

# ACER draft amendments to the Network Code on Requirements for Generators

Fields marked with \* are mandatory.

## Introduction

This consultation aims to present ACER's draft 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')**.

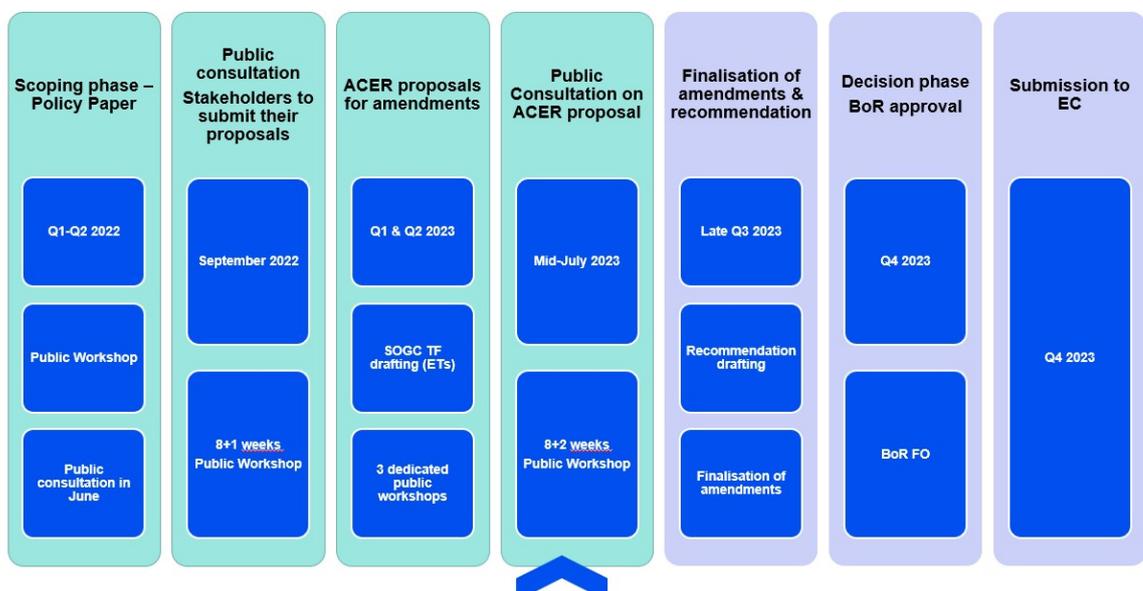
For draft amendments concerning Network Code on Demand Connection ('NC DC'), please go to the respective form: [NC DC](#).

**Responses to this consultation should be submitted by 25 September 2023.**

## Background

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 aimed to transparently indicate to stakeholders the key policy areas in which amendments were to be expected.

[Access the ACER Policy Paper on the revision of the NC RfG and NC DC.](#)

As a next step, ACER launched the Public Consultation to gather stakeholders' views and concrete amendment proposals regarding the GC NCs. The stakeholders could submit their inputs by 21 November 2022.

[Access the results of the Public Consultation on the amendments to the grid connection network codes.](#)

Additionally, in the preparation of the draft amendment proposals, ACER organised three dedicated public workshops, namely:

- [electromobility, power-to-gas demand units and heat-pumps](#) (held on 17 April 2023);
- [rate of change of frequency and grid forming capabilities](#) (held on 10 May 2023); and
- [electricity storage](#) (held on 11 May 2023).

After the evaluation of stakeholders' inputs, ACER has formulated its own proposal for the amendments of the GC NCs which is subject to this public consultation.

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## Stakeholder's details

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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:

ASOCIACIÓN EMPRESARIAL EÓLICA - AEE (Spanish Wind Energy Association)

\* Contact person:

[REDACTED]

\* Contact person's email address:

[REDACTED]

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

Spain

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\* 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:

Wind Energy Association, including developers and OEMs

\* 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)

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## Instructions

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Stakeholders are invited to submit their comments to the NC RfG articles amended by ACER in three mandatory steps:

1. by downloading the ACER draft amendments in the Word file provided below. The file can also be accessed on the right panel of the consultation form under the Background Documents;
2. by commenting on the ACER's draft amendments through this online consultation form and adding their alternative text proposals to the table, if any; and
3. by uploading the alternative amendment proposals to the **entire NC RfG** using the Track Changes mode in the ACER draft amendments file downloaded from **Step 1**.

