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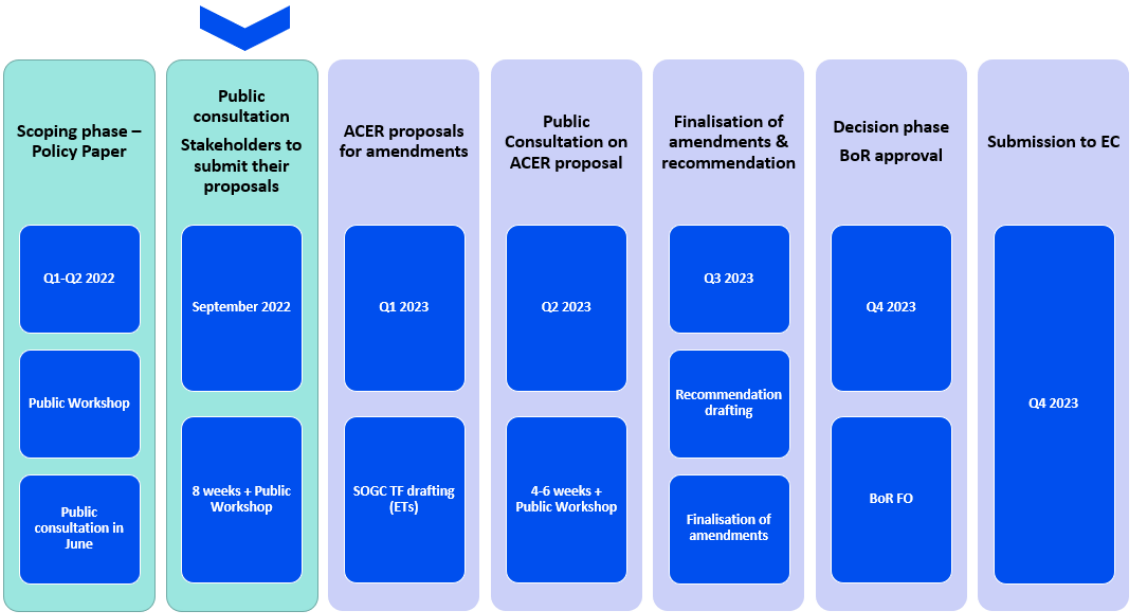
Proposals for amendments to the Demand Connection Code

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) 2016/1388 of 17 August 2016 establishing a **Network Code on Demand Connection** ('NC DC').
For amendment proposals concerning Network Code on Requirements for Generators ('NC RfG'), please go to the form: **NC RfG**.

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

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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 NC DC 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.

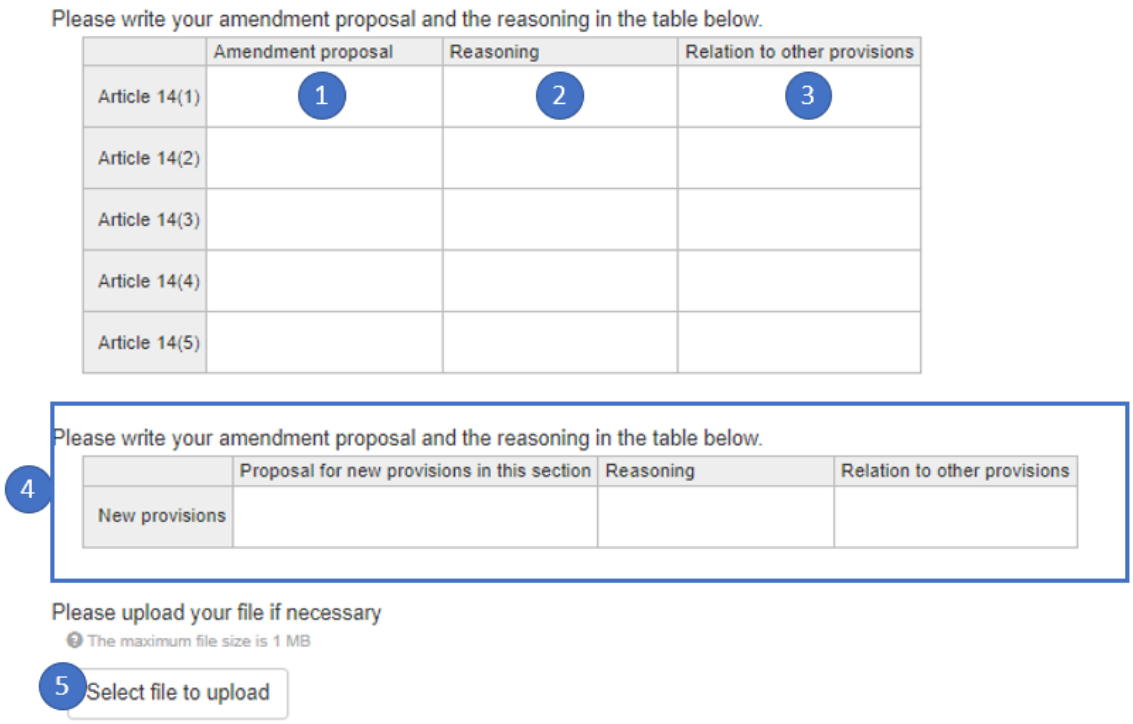
Step 1

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_DC_stakeholder_name"), please upload it in the last section of this form (FILE UPLOAD)

Download the Word file (NC DC)

Step 2

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

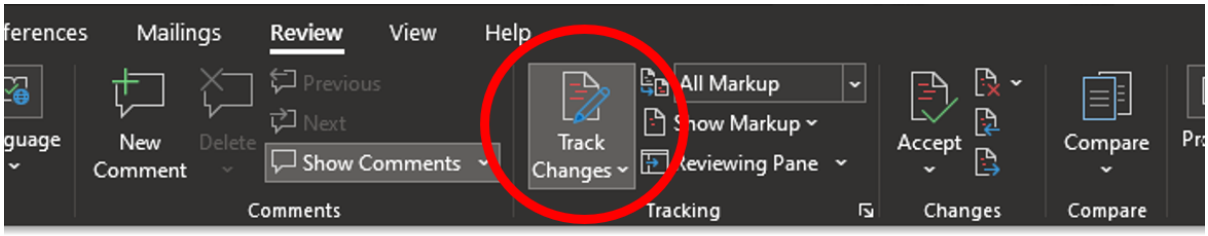


1. Propose an amended wording of the relevant provision, as you provided in the Word file.
2. Provide the motivation/reasoning behind your proposal.
3. Indicate (if any) which other provisions of the NC DC are impacted and may need to be amended following your proposal.
4. Provide (if any) your proposals 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

This section shows an example of an input to the survey on the NC RfG. The input process is the same for the NC DC survey.

