations can sum up between different parks. The forced oscillations are in the frequency range of the	Additional reasonings: 1. With regard to ENTSO-E Amendment 56: The issue in the current requirements is categorized as " If the amendment is not implemented, it has the following implications Inconsistency between Guidelines and NC. 2. With regard to ENTSO-E Amendment 52: The planned and rapid expansion of wind generation could increase the interaction of windfarms with the ENTSO-E grid and stimulate larger, continuous oscillations, and influence negative the damping of the existing interarea modes. There are currently no known system alternatives to cancel the effect of the forced oscillations other than disconnecting the wind parks.	Cross references: 1. With regard to ENTSO-E Amendment 56: New needs: Grid Forming Capabilities 2. With regard to ENTSO-E Amendment 52: Art. 21.4 – Active Power Forced Oscillations

	existing CE Interarea oscillation modes (i.e. 0,15 Hz-0,25 Hz). Literature review has shown that forced oscillations, even of small amplitude, if centered on system oscillation modes can have a very high impact and create significant amplified oscillations. Additional impacts of forced oscillations on operation are: Increase in system losses, reduction of transmissions margins, hence impact on market prices & social welfare and possible impact on balancing & frequency control. In general forced oscillations are dangerous on system stability, the proposed amendment will be beneficial also for other possible forced oscillations that may arise in the future, even if not arising from the specific functionality of the wind parks but from other PPM types.		

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Requirements for type D power park modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 22			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions in this section	Reasoning	Relation to other provisions

New provisions	Aim of the proposal: 1. With regard to ENTSO-E Amendment 63: System decarbonization poses a great challenge in terms of dynamic stability. Additionally, system enlargements (e.g. Ukraine-Moldova) could have a negative impact towards system oscillatory damping. Oscillatory stability has to be tackled from a system-wide perspective, as system damping can vary notably, depending on system power flows, system topology, type of load, demand, etc. Taking into account that system decarbonization relies mainly on PPMs (namely, for wind and solar generation), these technologies will be present in a greater proportion in the power system and will displace other technologies such as synchronous generators. The technology is sufficiently mature to provide the required control of active or reactive power in order to improve the damping of oscillatory modes (Power Oscillation Damping -POD-P and/or POD-Q). Adding stabilising power to the system would improve system stability and allow improvement of the power flow transfers throughout the system, easing market integration and system decarbonization.	Additional reasonings: 1. With regard to ENTSO-E Amendment 63: System decarbonization would not be achieved in terms of security conditions form the oscillatory stability point of view, taking into account the system enlargements forecast and the displacement of synchronous generators by power plant modules. System enlargements (Ukraine-Moldova, Baltics…) and the real implementation of internal energy markets (maximizing power flows between countries) could be at risk if no additional measures for improving damping capabilities of the system are implemented.	Cross references: 1. With regard to ENTSO-E Amendment 63: Power Oscillation Damping in PPM

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE II CHAPTER 4 - Requirements for offshore power park modules

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 23			
Article 24			
Article 25	Aim of the proposal: 1. With regard to ENTSO-E Amendment 41: All voltage levels above 110kV are covered by the RfG. The old table is replaced with the new one containing the changes in values for voltage levels above 110 kV, as justified in Amendment 47. All voltage levels below 110kV are covered by the relevant system operator.	Additional reasonings: 1. With regard to ENTSO-E Amendment 41: The requirements from this network code would be more stringent that standards currently in use below 110kV. Voltage levels below 110kV are identified as having cross-border impact. Furthermore, ambiguity remains that all offshore installations (including smaller wave energy installations) should be considered as type D power generating module because of the lack of under-limit for table 10.	Cross references: 1. With regard to ENTSO-E Amendment 41: Art. 25.1: Voltage table applicable above 110kV
Article 26			
Article 27			
Article 28			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new articles in this section	Reasoning	Relation to other provisions
New articles	See proposals of new articles: [Creation of a new article named 'Requirements for type A synchronous power-generating modules' before current article 17] as explained in "New provisions for Chapter 2" and [Creation of a new article named 'Requirements for type A power park modules' before current article 20] as explained in "New provisions for Chapter 3"	See proposals of new articles: [Creation of a new article named 'Requirements for type A synchronous power-generating modules' before current article 17] as explained in "New provisions for Chapter 2" and [Creation of a new article named 'Requirements for type A power park modules' before current article 20] as explained in "New provisions for Chapter 3"	See proposals of new articles: [Creation of a new article named 'Requirements for type A synchronous power-generating modules' before current article 17] as explained in "New provisions for Chapter 2" and [Creation of a new article named 'Requirements for type A power park modules' before current article 20] as explained in "New provisions for Chapter 3"