Where the stakeholder does not have any comments regarding the amendments, the relevant cells in the consultation form can be left blank.

The mandatory steps for submitting the comments are listed below.

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### ***Step 1***

Please see ACER's draft amendments in the Word file provided below. The file can also be accessed on the right panel of the consultation form under the Background Documents.

## [Download ACER draft amendments to the NC RfG here](#)

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### *Step 2*

**Kindly note that this consultation form follows the structure of the NC RfG amended legal text provided by ACER in Step 1.**

The paragraph numbering in the form reflects paragraph numbers in the amended legal text. Nevertheless, stakeholders can comment on the deleted paragraphs/articles/titles, which are marked as [deleted]. New articles and titles are marked as [new].

Please use this form to comment on ACER draft amendments and/or to provide an alternative text proposal. The instructions are the following:

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below.

Includes new articles

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 1	1	2
Article 3		
Article 4		
Article 4a [new]		
Article 5		
Article 6		
Article 7		
Article 8		
Article 9		
Article 10		
Article 11		
Article 12		

Please write your amendment proposals, if any, in the table below.

	Text amendment proposal (if applicable)
New article	3

Please upload figures or tables if necessary

The maximum file size is 1 MB

Select file to upload 4

1. Leave comments on the ACER draft amendment proposals.
  2. Propose (if any) alternative wording of the relevant provision, as you provided in the Word file.
  3. Provide (if any) your proposals for adding new provisions to the relevant section of the NC RfG, as you provided in the Word file.
  4. Upload figures or tables if necessary; text inputs should be provided directly in the consultation form.
- 

### ***Step 3***

Where the stakeholder would like to propose an alternative amendment to the **entire NC RfG**, please upload the Word file (**downloaded from Step 1**) containing all your alternative amendment proposals in the Track Changes mode to the next **FILE UPLOAD** section and rename it with your stakeholder's name ("ACER\_draft\_RfG\_stakeholder\_name"). You can also upload your justification documents, where applicable.

**In case the file size exceeds the 1MB limit**, which is a consultation tool limit, kindly send the document to the functional mailbox shown on the right panel of the consultation form. Please rename the file with your stakeholder's name as indicated above and send it with the subject "ACER draft RfG legal text [stakeholder name]". Note that only submissions sent within the consultation deadline will be considered.

To facilitate the process, please, make sure that the **alternative text proposals provided in this consultation form are consistent**, to the extent possible, **with those in the Word file** you are uploading, taking into account the character limitations of each cell (max 5000 characters).

## **FILE UPLOAD**

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Please upload your file here

The maximum file size is 1 MB

Only files of the type pdf,doc,docx,odt,txt,rtf are allowed

**Kindly note that in case the file size exceeds 1MB, the file can be sent to the functional mailbox shown on the right panel of the consultation form under Contact. Please ensure that the file name and email subject are consistent with the instructions in Step 3.**

Please also upload any other document (i.e. **justifications**) below, if relevant.

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Due to the significant length of this survey:

- you have the possibility to edit your answer after submission. When clicking on "Submit" button, you will be given a Contribution ID which you can then use to access your answers and edit them, if necessary.
- 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

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Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Numbers in the first column correspond to the recitals of the amended version of NC RfG Whereas section, including new recitals

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
(1)		
(2)		
(3)		
(s1)		
(s2)		
(4)		
(5)		
(6)		
(7)		
(8)		
	<p>This NC RfG v2 does not cover hybrid renewables PPMs. Hybridation of different renewable technologies under the same PPM (e. g. a wind farm hibridised with PV modules and storage) is an important trend in most EU countries. This kind of hybrid solutions allow for an optimised use of existing grid infrastructures and grid access capacity, improving capacity factors, reducing the need of new investments in grid development. Thus, hybridation is a key driver for speeding up decarbonization and achieve renewable energy targets.</p> <p>Our alternative text amendment pursues that several power-generating units of different technologies could be collected to form an economic unit with a single connection point. To</p>	

(9)

take advantage of synergies between different renewable technologies and improved capacity factors, PPMs shall be assessed based on the (contractually) agreed maximum active power export capacity at their connection point, no matter what technologies and primary energy sources they are using inside the PPM.