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

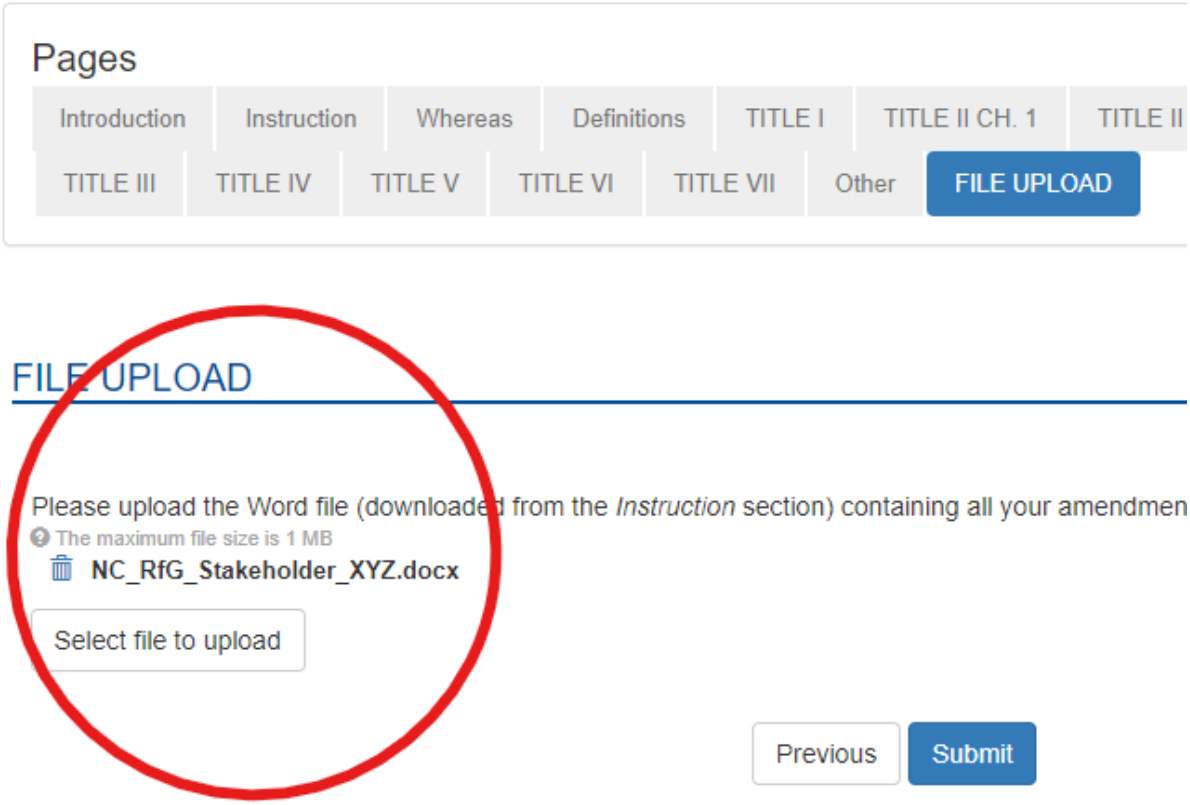
The system restoration requirements laid down ~~respectively~~ in Article 14(4) and Article 15(5) shall apply to AC-connected offshore power park modules types B and C, respectively.