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE III - Operational notification procedure for connection

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 29	Aim of the proposal: 1. With regard to ENTSO-E Amendment 42: Article 30.3, 32.4 and 32.5 related to operational notification for PGMs include requirements for information to the relevant system operator and regulatory authority upon closure of PGMs of type A to C. Similar requirements are not provided for Type D PGMs. The same provision should apply to Type D facilities. Therefore these requirements are added to article 29 to cover all PGMs and these requirements are deleted from article 30 and 32.	Additional reasonings: 1. With regard to ENTSO-E Amendment 42: Requirements for information to the relevant system operator and regulatory authority upon closure of PGMs are only applicable for type A to C and not for Type D PGMs.	Cross references: 1. With regard to ENTSO-E Amendment 42: Art. 29: General provisions

Article 30	Aim of the proposal: 1. With regard to ENTSO-E Amendment 43: Article 30.3, 32.4 and 32.5 related to operational notification for PGMs include requirements for information to the relevant system operator and regulatory authority upon closure of PGMs of type A to C. Similar requirements are not provided for Type D PGMs. The same provision should apply to Type D facilities. Therefore these requirements are added to article 29 to cover all PGMs and these requirements are deleted from article 30 and 32.	Additional reasonings: 1. With regard to ENTSO-E Amendment 43: If the amendment is not implemented, requirements for information to the relevant system operator and regulatory authority upon closure of PGMs are only applicable for type A to C and not for Type D PGMs.	Cross references: 1. With regard to ENTSO-E Amendment 43: Art. 30 Operational Notification Procedure of type A power generating modules
Article 31			
Article 32	Aim of the proposal: 1. With regard to ENTSO-E Amendment 44: The requirements for type B and type C PGMs and type D PGMs are harmonized as far as applicable. This means that the wording in the articles is harmonized so that it becomes clear that the same requirements are described in the respective articles.	Additional reasonings: 1. With regard to ENTSO-E Amendment 44: If the amendment is not implemented, requirements for information to the relevant system operator and regulatory authority upon closure of PGMs are only applicable for type A to C and not for Type D PGMs.	Cross references: 1. With regard to ENTSO-E Amendment 44: Art. 32 Procedure for type B and C power generating modules
Article 33			
Article 34			
Article 35			
Article 36			

Article 37			
Article 38			
Article 39			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new articles in this section	Reasoning	Relation to other provisions
New articles			

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE IV - Compliance

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 40			
Article 41			
Article 42	Aim of the proposal: 1. With regard to ENTSO-E Amendment 10: The need to clarify who shall be appointed by the System operator to carry out the compliance tests is added to the article. Compatibility testing is one of the most basic and reliable ways to check PGM's technical requirements. For this purpose, it is reasonable to carry out a number of preparatory activities before the actual test run. One of such elements is the development and agreement of detailed test programs that will precisely describe how the given test elements will be carried out. In addition, the correct and effective performance of these tests requires specialist knowledge and access to PGM's automation systems which are responsible for the implementation of regulations and the technical implementation of power regulation (active and reactive), technical protections and superior systems. Resources may	Additional reasonings: 1. With regard to ENTSO-E Amendment 10: Absence of a clause enabling to carry out the compliance tests by the independent expert company.	Cross references: 1. With regard to ENTSO-E Amendment 10: Art. 42.3 Compliance monitoring

	be insufficient for the implementation of the above-mentioned activities and for this purpose it is reasonable to use an independent expert company that can carry out some of the activities. Enabling the participation of this type of company increases the credibility of the conducted compliance tests and their objective evaluation. This is especially important nowadays, with the use of distributed automation systems with remote access.		
Article 43			
Article 44			
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 9: The general intention of the NC concerning the minimum capabilities is explained in a new “whereas”. Network operator does not expect grid users to behave unexpectedly outside of the minimum capability defined in this NC. In a case where grid users have a different possible and an acceptable way to behave outside of the requirements defined in this NC, interest of society should be privileged. As an example, in exceptional temperature		