...” should not be aggregated for the purpose of the determination of significance...” This last statement goes against the inherent possibility of design strategy optimization of the "hybridation" of technologies (possible synergies and cost reduction in the design of each individual power generating plant that compose the "hybridation"). We propose to eliminate the complete phrase: “Moreover, to ensure an appropriate harmonisation or rules for mass-market products, capacities of units of different classes, for instance, photovoltaic, electricity storage, combined heat and power installations, or V2G electric vehicles, should not be aggregated for the purpose of the determination of significance”

The meaning of this paragraph is not clear and difficult to interpret: "Electricity storage integrated to a power-generating module, where module is either non-synchronously connected to the network or connected through power electronics, used solely for the purpose of

Non-synchronously connected power-generating units of the same any underlying technology and any primary energy source, where they are collected together to form an economic unit towards the RSO and where they have a single connection point to the RSO, shall be assessed based on the agreed maximum continuous active power export capacity at the point of connection, irrespective of their installed aggregated capacity.

Electricity storage integrated to a power-generating module, where module is either non-synchronously connected to the network or connected through power electronics, used solely for the purpose of meeting the requirements of this Regulation should be considered as part of such power generating module while its maximum capacity (P<sub>max</sub> ESM) shall not count towards the power-generating module capacity for the determination of significance.

	meeting the requirements of this Regulation should be considered as part of such module while its capacity should not count towards the power-generating module capacity	
(10)		
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	Requiring all new PPMs to provide the full scope of "appropriate grid-forming and rate-of-change-of-frequency withstand requirements" is probably the costliest way to enforce them. Especially all DSO connected PPMs are not	

(\*\*)

currently allowed to work as grid forming plants for system security reasons, based on the DSO request. Therefore, both technology grid following and grid forming shall be kept.

The regulator shall make a CBA and decide differentiated, which system need is better satisfied through mandatory requirements (must-have & must-delivered) and which ones shall be ensured as ancillary services (delivered through market based conditions).

Using RES as primary source doesn't mean a plant has no inherent capability to resist frequency deviations. One example are hydro power plants using typically synchronous generators.

Even plants without inherent capabilities that use power electronics, may have certain capabilities programmed into their systems, some easier, others with more effort and cost.

Forcing converter-based PPMs to comply with grid-forming as an exhaustive general requirement can become very expensive. However, enabling some specific capabilities, such as a high rate-of-change-of-frequency withstand capability, can be much easier and usually less expensive.

Moreover, grid forming has not even been defined in this RfG amendment proposal. The grid forming technology has not yet been adequately tested in high scale installations.

Rapidly increasing penetration of dispersed generation and converted-based technologies into European networks has presented new challenges in ensuring overall system security. To the extent that an adequate contribution to the dynamically transforming system depends partly on advanced capabilities, power-generating modules should be able to support the system robustness by fulfilling appropriate grid-forming and rate-of-change-of-frequency withstand requirements.

The regulator shall consider if such advanced capabilities are to be provided as in accordance with mandatory requirements, or if some of these shall be provided as ancillary services according to EU directive 2019/944 of 5 June 2019. Those capabilities to be provided as in accordance with mandatory requirements shall be supported by a full, publicly consulted cost-benefit analysis.

	<p>Because of all the above reasons, grid forming capabilities should not be introduced by any means as an exhaustive mandatory requirement. They should be implemented case by case by each TSO / DSO, depending on their specific needs, and once the concept of grid forming has been defined adequately and harmonized at European level.</p>	
(26)		
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Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New recital	

## Definitions (Article 2)

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Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Includes new definitions

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
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(10a)		
Article 2(11)		
Article 2(12)		
Article 2(13)		
Article 2(14)		
Article 2(15)		
	<p>This alternative text is proposed with two objectives:</p> <ol style="list-style-type: none"> <li>To avoid misinterpretations of the definition of Pmax, in those cases where some units of a PGM may be disabled or unavailable. In those cases, Pmax should be referred to the maximum power of the available units. If units within the PGM are temporarily unavailable, Pmax' is reduced accordingly during that time. Many ramp rate and maximum capability</li> </ol>	

Article 2(16)

requirements refer to Pmax, and are impossible to achieve if some units of the PGM are unavailable.