Article 28

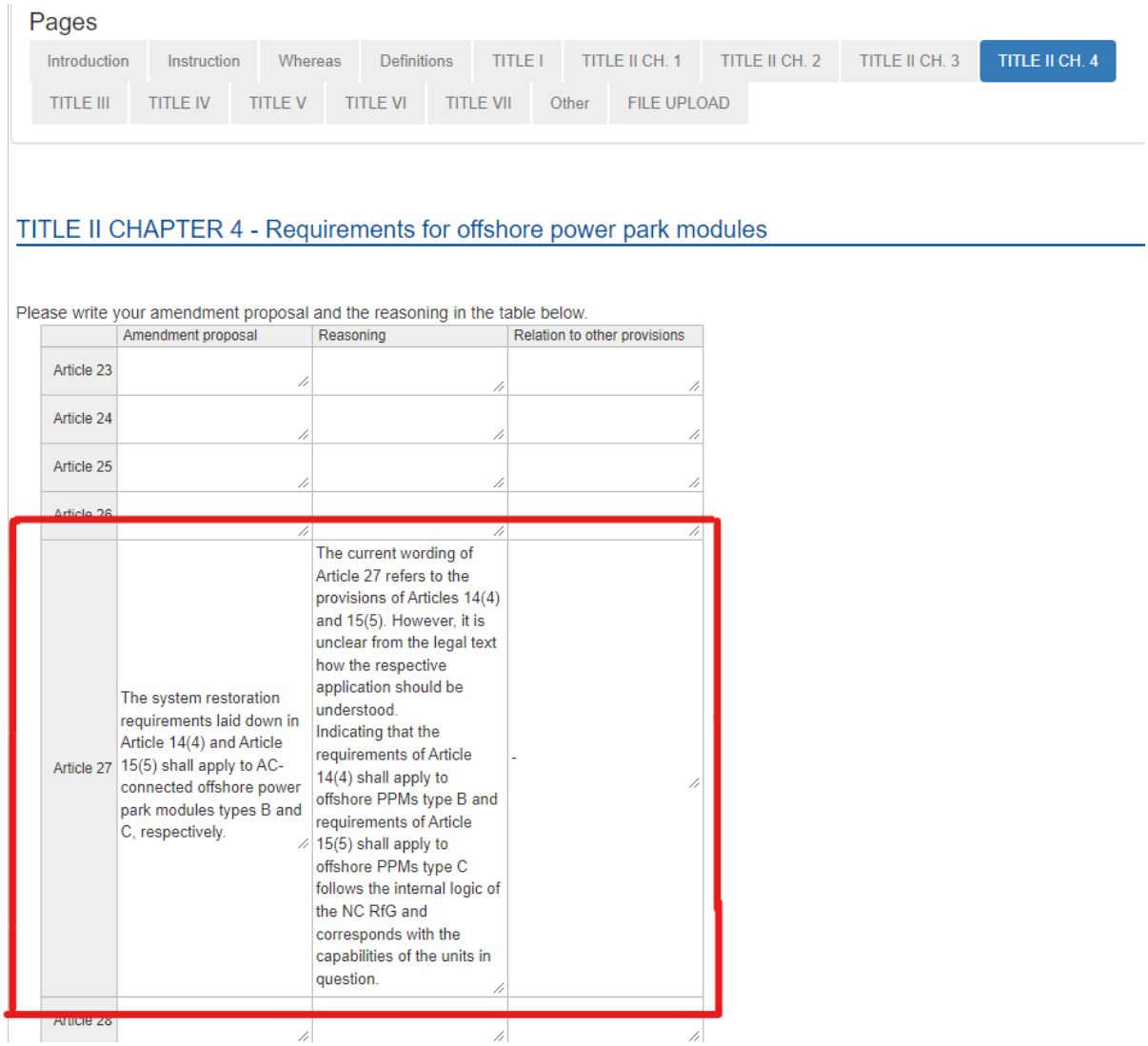
General system management requirements applicable to AC-connected offshore power park modules

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 DC Whereas section

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

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 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF). To prevent a total system collapse the automatic load shedding relays will disconnect a part of the load, causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected		

	to be reduced. To prevent the triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for electro mobility, such as V1G, power-to-gas demand unit and temperature controlled devices that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will			

New recitals	be activated automatically. Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected this demand will respond before the normal wide spread arbitrary demand disconnection of users occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency	Additional reasonings: 1. With regard to: ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security.	"Cross references: With regard to: ENTSO-E Amendment 24: New Needs - Limited Frequency Sensitive Mode – Underfrequency Consumption (LFSM-UC): Article 1, Article 2, Article 24, Article 25, New Title before title III (see new provision), Article 33, Article 34.

	deviations from the nominal frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on LFSM-UC on Temperature Controlled Devices as given in the code allows for different possible technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. The			

	identification of which devices will be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive. Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code.		

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)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 2: It should be made clear that a demand unit is a part of a 'demand facility' or of a CDSO. The concept of 'demand facility' is different to the one of 'distribution system facility'. For this reason, the clarification that demand unit is a part of a demand facility or CDSO is recommended. Consequent changes may also be conducted in the 'whereas' section.	Additional reasonings: 1. With regard to ENTSO-E Amendment 2: If not implemented, there will be a lack of clarity wheter a demand unit is a part of a demand facility or part of a closed-distribution system or not.	Cross references: With regard to ENTSO-E Amendment 2: Art. 2.3 Definition of ‘transmission-connected distribution facility’.

Article 2(4)	Aim of the proposal: 1. With regard to ENTSO-E Amendment 3: Not only the equipment at the connection point but also the equipment needed for the connection should be included should be covered in the relevant definition. For this reason, a clarification that the facility is a part of a distribution system and a clarification that it covers installation & equipment's used at the site of the connection point is recommended.	Additional reasonings: 1. With regard to ENTSO-E Amendment 3: If not implemented, there will be a lack of clarity wheter the facility covers installation & equipments used at the site of the connection point and also the definition will not be consistent with TC DS definition.	Cross references: With regard to ENTSO-E Amendment 3: Art. 2.4 Definition of ‘demand unit’. Whereas
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)			
Article 2(16)			
Article 2(17)			
Article 2(18)			
Article 2(19)			
Article 2(20)			

Article 2(21)			
Article 2(22)			

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 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF). To prevent a total system collapse the automatic load shedding relays will disconnect a part of the load, causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected to be reduced. To prevent the		

	triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for electro mobility, such as V1G, power-to-gas demand unit and temperature controlled devices that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will be activated automatically.			

New definitions	Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected this demand will respond before the normal wide spread arbitrary demand disconnection of users occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency deviations from the nominal	Additional reasonings: 1. With regard to: ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security.	Cross references: With regard to: ENTSO-E Amendment 24: New Needs - Limited Frequency Sensitive Mode – Underfrequency Consumption (LFSM-UC): Whereas, Article 1, Article 3, Article 24, Article 25, New Title before title III (see new provision), Article 33, Article 34.

	frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on LFSM-UC on Temperature Controlled Devices as given in the code allows for different possible technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. The identification of which devices will			

	be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive. Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code.		