Article 45	conditions, when maximum steady-state loading is reached, derating is preferred over full disconnection. A similar behaviour would be expected for reactive power capability defined in NC for a given voltage range. Outside of this voltage range, NC requirement are not explicitly specified but interest of society would benefit for reduced reactive power support rather than no reactive power support, because nothing is requested by the NC. It is however acknowledged that a legally binding requirement covering such an intention is complex as one cannot expect grid user to know what is the best for society. Therefore, an approach in a “whereas” is proposed to offer a guideline in bilateral agreement between grid user and network operator. In the context of reactive power capability, the request of demonstration/information exchange of technical capability of the PGM is added in article 45 (testing) and 52 (simulation). It is indeed of upmost importance that network planning and design take into account the expected behaviour of the grid users to take	Additional reasonings: 1. With regard to ENTSO-E Amendment 9: Outside defined capability required by the NC, unless explicitly defined otherwise, the PGM should try to support the system which it best of its capability. If the “whereas” is not amended PGMs wouldn’t have a requirement in exceptional system states.	Cross references: 1. With regard to ENTSO-E Amendment 9: Requested behaviour outside a defined requirement of the NC

	decision in interest of society. Information exchange between grid user and Network operator is therefore needed. Similar amendments are proposed to NC HVDC.		
Article 46			
Article 47	Aim of the proposal: 1. With regard to ENTSO-E Amendment 60: The meaning of Art. 15 is to request stability of the unit in different modes of operation (interconnected system, island system and houseload) and the stability of the units during switching from one mode of operation to another without relying on information provided by the RSO (e.g. position signals of the system operator's switchgear). However, the Amendment 31 to 15.5.b.iii does not sufficiently describe the necessary behaviour of PGMs with regard to the different modes. For the fault case, stable controller behaviour must be required from the PGM with regard to voltage and frequency control. Both simulations and on-site measurements of real events show that power plants that are compliant with grid codes cannot yet guarantee stable control	Additional reasonings: 1. With regard to ENTSO-E Amendment 60: The issue in the current requirements is categorized as 'Unclarity/New Needs' The Amendment 31 to 15.5.b.iii does not adequately describe the necessary behaviour of PGM with regard to the different modes of operation. Due to the lack of requirements for the stable controller behaviour, a danger to the system as a whole cannot be excluded, even if each PGM is compliant with the requirements of the RfG on its own. The substitution of conventional transmission-connected generation, where (based on expertise and/or specific requirements) a stable controller design is required today, by distributed generation leads to: * A decrease of stable controllers;	Cross references: 1. With regard to ENTSO-E Amendment 60: Stable PGM Control

	behaviour in the entire system. In addition, the required damping has not yet been sufficiently determined. Therefore, in addition to the requirements for the individual PGM, verification is required that a PGM has a stable control behaviour in combination with other PGMs in the overall system. In addition to the change in chapter 15.5.b.ii, changes are therefore necessary in the corresponding chapters on frequency and voltage control. Furthermore, the verification of compliance with these requirements must be described for the behaviour of each PGM in the overall system.	* The introduction of (mostly) instable controllers; * Reduction of stability margin, due to interaction of those. Consequence: * the system defence plan might not work even so LFSM and other measures seem to be sufficient,; * stable island operation including distributed and/or renewable generation might not be possible; * in the long run even interconnected operation might become sensitive (small signal stability). This is due to the fact, that the “grid” (passive voltage source) in compliance tests, in real life is only the parallel operation of all the other generators.	
		Additional reasonings: 1. With regard to ENTSO-E Amendment 49: In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are	

Article 48	Aim of the proposal: 1. With regard to ENTSO-E Amendment 49: The penetration of energy storage devices at EU level is increasingly rising. Forecasts on the storage capacity are a magnitude of scale larger than for other emerging technologies. As such, energy storage devices need to fulfil certain technical requirements with cross-border relevance to support the system and avoid possible issues and threats. Currently, the three European Connection Network Codes (RfG, HVDC and DCC) explicitly exclude storage technologies other than in respect of Pumped Storage. Therefore, a contribution to the EU level security of supply and sustainability is required. • Batteries can be used to merge capabilities for PPM • But not for SPGM because of 'indivisible set of installations' • If the interpretation is confirmed, this constitutes to a discrimination For these reasons, the following is recommended: 1. Proposals of the EG Storage were taken over to the extent considered sensible by CAT 2. Electricity Storage Modules (ESM) are to be considered as	reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for the required switching times PGM-owners may unnecessarily waste time. In recent years, there has been a substantial increase in the use of electrical system connected storage applications to the extent	Cross references: 1. With regard to ENTSO-E Amendment 49: Storage Requirements.