We propose that this RfG amendment introduces similar clarifications in every requirement as some countries have already done in their national regulations. For example, in the Spanish network codes regulation (Orden TED 749/2020), the requirements referred to Pmax only apply to the available units and to the available primary wind resource:

EXAMPLE: ORDEN TED 749/2020, section 2.3.2.1.b) Capacidad de potencia reactiva por debajo de la capacidad máxima ( $P < P_{max}$ ). “En esta situación, los módulos de parque eléctrico deberán ser capaces de suministrar potencia reactiva en cualquier punto de funcionamiento dentro del perfil P-Q/Pmax establecido en la figura 11, siempre que todas las unidades del módulo de parque eléctrico que generan energía estén técnicamente disponibles, es decir, que no estén fuera de servicio debido a mantenimiento o avería. En caso contrario, el gestor de red pertinente en coordinación con el operador del sistema admitirá una menor capacidad de potencia reactiva, teniendo en cuenta las unidades disponibles.”

2. To avoid penalizing those PGM that include storage or hybrid configurations based on several different technologies (i.e. wind + solar pv).

In this sense, a new (16a) is proposed to take consideration of typical hybrid PPMs (e.g. wind+BESS), where the addition of storage do

‘maximum capacity’ or ‘Pmax’ means the maximum continuous active power which a power-generating module can export while all units are available, less any demand or losses associated solely with facilitating the operation of that power-generating module as specified in the connection agreement or as agreed between the relevant system operator and the power-generating facility owner, or determined by other appropriate means, where an agreement is not required and which may differ from the aggregated installed capacity of a power-generating module.

	<p>not modify the original agreed maximum export capacity of the PPM. If the PPM owner intends to use the storage capacity as additional generation to that of the PPM, then a new connection agreement needs to be agreed with the relevant TSO/RSO.</p> <p>Again, it is worth mentioning that these types of generation facilities are being developed and getting connected as of today in some Member States, for instance in Spain.</p>	
Article 2(17)	<p>Clarification to ensure that different technologies and storage can be aggregated to a PPM (e.g., but not limited to a combination of WTGs, PV inverters and BESS), in similar ways as the aggregation of gas turbines and steam turbines in a CCGT power plant.</p>	<p>'power park module' or 'PPM' means a unit or ensemble of units, that can export electrical energy by different technologies or, if applicable, additionally store electrical energy by different technologies, which is not a synchronous power-generating module and which is either non-synchronously connected to the network or connected through power electronics, and that also has a single connection point to a transmission system, distribution system including closed distribution system or HVDC system, and if they have a coordinated control to behave as single plant.</p>
Article 2(18)		
Article 2(19)		
Article 2(20)		
Article 2(21)		

Article 2(22)	<p>The present text is not precise enough and looks only at 50Hz. A general definition of the term "frequency" is needed, since the RfG2.0 text also addresses phenomena in the frequency range 0.2Hz up to 9kHz.</p> <p>In the interest of system stability, it is not acceptable that a key electrical value like the frequency remains with such a blurry "definition".</p> <ol style="list-style-type: none"> <li>1. Frequency cannot be measured; it is always calculated based on measurable physical quantities. Depending on what is measured over what time, and how this is eventually filtered, different values will result for the frequency.</li> <li>2. In the interest of system stability, it is key that the way how frequency is calculated based on measured values is harmonized across a synchronous area. Therefore, the proposal to use by default the 200ms gliding window.</li> <li>3. However, at least for the requirements about RoCoF, Grid Forming and (synthetic) inertia it is crucial to have the possibility to define frequency for a much shorter time interval (e.g., 20ms) in a meaningful way.</li> </ol>	<p>Eliminate "'frequency' means the electric frequency of the system expressed in hertz that can be measured in all parts of the synchronous area under the assumption of a consistent value for the system in the time frame of seconds, with only minor differences between different measurement locations. Its nominal value is 50Hz; "</p> <p>Add:  'frequency' means the inverse of the period of a periodic electrical quantity. It is calculated on the basis of measurable electrical quantities such as current or voltage. The fundamental frequency of the periodic electrical quantity is decisive for the generation, transport and use of electrical energy. Its nominal value is 50 Hz.</p> <p>The fundamental frequency is to be determined over a gliding time window of not more than 200ms.</p> <p>For any frequency-related requirements about grid forming, synthetic inertia and fast-fault-current injections the relevant TSO shall be publish a specific definition of 'frequency' in accordance with applicable IGDs, which suits the sub-cycle character of these phenomena.</p>
Article 2(23)		
Article 2(24)		
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Article 2(64)		
Article 2(65)		
Article 2(66)		
Article 2(67)	Complementing the proposed language changes for the definitions of Pmax and PPMs in Art. 2, (16) and (17)	'electricity storage module' or 'ESM' means a synchronous power-generating module or a power park module which can inject and consume active power to and from the network for electricity storage, excluding pump-storage power-generating modules. A V2G electric vehicle and associated V2G electric vehicle supply equipment with a bidirectional functionality is regarded as an electricity storage module. Electricity storage integrated to a power-generating module should be considered as part of such module while its capacity should not count towards the power-generating module capacity, unless the connection agreement is modified by the PGFO (Power generator facility owner);
Article 2(68)		
Article 2(69)		
Article 2(70)		
Article 2(71)		
Article 2(72)		