Please upload figures or tables if necessary

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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 1: For proper LFDD functionality, demand facilities (DF) connected to DSO system should also be required to be equipped with a UFLS relay. The scope of the DCC covers already all DSO. It is proposed to extend the scope of the DCC to demand facilities, if specified by the relevant TSO, in coordination with the relevant system operators, to provide demand disconnection and reconnection. Additionally, article 19 is amended to clarify that LFDD could be requested to distribution connected demand facilities & distribution system. 2. With regard to: ENTSO-E Amendment 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF). To prevent a total system collapse	[continuation from Proposal cell] The identification of which devices will be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive.	

	the automatic load shedding relays will disconnect a part of the load, causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected to be reduced. To prevent the triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for electro mobility, such as V1G,	Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code. 3. With regard to: ENTSO-E Amendment 10: It is not clearly written whether LFDD requirements are just for the “TSO-connected DSO” or also everything the is connected within the “TSO-connected DSO”. From TSOs point of view all relevant grid users should fulfill the LFDD requirements. DCC applies to transmission-connected distribution systems, but it is not clear how can distribution system can cascade the requirement to underlying grid	

Article 1	power-to-gas demand unit and temperature controlled devices that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will be activated automatically. Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected this demand will respond before	users/DS in order to achieve the required functionality. It is proposed to explicitly foresee such a cascading in article 19 so that LFDD could be requested for distribution connected demand facilities & distribution system. Consequent changes in the operational notification procedures are to be carried out as well. 4. With regard to: ENTSO-E Amendment 4: The DCC applies to transmission-connected distribution systems, but it is not clear how distribution system can cascade requirements to underlying grid users/DS in order to achieve the required functionality. It is proposed to explicitly foresee such a cascading in article 19 so that LFDD could be requested for distribution connected demand facilities & distribution-connected distribution systems. Additional reasonings: 1. With regard to: ENTSO-E Amendment 1: The subject matter could be misunderstood and requirements could be applied only by a few grid users, which will lead to not having a sufficient amount of demand facilities capable of providing	Cross references: With regard to: ENTSO-E Amendment 1: Art. 1.1.a Subject matter With regard to: ENTSO-E Amendment 4: Cascading of requirements: Article 19. With regard to: ENTSO-E Amendment 10: LFDD application: Article 19. With regard to: ENTSO-E Amendment 24: New Needs - Limited Frequency Sensitive Mode – Underfrequency Consumption (LFSM-UC): Whereas, Article 2, Article 3, Article 24, Article 25, New Title before title III (see new provision), Article 33, Article 34.

	the normal wide spread arbitrary demand disconnection of users occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency deviations from the nominal frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on LFSM-UC on Temperature	demand disconnection and reconnection. Such shortcomings are potential threat to grid stability. 2. With regard to: ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security. 3. With regard to: ENTSO-E Amendment 4 and Amendment 10: If the amendment is not implemented, it could be impossible to implement an effective LFDD as requested by NC E&R in case of large share of embedded generation.		

	Controlled Devices as given in the code allows for different possible technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. [continues in Reasoining cell]		
	Aim of the proposal: 1. With regard to: ENTSO-E Amendment 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF). To prevent a total system collapse the automatic load shedding relays will disconnect a part of the load,		

	causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected to be reduced. To prevent the triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for electro mobility, such as V1G, power-to-gas demand unit and temperature controlled devices			

Article 3	that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will be activated automatically. Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected this demand will respond before the normal wide spread arbitrary demand disconnection of users	[continuation from Proposal cell] 2. With regard to: ENTSO-E Amendment 5: Pumped-hydro applications are covered by the NC RfG. The amendment to DCC reflects the outcomes of the GC ESC Expert Group “Pump Storage Hydro (PSH)”. The detailed background and justifications for the amendment can be found in the final report of this Expert Group. Additional reasonings: 1. With regard to: ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD		

	occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency deviations from the nominal frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on LFSM-UC on Temperature Controlled Devices as given in the code allows for different possible	concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security. 2. With regard to: ENTSO-E Amendment 5: If the amendment is not implemented, it could lead to legal ambiguity as two potentially conflicting sets of requirements could apply for when in pump-mode (RfG & DCC).	Cross references: With regard to: ENTSO-E Amendment 24: New Needs - Limited Frequency Sensitive Mode – Underfrequency Consumption (LFSM-UC): Whereas, Article 1, Article 2, Article 24, Article 25, New Title before title III (see new provision), Article 33, Article 34. With regard to ENTSO-E Amendment 5: Art. 3.2.b: Pumped-hydro units should be excluded from the NC DC: Article 5

	technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. The identification of which devices will be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive. Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the			

	performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code. [...]		
Article 4	Aim of the proposal: 1. With regard to ENTSO-E Amendment 19: The amendment proposal includes the recommendations from EG CSM (Criteria for Significant Modernisation) Alignment with RfG amendment proposal. Compared to proposal from 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 a non-ambiguous translation to the different EU national languages. - to use the wording “equipment” instead of “assets” in 4.1.c.ii, in alignment with the rest of the amendment proposal.	Additional reasonings: 1. With regard to ENTSO-E Amendment 19: Implications may be that many stakeholders argue that no modernization took place because the characteristics have not been altered.	Cross references: With regard to ENTSO-E Amendment 19: Art. 4: Scope

Article 5	Aim of the proposal: 1. With regard to ENTSO-E Amendment 5: Pumped-hydro applications are covered by the NC RfG. The amendment to DCC reflects the outcomes of the GC ESC Expert Group “Pump Storage Hydro (PSH)”. The detailed background and justifications for the amendment can be found in the final report of this Expert Group.	Additional reasonings: 1. With regard to ENTSO-E Amendment 5: If the amendment is not implemented, it could lead to legal ambiguity as two potentially conflicting sets of requirements could apply for when in pump-mode (RfG & DCC).	Cross references: With regard to ENTSO-E Amendment 5: Art. 3.2. b: Pumped-hydro units should be excluded from the NC DC: Article 5
Article 6			
Article 7			
Article 8			
Article 9			
Article 10			
Article 11			

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 provisions			

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TITLE II - Connection of transmission-connected demand facilities, transmission-connected distribution facilities and distribution systems