	PGMs. Therefore, they are either a SPGM/PPM. 3. General rules for SPGM/PPM are applied. 4. Additionally, the amendments account for some ESM characteristics such as limited energy reservoir or the possibility to switch from generation to consumption mode. Further information can be found on the final report by the Storage Expert Group, which can be found (https://www.entsoe.eu/Documents/Network codes documents/GC ESC/STORAGE /Final_Report_STORAGE__%2Bsupporting_material__-_phase_2.zip) • Improved wording to explicitly stated that a certain response time applies. • Added accountability for switching time.	that some form of connection requirements is necessary. This need is to ensure that relevant system operators can continue to operate safe, secure and economic networks, the requirements upon developers are reasonable, proportionate and non-discriminatory and the definitions are clear. These EU wide requirements are all fundamental pre-requisites which are necessary to facilitate Union wide trade in electricity, ensure security of supply, facilitate the integration of renewable energy sources, increase competition and allow the more efficient use of the network and resources for the benefit of consumers. Some NRAs have launched public consultations on storage uses and needs. If the proposed modification is not accepted, it may lead to a non-uniform process of connection to the network within Europe. 1. Stakeholders may interpret that the response times only apply until the switching from consumption to generation happens. This may cause too little frequency support in case of underfrequency, so that LFDD-schemes may be triggered. 2. Without added accountability for	

		the required switching times PGM-owners may unnecessarily waste time.	
Article 49			
Article 50	Aim of the proposal: 1. With regard to ENTSO-E Amendment 45: Reference to art. 47, 48 and 49 is missing in Art. 50. For these reasons, the following is recommended Reference to Article 44(2) and paragraphs 2, 3, 4, 5, 7, 8 and 9 of Article 48, has been replaced by a reference to Article 47, 48 and 49.	Additional reasonings: 1. With regard to ENTSO-E Amendment 45: Risk for incorrect and not complete compliance tests for offshore power park modules.	Cross references: 1. With regard to ENTSO-E Amendment 45: Art. 50 Compliance tests for offshore power park modules
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 60: The meaning of Art. 15 is to request stability of the unit in different modes of operation (interconnected system, island system and houseload) and the stability of the units during switching from one mode of operation to another without relying on information provided by the RSO (e.g. position signals of the system operator's switchgear). However, the Amendment 31 to 15.5.b.iii does not sufficiently describe the necessary behaviour of PGMs with regard to the different modes. For the fault case,	Additional reasonings: 1. With regard to ENTSO-E Amendment 60: The issue in the current requirements is categorized as 'Unclarity/New Needs' The Amendment 31 to 15.5.b.iii does not adequately describe the necessary behaviour of PGM with regard to the different modes of operation. Due to the lack of requirements for the stable controller behaviour, a danger to the system as a whole cannot be excluded, even if each PGM is compliant with the requirements of the RfG on its own.	

Article 51	stable controller behaviour must be required from the PGM with regard to voltage and frequency control. Both simulations and on-site measurements of real events show that power plants that are compliant with grid codes cannot yet guarantee stable control behaviour in the entire system. In addition, the required damping has not yet been sufficiently determined. Therefore, in addition to the requirements for the individual PGM, verification is required that a PGM has a stable control behaviour in combination with other PGMs in the overall system. In addition to the change in chapter 15.5.b.ii, changes are therefore necessary in the corresponding chapters on frequency and voltage control. Furthermore, the verification of compliance with these requirements must be described for the behaviour of each PGM in the overall system.	The substitution of conventional transmission-connected generation, where (based on expertise and/or specific requirements) a stable controller design is required today, by distributed generation leads to: * A decrease of stable controllers; * The introduction of (mostly) instable controllers; * Reduction of stability margin, due to interaction of those. Consequence: * the system defence plan might not work even so LFSM and other measures seem to be sufficient,; * stable island operation including distributed and/or renewable generation might not be possible; * in the long run even interconnected operation might become sensitive (small signal stability). This is due to the fact, that the “grid” (passive voltage source) in compliance tests, in real life is only the parallel operation of all the other generators.	Cross references: 1. With regard to ENTSO-E Amendment 60: Stable PGM Control
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 60: The meaning of Art. 15 is to request stability of the unit in different modes of operation		