Article 2(73)		
Article 2(74)		
Article 2(75)		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
<p>New definition</p>	<p>Article 2 (76)  'generic model' means a model for the simulation of the electrical performance of a component, based on a generic structure and software modules (e.g. protection and control systems), which may deviate from specific manufacturer system. The models shall easily be parameterized to represent a manufacturer specific system but taking into account generic model has less accuracy than user-written model.</p> <p>Article 2 (77)  'user-written model' means a model made by the manufacturer for the simulation of the electrical performance of a component, based on the algorithms and parameterization used in the component. It reflects the electrical behaviour more accurately than a generic model.</p> <p>Article 2 (78)  'Inherent energy storage' means an amount of energy, expressed in MWs or MWh, available in physical components of a PPM, which can be used as determined by the power-generating facility owner, without effecting the design of the physical components of individual units;</p> <p>Comment: In Art Y is written already 'Inherent energy storage' means ..."  However, any definition should be introduced into the Art 2 Definitions.  The way the definition is written so far in Art Y is open to mis-interpretations and thus is arbitrary. For example, if the rotational energy of a wind turbine, or the DC capacity in a unit, can be used to provide capabilities like grid forming and/or synthetic inertia, can't be up to the TSO or RSO. Solely the manufacturer can tell if a usage will affect the design, or lifetime, or stability, or any other relevant aspect of a generating unit.</p> <p>Article 2 (79)  "grid-forming" means.....</p> <p>Comment: There is a need for a common, solid, unarguable definition of what grid-forming is, and the capabilities it encompasses, so that said</p>

definition shall be adapted in all Member States. The potential co-existence of different definitions of grid-forming is against the development and certification of standardised mass-market products, thus impacting in costs and technical complexities.

Please upload figures or tables if necessary

The maximum file size is 1 MB

## TITLE I - General provisions

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Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the

Includes new articles

	Comment on the ACER draft amendments	Alt
Article 1		
Article 3		
Article 4		
Article 4a [new]	<p>4a.2.(a)                      The minimum percentage value of 5% is too low, and typically would include all minor operational optimisation to improve energy yield. It is hard to imagine that an additional 5%, 10%,... maximum capacity would result in a significant cross-border impact on frequency and voltage stability.</p> <p>Some Member States have already defined this threshold during the national implementation of Regulation (UE) 2016/631. In Spain, for instance, the percentage of power increase has been defined as more than 20%. Therefore, the threshold defined in this amended NC should be closer to this value and not much lower than this.</p> <p>Elimination of 4a.2.(b) and 4a.2.(c):                      The inclusion of (b) and (c) of the original text will potentially hamper any possibility to improve technical capabilities of existing, old PPMs:</p> <ul style="list-style-type: none"> <li>• Installing external compensation solutions (e.g. a STATCOM at the PPM substation) to allow /or to enhance participation of a PPM in ancillary services such as voltage control.</li> <li>• Improving active power management capabilities (e.g. enabling active power control by blade-pitching or advance PPC function) to allow participation in ancillary services such as secondary frequency control.</li> </ul> <p>In some countries as Spain, additional reactive power capabilities will be object soon of a new ancillary service market. It is not necessary to limit modernizations in reactive power capability to a minimum percentage.</p> <p>If doing this means that the existing, old PPMs needs to comply with the new requirements (e.g. being grid-forming capable, RoCoF,...), PPM owners will regrettably discard participating in these markets, and TSOs will loss a significant number of potential ancillary service providers</p>	