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

	Amendment proposal	Reasoning	Relation to other provisions
Article 12			
Article 13			
Article 14	Aim of the proposal: 1. With regard to ENTSO-E: Amendment 6: Not all transmission network elements should be considered by the TSO to specify the maximum short-circuit current at the connection point, but only the relevant ones. 2. With regard to ENTSO-E: Amendment 7: Regarding Art. 14.2 the wording “short-circuit currents” should be replaced by “short-circuit currents contribution” for accuracy of the requirement. Furthermore, ENTSO-E proposes to add the wording “transmission” for unambiguous understanding of the equivalent of which network is represented. The same change proposal applies to the following requirement of this article. Regarding the new provision of Art 14.3 both sides of the interface between the TSO and the transmission-connected demand facility or the transmission-connected distribution system are influencing the respective other		

	side in terms of short circuits. Therefore, both sides need the information in terms of short circuit of the respective other side. 3. With regard to ENTSO-E: Amendment 8: The deleted items are not related to connection capabilities but to operational planning and therefore are subject of DCC. They are covered by SO GL.	Additional reasonings: 1. With regard to ENTSO-E: Amendment 6: If the amendment is not implemented, confusion between NC DC and SO GL will persist. 2. With regard to ENTSO-E: Amendment 7: If the amendment is not implemented, the relevant TSO could be held accountable for “wrong” calculation methods. 3. With regard to ENTSO-E: Amendment 8: If the the new provision of Art 14.3 is not implemented, TSOs might not have sufficent data, which results in the case that the TSO cannot assess the connection of the transmission-connected demand facility or the transmission-connected distribution system properly.	Additional reasonings: 1. With regard to ENTSO-E: Amendment 6: If the amendment is not implemented, confusion between NC DC and SO GL will persist. 2. With regard to ENTSO-E: Amendment 7: If the amendment is not implemented, the relevant TSO could be held accountable for “wrong” calculation methods. 3. With regard to ENTSO-E: Amendment 8: If the the new provision of Art 14.3 is not implemented, TSOs might not have sufficent data, which results in the case that the TSO cannot assess the connection of the transmission-connected demand facility or the transmission-connected distribution system properly.
	Aim of the proposal: 1.With regard to ENTSO-E: Amendment 9: Following feedback from stakeholders in ESC meetings, a question was raised in the ESC issue logger in March 2017 on the correct understanding of the article 15.2 (“What is the correct understanding of article 15.1 (f) and 15.2 of the NC DCC?”). It was acknowledged by ENTSO-e that the requirements in the code		

Article 15	lacks clarity and could be misconceived. Several interpretations where shared among stakeholders and tentative revised wording were proposed with remaining unclarity on the concept of “active power flow of less than 25% of the maximum import capability”, “at reference 1 pu voltage” as well as on the outcome of the joint analysis. It is proposed to greatly simplify the formulation of the article by keeping the need for DSO to be capable of not exporting reactive power in specific circumstances, low active power exchange and high penetration of decentralized generation. The article is made more clearly non-exhaustive (thresholds to be defined) and the need for the joint analysis focused on the justification of the non-exhaustive values. Compliance verification is adapted accordingly: - The built points in Article 43.1 are harmonized with requirements in Article 15.2. - As article 15.2 applies to transmission-connected distribution systems, so is the article 43. 2.With regard to ENTSO-E:	Additional reasonings: With regard to ENTSO-E: Amendment 9: The existing requirement, being uncleared, is implemented in very different ways in different Member States without that these differences could be monitored. This creates an unjustified distortion of the level playing field. 2. With regard to ENTSO-E: Amendment 22: The issue found in the current requirements is a lack of clarity with risk that the requirement is not implement coherently in every situation and that ineffective case-by-case discussions or legal disputes are triggered at the time of connection.	Cross references: With regard to ENTSO-E: Amendment 9: Art. 15.1. b.i&ii reactive power / removal of “power factor” With regard to ENTSO-E Amendment 22: Art.15.2 reactive power / DSO-TSO interface 25%: Article 43

	Amendment 22: The DCC requirements are defined as shares of the maximum capacity which means that the capability to stay within a rectangular area in the P-Q plane is requested. One point of the P-Q plane can also be described by a P and power factor coordinated but defining the requirement in terms of power factor could lead to the understanding that the capability to stay within a triangular area in the P-Q plane is requested, which is not the case. For clarity reasons the expression of the power factor in the brackets should then be deleted as this objective of clarification is misleading. Additionally, the wording import /export has led to confusion during several national implementation where import or export could depend on the point of view; an import from the distribution grid is an export from the transmission grid. It is therefore proposed to use, throughout the DCC text the wording consumption/infeed to better clarify the requirement.		
Article 16			
Article 17			
Article 18			

	Aim of the proposal: With regard to ENTSO-E Amendment 11: LFDD operation times should be clarified since the understanding among national interpretations is very diverse. It will have an impact on the speed of activation of load shedding and subsequently on system security. In the new proposal it is clearly stated what is covered by the maximum total tripping time to provide a clear specification. The relay accuracy is specified to make clear what frequency measurement tolerance is required in case of quick activation of LFDD. Also the inappropriate wording of “nominal Alternating Current input” should be corrected. The frequency relays typically use voltage for calculating of frequency. The word “nominal” is not appropriate since the frequency relay has to operate according immediate value. It is not specified how the ""nominal Alternating Current ('AC) input"" should be interpreted. Therefore changes to ""electrical input"" are proposed. 2. With regard to ENTSO-E Amendment 10: It is not clearly written whether LFDD			