	(interconnected system, island system and houseload) and the stability of the units during switching from one mode of operation to another without relying on information provided by the RSO (e.g. position signals of the system operator's switchgear). However, the Amendment 31 to 15.5.b.iii does not sufficiently describe the necessary behaviour of PGMs with regard to the different modes. For the fault case, stable controller behaviour must be required from the PGM with regard to voltage and frequency control. Both simulations and on-site measurements of real events show that power plants that are compliant with grid codes cannot yet guarantee stable control behaviour in the entire system. In addition, the required damping has not yet been sufficiently determined. Therefore, in addition to the requirements for the individual PGM, verification is required that a PGM has a stable control behaviour in combination with other PGMs in the overall system. In addition to the change in chapter 15.5.b.ii, changes are therefore necessary in the	Additional reasonings: 1. With regard to ENTSO-E Amendment 60: The issue in the current requirements is categorized as 'Unclarity/New Needs' The Amendment 31 to 15.5.b.iii does not adequately describe the necessary behaviour of PGM with regard to the different modes of operation. Due to the lack of requirements for the stable controller behaviour, a danger to the system as a whole cannot be excluded, even if each PGM is compliant with the requirements of the RfG on its own.	

Article 52	corresponding chapters on frequency and voltage control. Furthermore, the verification of compliance with these requirements must be described for the behaviour of each PGM in the overall system. 2. With regard to ENTSO-E Amendment 9: The general intention of the NC concerning the minimum capabilities is explained in a new “whereas”. Network operator does not expect grid users to behave unexpectedly outside of the minimum capability defined in this NC. In a case where grid users have a different possible and an acceptable way to behave outside of the requirements defined in this NC, interest of society should be privileged. As an example, in exceptional temperature conditions, when maximum steady-state loading is reached, derating is preferred over full disconnection. A similar behaviour would be expected for reactive power capability defined in NC for a given voltage range. Outside of this voltage range, NC requirement are not explicitly specified but interest of society would benefit for reduced reactive power support rather than no	The substitution of conventional transmission-connected generation, where (based on expertise and/or specific requirements) a stable controller design is required today, by distributed generation leads to: * A decrease of stable controllers; * The introduction of (mostly) instable controllers; * Reduction of stability margin, due to interaction of those. Consequence: * the system defence plan might not work even so LFSM and other measures seem to be sufficient,; * stable island operation including distributed and/or renewable generation might not be possible; * in the long run even interconnected operation might become sensitive (small signal stability). This is due to the fact, that the “grid” (passive voltage source) in compliance tests, in real life is only the parallel operation of all the other generators. 2. With regard to ENTSO-E Amendment 9: Outside defined capability required by the NC, unless explicitly defined otherwise, the PGM should try to support the system which it best of its	"Cross references: 1. With regard to ENTSO-E Amendment 60: Stable PGM Control 2. With regard to ENTSO-E Amendment 9: Requested behaviour outside a defined requirement of the NC

	reactive power support, because nothing is requested by the NC. It is however acknowledged that a legally binding requirement covering such an intention is complex as one cannot expect grid user to know what is the best for society. Therefore, an approach in a “whereas” is proposed to offer a guideline in bilateral agreement between grid user and network operator. In the context of reactive power capability, the request of demonstration/information exchange of technical capability of the PGM is added in article 45 (testing) and 52 (simulation). It is indeed of upmost importance that network planning and design take into account the expected behaviour of the grid users to take decision in interest of society. Information exchange between grid user and Network operator is therefore needed. Similar amendments are proposed to NC HVDC.	capability. If the “whereas” is not amended PGMs wouldn’t have a requirement in exceptional system states.	
Article 53			