	<p>already connected in their grids.</p> <p>In addition, deployment of hybrid power plants will be also impacted since a new PPM forming a hybrid installation with an existing PPM, subsequently changes the capabilities of the existing PPM.</p> <p>Modification of 4a.2.(d): This criterion has been already well defined by some Member States. In Spain, for instance, significant modernisation has been defined as change of the main generating plant in a percentage higher than 70% of the installed capacity, as per Royal Decree RD 647/2020. This same RD provides a clear definition for main generating plant according to the specific technology components of SPMG and PPM (wind and PV).</p> <p>The NC shall take this as relevant reference and procure some degree of harmonisation in Member States.</p>	<p>4a. 2. tak (a) cap wh mo mo del ran diff cor</p> <p>Eli</p> <p>Mo (d) get in a For ma a) l mo mo b) l ass get on mo • turl get be tow • inv pla dire of t</p>
Article 5		
Article 6		

Article 7	<p>We propose to change “and” instead of “or” because the requirements of general application and the methodology for calculation are not replaceable with each other. Moreover, it is essential that together with the requirements and the methodology, the TSO shall also submit a validation scheme for its implementation.</p> <p>Otherwise, new approved requirements cannot be validated, nor certified in those countries where certification is mandatory.</p> <p>In addition, two years seem to be a very short time for TSO to submit the proposal, taking into account that national implementation processes take a lot of time and effort, stakeholder involvement and deep analysis of particular system’s needs.</p> <p>These amendment proposals tries to avoid previously experienced problems and delays in the implementation of RfGv1 in countries like Spain, where NC came into force in 2020 but before having defined the validation scheme for certification.</p>	4. sut ap cal val des int
Article 8		
Article 9		
Article 10		
Article 11		
Article 12		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New article	

Please upload figures or tables if necessary

The maximum file size is 1 MB

## TITLE II CHAPTER 1 - General Requirements

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**General requirements for type A power-generating modules**

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Includes new paragraphs

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 13(1)		
Article 13(2)		
Article 13(3)	<p>(g) figure XX should be clearer. The Y axis should mention “<math>\Delta P</math>” instead of “value” and the initial value should be 0% of <math>\Delta P</math>. The initial time should be also referred to a step in frequency.</p> <p>See example of the IEC 61400-21-1 2019:</p> <p>Tid is not clearly defined: when should we consider that the active power starts to decrease /increase?</p>	
Article 13(4)		
Article 13(5)		
Article 13(6)		
Article 13(7)		
Article 13(8)	<p>In the case of PPM, the technical capability to connect to the network depends on the availability of primary resource.</p> <p>The concept "Observation time" shall be defined.</p>	<p>8. The technical capability of the power-generating module to connect to the network, taking into consideration the availability of primary resource, shall be as follows:</p> <p>(a) Voltage range at the grid connection point: within the voltage range that is defined for unlimited time operation if so applicable;</p> <p>(b) Frequency range of <math>47.5 \text{ Hz} \leq f \leq 51 \text{ Hz}</math>;</p> <p>(c) Adjustable observation time: from 0 to 300 s;</p>

Article 13(9)	<p>In the case of PPM, the technical capability of autonomous connection depends on the availability of primary resource.</p> <p>The concept "Observation time" shall be defined.</p>	<p>9. Within the capability defined in paragraph (7), the default settings for an autonomous connection taking into consideration the availability of primary resource, shall be as follows:</p> <p>(a) Voltage range: <math>0.9 \text{ pu} \leq U \leq 1.1 \text{ pu}</math>;</p> <p>(b) Frequency range:  — Continental Europe: <math>47.5 \text{ Hz} \leq f \leq 50.1 \text{ Hz}</math>  — Other synchronous areas <math>47.5 \text{ Hz} \leq f \leq 50.5 \text{ Hz}</math></p> <p>(c) Minimum observation time: 60 s;</p>
Article 13(10)	<p>It must be clarified that a PPM contributes to maintain the voltage level within its setpoint, but is not solely responsible to achieve it. For this, it supplies or absorbs reactive power proportionately to the grid voltage deviation. This reactive power shall always be within the P-Q capability chart which is already defined in Article 15. This must be clarified to avoid misinterpretations that reactive power capability beyond the requirement of Article 15 can be required.</p> <p>Any additional reactive power capability beyond Article 15 shall be always procured through market-based ancillary services.</p>	<p>10. The power generating module shall be equipped with voltage control that can contribute to constant terminal voltage when generating power at a selectable setpoint without instability over the entire operating range of the power-generating module. The relevant system operator shall have the right to specify the capability of a power-generating module to supply or absorb reactive power both when importing or exporting active power with P-Q capability chart to be defined by the relevant system operator with boundaries not wider than Article 15, Figure 9</p>
Article 13(11)		
Article 13(12)		
Article 13(13)		
Article 13(14)		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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**[NEW] General requirements for type EV1 and EV2 V2G electric vehicles and associated V2G electric vehicle supply equipment**