Article 19	requirements are just for the “TSO-connected DSO” or also everything the is connected within the “TSO-connected DSO”. From TSOs point of view all relevant grid users should fulfill the LFDD requirements. DCC applies to transmission-connected distribution systems, but it is not clear how can distribution system can cascade the requirement to underlying grid users/DS in order to achieve the required functionality. It is proposed to explicitly foresee such a cascading in article 19 so that LFDD could be requested for distribution connected demand facilities & distribution system. Consequent changes in the operational notification procedures are to be carried out as well. 3. With regard to ENTSO-E Amendment 13: It is unclear whether the ""TSO request"" refers to the capability as such (making the requirement non-mandatory) or to instructing a disconnection command. 4. With regard to ENTSO-E Amendment 4: The DCC applies to transmission-connected distribution systems, but it is not	Additional reasonings: 1. With regard to ENTSO-E Amendment 10 and Amendment 4: If the amendment is not implemented, it could be impossible to implement an effective LFDD as requested by NC E&R in case of large share of embedded generation. 2. With regard to ENTSO-E Amendments 13: If the amendment is not implemented, it is not clear how to treat this requirement of disconnection as a capability or as instructing a disconnection command. 3. With regard to ENTSO-E Amendments 11 and Amendment 12: The requirement on LFDD could be misunderstood, which poses a potential threat to grid stability.	Cross references: With regard to ENTSO-E Amendment 4: Art. 19: Cascading of requirements With regard to ENTSO-E Amendment 10: Art. 19.1 LFDD / application With regard to ENTSO-E Amendment 11: Art. 19.1.c &(.ii) LFDD / functional capabilities With regard to ENTSO-E Amendment 12: Art. 19.1.d LFDD / input signal With regard to ENTSO-E Amendment Amendment 13: Art. 19.4.c Remote disconnection

	clear how distribution system can cascade requirements to underlying grid users/DS in order to achieve the required functionality. It is proposed to explicitly foresee such a cascading in article 19 so that LFDD could be requested for distribution connected demand facilities & distribution-connected distribution systems. 5. With regard to ENTSO-E Amendment 12: The term ""AC voltage supply"" is ambiguous as it should not refer to the power supply of the disconnection relay but to the measured voltage used to computed the network frequency. Consequently, it has been clarified that the input signal shall be measured at least from two phases to ensure the LFDD's selectivity in case of ground faults. The AC voltage supply has been replace by the „electrical input signal“ that appropriately and still generally describes the signal for LFDD.		
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 20: Modification of the article on power quality provides clarification that power quality parameters shall not		

Article 20	be only limited to fluctuation and distortion of voltage sinus wave but to all relevant power quality parameters, according to specification of relevant TSO, at the connection point. The interface between any TSO and the transmission-connected DSOs is part of the electricity transportation system. It is not an individual source of or sink for distorting emissions and hence, cannot be assessed like power generating or demand units. Even if high harmonic distortion would be measured at the TSO/DSO interface, there will be no singular reason and the measures would be manifold. There is no reliable method to allocate distortion levels to such a connection. In future power grids, from the TSOs viewpoint, DSOs can be both harmonic emission sources and emission sinks, depending on the harmonic order and the operating conditions. Therefore, the coordination of power quality requirements with the requirements of adjacent TSOs and also the transmission-connected distribution system operators is recommended instead of threating the DSOs as singular	With regard to ENTSO-E Amendment 20: Additional reasonings: 1. If the suggested amendment is not accepted, then the article could be misunderstood. In the original text of article 20 of NC DC could be understood that only parameters limited to fluctuation and distortion of the supply voltage on the network, at the connection point, shall be specified. The proposed modification extended the power quality parameters for all relevant parameters that could be specified by relevant TSO if needed. If the TSO is required only to define distorting emission limits to its transmission-connected DSOs, due to the lack of significance and methodology, it will use the maximum distortion levels defined in relevant standards. Moreover, following the current text, the TSO is not required to cooperate with the DSO, although well known, that power quality not a local, but a large-area phenomena. If the current draft is kept, current and future problems of allocating harmonic levels and mitigating possible violations are not solvable in a reasonable and efficient way.	Cross references: With regard to ENTSO-E Amendment 20: Art. 20 Power quality / Voltage distortion also changes in RfG & HVDC

	facilities.		
Article 21	Aim of the proposal: 1. With regard to ENTSO-E Amendment 16: It is not clear why a system operator (not TSO) should specify the requirements of the performance of the recordings. Only TSO should prepare such specifications in coordination with relevant system operators. 2. With regard to ENTSO-E Amendment 15: It is not clear why simulation models do not consider frequency regulation despite the capability of demand response system frequency control as determined in paragraph 29 or distribution systems connected PGMs. 3. With regard to ENTSO-E Amendment 14: The EG ISSM (Interaction Studies and Simulation Models) recommends a more precise description of the model requirements	Additional reasonings: 1. With regard to ENTSO-E Amendment 15 and Amendment 16: If the amendment is not implemented, this lack of clarity will continue. 2. With regard to ENTSO-E Amendment 14: Lack of clarity could lead to useless models for the purpose of frequency domain simulations, among others.	Cross references: With regard to ENTSO-E Amendment 14: Art. 21.3.a Simulation models / content With regard to ENTSO-E Amendment 15: Art. 21.4 Simulation models / sub models With regard to ENTSO-E Amendment 16: Art. 21.5 Simulation models / relevant SO

Article 22	Aim of the proposal: 1. With regard to ENTSO-E Amendment 21: From some TSO point of view the ""Operation notification procedure"" does not apply to DSO. Transmission-connected DSOs argue that it should because some requirements (e.g. 19,1) apply DSO. In line with issue on Art. 1.1, Article 19 and the fact that frequency requirements apply to all DSOs; operational notification procedures are extended to all DSO and all demand facility if requirement apply to them (i.e. LFDD). It shall be reported to the relevant system operator and no more the exclusively the relevant TSOs.	Additional reasonings: 1. With regard to ENTSO-E Amendment 21: The existing requirement, being uncleared, is implemented in very different ways in different Member States without that these differences could be monitored. This creates an unjustified distortion of the level playing field.	Cross references: With regard to ENTSO-E Amendment 21: Art. 22.1 ONP / General
Article 23			
	Aim of the proposal: 1.With regard to ENTSO-E Amendment 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF).		