Article 54	Aim of the proposal: 1. With regard to ENTSO-E Amendment 29: The system needs are that power generating modules shall stay connected and control voltage within defined ranges. Taking into account reactive power capabilities and voltage control capabilities of power generating units, an automatic disconnection is the worst for the system stability. No utilisation of such capability has been identified by TSO has used /needs in the future and for these reasons, the initial text of article 15.3 of NC RfG has been deleted	Additional reasonings: 1. With regard to ENTSO-E Amendment 29: Power generating modules owner might understand that they are expected to disconnect despite the absence of system need and would therefore not contribute to restore voltage to normal values within the defined ranges and aggravate a potential voltage issue.	Cross references: 1. With regard to ENTSO-E Amendment 29: Art. 15.3: Capability of disconnection at voltage values
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 60: The meaning of Art. 15 is to request stability of the unit in different modes of operation (interconnected system, island system and houseload) and the stability of the units during switching from one mode of operation to another without relying on information provided by the RSO (e.g. position signals of the system operator's switchgear). However, the Amendment 31 to 15.5.b.iii does not sufficiently describe the necessary behaviour of PGMs with regard to the	Additional reasonings: 1. With regard to ENTSO-E Amendment 60: The issue in the current requirements is categorized as 'Unclarity/New Needs' The Amendment 31 to 15.5.b.iii does not adequately describe the necessary behaviour of PGM with regard to the different modes of operation. Due to the lack of requirements for the stable controller behaviour, a danger to the system as a whole cannot be excluded, even if each PGM is compliant with the requirements of the RfG on its	

Article 55	different modes. For the fault case, stable controller behaviour must be required from the PGM with regard to voltage and frequency control. Both simulations and on-site measurements of real events show that power plants that are compliant with grid codes cannot yet guarantee stable control behaviour in the entire system. In addition, the required damping has not yet been sufficiently determined. Therefore, in addition to the requirements for the individual PGM, verification is required that a PGM has a stable control behaviour in combination with other PGMs in the overall system. In addition to the change in chapter 15.5.b.ii, changes are therefore necessary in the corresponding chapters on frequency and voltage control. Furthermore, the verification of compliance with these requirements must be described for the behaviour of each PGM in the overall system.	own. The substitution of conventional transmission-connected generation, where (based on expertise and/or specific requirements) a stable controller design is required today, by distributed generation leads to: * A decrease of stable controllers; * The introduction of (mostly) instable controllers; * Reduction of stability margin, due to interaction of those. Consequence: * the system defence plan might not work even so LFSM and other measures seem to be sufficient,; * stable island operation including distributed and/or renewable generation might not be possible; * in the long run even interconnected operation might become sensitive (small signal stability). This is due to the fact, that the “grid” (passive voltage source) in compliance tests, in real life is only the parallel operation of all the other generators.	Cross references: 1. With regard to ENTSO-E Amendment 60: Stable PGM Control
Article 56			
Article 57			
Article 58			
Article 59			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new articles in this section	Reasoning	Relation to other provisions
New articles			

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE V - Derogations

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 60			
Article 61			
Article 62			
Article 63			
Article 64			
Article 65			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new articles in this section	Reasoning	Relation to other provisions
New articles			

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE VI - Transitional arrangements for emerging technologies

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 66			
Article 67			
Article 68			
Article 69			
Article 70	Aim of the proposal: 1. With regard to ENTSO-E Amendment 46: Reference to Article 4(2) should be replaced by Article 4(3).	Additional reasonings: 1. With regard to ENTSO-E Amendment 46: Risk for incorrect interpretation of the text.	Cross references: 1. With regard to ENTSO-E Amendment 46: Art. 70 Withdrawal of emerging technology classification

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new articles in this section	Reasoning	Relation to other provisions
New articles			

Please upload figures or tables if necessary

The maximum file size is 1 MB

TITLE VII - Final provisions

Please write your amendment proposal and the reasoning in the table below.

	Amendment proposal	Reasoning	Relation to other provisions
Article 71			
Article 72			

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new articles in this section	Reasoning	Relation to other provisions
New articles			

Please upload figures or tables if necessary

The maximum file size is 1 MB

Other additional provisions

Please write your amendment proposal and the reasoning in the table below.

	Proposal for new provisions	Reasoning	Relation to other provisions
Other new provisions			

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

Please upload figures or tables if necessary

The maximum file size is 1 MB

FILE UPLOAD

Please upload the Word file (downloaded from the **Instruction** section) containing all your amendment proposals in the Track Changes mode.

The maximum file size is 1 MB

9fb64cb9-cfdd-48c8-9fae-a344befa586d/NC_RfG_ENTSO-E.z01
e279f638-e51c-43f7-8dee-599fc57bfb83/NC_RfG_ENTSO-E.z02
c06133c3-882c-4136-9984-61361ea77693/NC_RfG_ENTSO-E.z03
fe0371aa-9892-4c62-be5e-02389912de60/NC_RfG_ENTSO-E.zip
162bc2b3-8f52-44b8-beda-d23ae0fb794d/Readme_ENTSO-E.txt

Contact

Contact Form