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 13a(1)		
Article 13a(2)		
Article 13a(3)		
Article 13a(4)		
Article 13a(5)		
Article 13a(6)		
Article 13a(7)		
Article 13a(8)		
Article 13a(9)		
Article 13a(10)		
Article 13a(11)		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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**General requirements for type B power-generating modules**

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 14(1)		
Article 14(2)[deleted]		
Article 14(2)		
Article 14(3)	<p>In some countries like Spain, there are connection points where multiple PGMs/PPMs are connected sharing electrical infrastructure and commonly through long HV/MV connection lines up to the grid interface with the TSO/RSO. Therefore, in these cases it is not possible to comply with this requirement. There shall be an exception on this kind of connection configurations, where the specific connection point (and verification of compliance point) of the PGMs/PPMs is agreed by the owner and the TSO/RSO (usually the HV side of the PPM main step-up transformer).</p> <p>An example of a typical shared connection point by several PGMs/PPMs can be seen in the following figure:</p>	<p>(c) The power-generating module shall be capable of operating stably without disconnecting from the network, if none of the phase-to-phase voltages exceeds the voltage-against-time-profile defined in Figure X at the agreed connection point.</p>
Article 14(4)	<p>All connection agreements of PGMs/PPMs shall clearly define said minimum short-circuit level. It is not the case in all Member States.</p>	<p>(c) in case of change in the network leading to the minimum short-circuit level as defined in the connection agreement the PGM shall be able to ensure robustness to its control system.</p> <p>Minimum short-circuit level shall be clearly specified by the TSO/RSO in the connection agreement.</p>

Article 14(5)	Metering device and communication link shall be defined	d(ii) power-generating facilities shall be capable of exchanging real time data for metering with the relevant system operator or the relevant TSO.
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Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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**[NEW] Requirements for type EV3 electric vehicles and associated V2G electric vehicle supply equipment and V2G electrical charging parks**

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 14a(1)		
Article 14a(2)		
Article 14a(3)		
Article 14a(4)		
Article 14a(5)		
Article 14a(6)		
Article 14a(7)		
Article 14a(8)		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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### General requirements for type C power-generating modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 15(1)		
Article 15(2)		
Article 15(3)[deleted]		
Article 15(3)		
Article 15(4)		
Article 15(5)		<p>(i) at the request of the relevant system operator or the relevant TSO, the power-generating facility owner shall provide simulation models which properly reflect the behaviour of the power-generating module for the relevant study purpose in both steady-state and dynamic simulations (root mean square) or in electromagnetic transient simulations. The simulation model requirements and data provided shall not violate manufactures intellectual property.</p> <p>The power-generating facility owner shall ensure that the models provided have been verified against the results of compliance tests referred to in Chapters 2, 3 and 4 of Title IV, and shall notify the results of the verification to the relevant system operator or relevant TSO. The TSO shall define, subject to public consultation and approval of relevant stakeholders, the verification standards and acceptance criteria considering state-of-the-art international standards. Member States may require that such verification be carried out by an authorised certifier;</p>

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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## General requirements for type D power-generating modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 16(1)		
Article 16(2)		
Article 16(3)		
Article 16(4)		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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

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**[NEW]** Requirements for type A synchronous power-generating modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article X		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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## Requirements for type B synchronous power-generating modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 17(1)		
Article 17(2)		
Article 17(3)		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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### Requirements for type C synchronous power-generating modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 18(1)		
Article 18(2)		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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### Requirements for type D synchronous power-generating modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Includes new paragraphs

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 19(1)		
Article 19(2)		
Article 19(3)		
Article 19(4)		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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## TITLE II CHAPTER 3 - Requirements for power park modules