	To prevent a total system collapse the automatic load shedding relays will disconnect a part of the load, causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected to be reduced. To prevent the triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for			

Article 24	electro mobility, such as V1G, power-to-gas demand unit and temperature controlled devices that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will be activated automatically. Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected		Cross references: With regard to ENTSO-E Amendment 17: Art. 24.3.e ONP / wrong reference With regard to: ENTSO-E Amendment 24: New Needs - Limited Frequency Sensitive Mode – Underfrequency Consumption (LFSM-UC): Whereas, Article 1, Article 2, Article 3, Article 25, New Title before title III (see new provision), Article 33, Article 34.

	this demand will respond before the normal wide spread arbitrary demand disconnection of users occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency deviations from the nominal frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on	[continuation from Proposal cell] 2. With regard to ENTSO-E Amendment 17: Wrong reference: references to Articles 46 and 47 has been replaced by a reference to Articles 44 and 45, because Articles 46 and 47 refer to the compliance monitoring, not to simulation studies. Additional reasonings: 1. With regard to ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security. 2. With regard to ENTSO-E Amendment 17: If the amendment is not implemented, the error in reference will remain in NC DC v2. 0 and might be a legal problem in case of a dispute in future.	

	LFSM-UC on Temperature Controlled Devices as given in the code allows for different possible technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. The identification of which devices will be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive. Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use			

	of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code. [continues ...]		
	Aim of the proposal: 1. With regard to ENTSO-E Amendment 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF). To prevent a total system collapse the automatic load shedding relays will disconnect a part of the load, causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to		

	restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected to be reduced. To prevent the triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for electro mobility, such as V1G, power-to-gas demand unit and temperature controlled devices that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on			

Article 25	Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will be activated automatically. Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected this demand will respond before the normal wide spread arbitrary demand disconnection of users occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-	Additional reasonings: With regard to ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security.	Additional reasonings: With regard to ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security.

	off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency deviations from the nominal frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on LFSM-UC on Temperature Controlled Devices as given in the code allows for different possible technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating			

	standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. The identification of which devices will be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive. Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code.		
Article 26			

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 provisions			

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TITLE III - Connection of demand units used by a demand facility or a closed distribution system to provide demand response services to system operators

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

	Amendment proposal	Reasoning	Relation to other provisions
Article 27			
Article 28			
Article 29			
Article 30			
Article 31			
Article 32			
	Aim of the proposal: 1.With regard to ENTSO-E Amendment 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF). To prevent a total system collapse the automatic load shedding relays will disconnect a part of the load, causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to		

	restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected to be reduced. To prevent the triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for electro mobility, such as V1G, power-to-gas demand unit and temperature controlled devices that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on			

Article 33	Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will be activated automatically. Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected this demand will respond before the normal wide spread arbitrary demand disconnection of users occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-	Additional reasonings: 1. With regard to ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security.	Cross references: With regard to: ENTSO-E Amendment 24: New Needs - Limited Frequency Sensitive Mode – Underfrequency Consumption (LFSM-UC): Whereas, Article 1, Article 2, Article 3, Article 24, Article 25, New Title before title III (see new provision), Article 34.

	off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency deviations from the nominal frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on LFSM-UC on Temperature Controlled Devices as given in the code allows for different possible technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating			

	standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. The identification of which devices will be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive. Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code.		

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 provisions			

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TITLE IV - Compliance

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 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF). To prevent a total system collapse the automatic load shedding relays will disconnect a part of the load, causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected to be reduced. To prevent the		

	triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for electro mobility, such as V1G, power-to-gas demand unit and temperature controlled devices that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will be activated automatically.			

Article 34	Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected this demand will respond before the normal wide spread arbitrary demand disconnection of users occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency deviations from the nominal	Additional reasonings: 1. With regard to ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security.	Cross references: With regard to: ENTSO-E Amendment 24: New Needs - Limited Frequency Sensitive Mode – Underfrequency Consumption (LFSM-UC): Whereas, Article 1, Article 2, Article 3, Article 24, Article 25, New Title before title III (see new provision), Article 33.

	frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on LFSM-UC on Temperature Controlled Devices as given in the code allows for different possible technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. The identification of which devices will			

	be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive. Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code.		
Article 35			
Article 36			
Article 37			
Article 38			
Article 39			
Article 40			
Article 41			
Article 42			

Article 43	Aim of the proposal: 1. With regard to: ENTSO-E: Amendment 22: Following feedback from stakeholders in ESC meetings, a question was raised in the ESC issue logger in March 2017 on the correct understanding of the article 15.2 (“What is the correct understanding of article 15.1 (f) and 15.2 of the NC DCC?”). It was acknowledged by ENTSO-e that the requirements in the code lacks clarity and could be misconceived. Several interpretations where shared among stakeholders and tentative revised wording were proposed with remaining unclarity on the concept of “active power flow of less than 25% of the maximum import capability”, “at reference 1 pu voltage” as well as on the outcome of the joint analysis. It is proposed to greatly simplify the formulation of the article by keeping the need for DSO to be capable of not exporting reactive power in specific circumstances, low active power exchange and high penetration of decentralized generation. The article is made more clearly non-exhaustive (thresholds to be defined) and the need for the joint analysis focused	Additional reasonings: 1. With regard to: ENTSO-E: Amendment 22: The existing requirement, being uncleared, is implemented in very different ways in different Member States without that these differences could be monitored. This creates an unjustified distortion of the level playing field.	Cross references: With regard to: ENTSO-E: Amendment 22: Art.15.2 reactive power / DSO-TSO interface 25%: Article 43

	on the justification of the non-exhaustive values. Compliance verification is adapted accordingly: - The built points in Article 43.1 are harmonized with requirements in Article 15.2. - As article 15.2 applies to transmission-connected distribution systems, so is the article 43.		
Article 44			
Article 45			
Article 46			
Article 47			

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 provisions			

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TITLE V - Applications and derogations

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

	Amendment proposal	Reasoning	Relation to other provisions
Article 48			
Article 49			
Article 50			
Article 51			
Article 52			
Article 53			
Article 54			
Article 55			

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 provisions			

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TITLE VI - Non-binding guidance and monitoring of implementation

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

	Amendment proposal	Reasoning	Relation to other provisions
Article 56			
Article 57			

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 provisions			

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TITLE VII - Final provisions

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

	Amendment proposal	Reasoning	Relation to other provisions
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 provisions			

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ANNEX I

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

	Proposal for new articles in this section	Reasoning	Relation to other provisions
Amendments to Annex I	Aim of the proposal: 1. With regard to ENTSO-E Amendment 23: When a system split is occurring, frequency in the overfrequency island can transiently overshoot before it is stabilized to a lower value (a simulation plot is attached below). If, during that transient, all load 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 load during the transient and therefore prevents the island from blacking out. By this, it is increasing system resilience.	Additional reasonings: 1. With regard to ENTSO-E Amendment 23: 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: With regard to ENTSO-E Amendment 23: Annex I Extension of frequency range. Linked to Article 12, where the frequency ranges and time periods of this Annex are referred to.

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ANNEX II

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

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

Amendments to Annex II	Aim of the proposal: 1. With regard to ENTSO-E Amendment 18: NC's ranges go beyond the standards which is not cost-effective and could lead to non-harmonized control and knowledge of the capabilities. NC DC 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 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.	Additional reasonings: 1. With regard to ENTSO-E Amendment 18: If the amendment is not implemented, NC's ranges go 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	Cross references: With regard to ENTSO-E Amendment 18: Annex II Voltage ranges. Linked to Article 13(1), where the voltage ranges of this Annex are referred to. This Amendment is to be implemented also in RfG NC and HVDC NC.

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Other additional provisions

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

	Proposal for new provisions	Reasoning	Relation to other provisions
	Creation of new Title (before current Title III) ENTSO-E Amendment 24: Frequency-related requirements must account for the energy system which is transforming during the green transition. During large disturbances in the network, for example caused by the loss of one or several generation units, a large shortage of power will occur. This will result in a fast change of frequency (=high RoCoF). To prevent a total system collapse the automatic load shedding relays will disconnect a part of the load, causing a partial black-out of the system. This automatic activation of the Low Frequency Demand Disconnection (LFDD) is the last defence line to prevent a total black-out of the system. In the future, issues with existing LFDD-schemes are foreseen. Historically LFDD disconnects demand to restore frequency. Due to increased distributed generation and the location of LFDD-relays it is not certain that only demand is disconnected. Consequently the effectiveness of LFDD is expected		

	to be reduced. To prevent the triggering of LFDD and to account for a reduced effectiveness of LFDD a new limited frequency sensitive mode for various demand units (LFSM-UC) is introduced. Besides that it is important that the demand units remain connected to the grid on high RoCoF cases. LFSM-UC is a requirement that applies in emergency state according to SOGL for demand units that can support system frequency by limiting their actual demand in response to a drop in the frequency. Charging units for electro mobility, such as V1G, power-to-gas demand unit and temperature controlled devices that have an inherent thermal store, for example refrigeration, space heating/cooling, water heating/cooling and other heating /cooling device are usually technically capable to fulfil such a requirement without negative consequences for the grid user. More specifically LFSM-UC on Temperature Controlled Devices, for example, fridges, freezers, heat pumps, immersion heaters, is foreseen as a second last defence line before the Low Frequency Demand Disconnection (LFDD) will			

Other new provisions	be activated automatically. Depending on their point in the hysteresis cycle of heating or cooling of Temperature Controlled Devices, the device can be switched off within a specified range. The accumulated effect of switching a large number of Temperature Controlled Devices, will give a substantial reduction of load in the system. In this way, it should be able to prevent activating the LFDD and thus preventing large scale system black-outs. Due to the proportional nature of LFSM-UC, it is expected this demand will respond before the normal wide spread arbitrary demand disconnection of users occurs. The LFSM-UC on Temperature Controlled Devices makes use of the built in hysteresis of the Temperature Controlled Device. The hysteresis between the on and off temperature range of the device can be used to temporary delay the switch-on of the device or to temporary switch-off the device. The Temperature Controlled Devices on and off temperature range settings will not be exceeded by the LFSM-UC on Temperature Controlled Devices when responding to frequency	Additional reasonings: 1.With regard to: ENTSO-E Amendment 24: In case of rare but severe frequency events it can be expected that more stages of LFDD will be triggered and some consumers would be faced with complete blackouts. As the effectiveness of LFDD will be reduced in the future there is also an increased risk that the LFDD concepts are sufficient to prevent a system wide blackout in exceptional cases. During severe frequency events, especially on over-frequency case, the trip of large scale demand units would jeopardise system security.	Cross references: With regard to: ENTSO-E Amendment 24: New Needs - Limited Frequency Sensitive Mode – Underfrequency Consumption (LFSM-UC): Whereas, Article 1, Article 2, Article 3, Article 24, Article 25, New Title before title III (see new provision), Article 33, Article 34.

	deviations from the nominal frequency. The LFSM-UC on Temperature Controlled Devices will provide a response to deviations in Network frequency across a frequency range by corresponding changes to the Target Temperature in proportion of its maximum temperature range. The maximum change in Target Temperature will be at the widest when the system frequency is at the boundary of the system operating range defined by the Relevant TSO. The open and high-level functional requirement on LFSM-UC on Temperature Controlled Devices as given in the code allows for different possible technical solutions to implement the requirement. As such, it is not expected that this could result in a monopoly for an existing patented design as the sole means to comply with this provision. Further technical specifications on the implementation are expected to be given in collaborating standardization activities. This functional requirement shall be applicable to apply to all future installations of electricity demands which are intended to deliver a controlled temperature. The			

	identification of which devices will be fitted with LFSM-UC by default is expected be specified following an implementing measure of the Sustainable products initiative, including Ecodesign Directive. Consecutively, the LFSM-UC on Temperature Controlled Devices functionality is expected to be implemented by inclusion in relevant European Standards for electrical heating and cooling equipment and associated control systems. The systems shall be designed to have no noticeable or negligible effect on the primary use of the facility. The priority of the temperature-controlled devices shall, at all times, be to deliver the performance and comfort to a high quality level. This level shall be defined within the European Standards in accordance with the principle defined in this Network Code.		

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