---

**[NEW]** Requirements for type A power park modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article Y(1)		
Article Y(2)		
Article Y(3)		
Article Y(4)		
Article Y(5)	<p>It must be acknowledged that despite recent advances, grid-forming technology in large-scale installation is not yet adequately tested, and its requirement and capabilities are not yet properly and fully modelled and demonstrated by the relevant stakeholders. Therefore, at this point a specific process must be designed to define under which circumstances the TSO may require grid forming capabilities. And it shall be considered that grid forming capabilities cannot be provided by all standard PPM, and shall be choose depending on each specific grid node needs.</p> <p>Prior to start considering large-scale applications with grid-forming capable PPMs, the technical requirements/specification shall be exhaustively defined (starting from a much needed common, solid, unarguable definition of grid-forming), and the technology derived from those technical requirements/specifications shall be thoroughly tested via demonstration project and sandboxes.</p> <p>Without this, it cannot be considered as a valid, certified mass-market product available in the next few years. In this respect, Acciona Energia</p>	<p>5. With regard to grid forming capability, the relevant TSO in coordination with the relevant system operator shall technically justify that power park modules shall be capable of providing grid forming capability at the connection point.</p>

	<p>urges ACER to take particularly consideration to the feedback provided by the European associations (WindEurope, SolarPower Europe) and other national associations (e.g. the Spanish AEE) in this matter, as it includes the opinions of the sector and particularly that from OEMs of future grid-forming products.</p> <p>In the meantime, both grid-following and grid-forming shall be equally recognised as valid generation technologies for non-synchronous PGMs</p>	
Article Y(6)	<p>It seems a short time to implement a mandatory requirement as Grid Forming because it is not yet a mature development.</p> <p>Grid Forming requirements are not yet exhaustively defined and therefore not properly modelled and tested for a large scale deployment. State of the art is not yet mature. RfG 2.0 should not eliminate grid following technologies until Grid Forming is demonstrated by stakeholders (industry, TSO/RSO, Academia, etc).</p>	Y.6(b) The power-generating facility owner has concluded a final binding contract for the purchase of the main generating plant by three years after the entry into force of the Regulation
Article Y(7)		
	<p>Article Y(8a):</p> <p>To align with the text proposal for Article Y(5). The justification provided in Article Y(5) applies here also.</p> <p>It shall be considered that if the conditions of the PPM change and there is no primary resource, the capabilities of such PPM could significantly change.</p>	

Article Y(8)

In addition, the term “individual unit” is not defined in the document. The proposal is based on the fact that grid forming capability can be provided either by the PPM itself or by dedicated storage modules within the PPM.

Please consider for that definition that hybrid multi-technology plants (Wind + Solar+Bess+H2) are being developed in most member countries.

Requesting grid forming for the entire plant may lead to local instabilities. It could be cases that only a percentage of the plant in grid forming mode would be sufficient. This shall be technically justified by the TSO.

Elimination of Article Y(8c):

To be deleted. Different parameters shall be carefully analyzed to check the affection to stability.

Elimination of Article Y(8d):

It is unclear if the required activation /deactivation must be performed in real-time, offline, at commissioning, etc. This switching in operating mode may lead to important loss of production and should be limited in number. Also, it could lead to having a dual functionality (grid-following + grid forming) in a same product, and the need to perform a duplicate testing and certification of the PPM and its components. It may have a significant impact in over-costs for OEMs and ultimately to PPM owners.

Article Y(8a):

8. If technically justified by the relevant TSO in accordance to Article Y(5), a power park module shall be capable of providing grid forming capability at the connection point if the primary resource is available as listed below.

(a) Within the power park module’s current and energy limits, the power park module shall be capable of behaving as a voltage source behind an internal impedance (Thevenin source), during normal operating conditions (non-disturbed grid conditions) and upon inception of a grid disturbance (including voltage, frequency and voltage phase angle disturbance). The Thevenin source is characterized by its internal voltage amplitude, voltage phase angle, frequency and internal impedance.

Eliminate Article Y(8c)

Eliminate Article Y(8d)

	It shall be carefully analysed and defined prior to set it as a technical requirement.	
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Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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### Requirements for type B power park modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Includes new paragraphs

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 20(1)	<p>To align with the text proposal for Article Y(5). The justification provided in Article Y(5) applies here also.</p> <p>Both grid forming and grid following technologies shall be kept.</p>	<p>1. Type B power park modules shall fulfil the requirements laid down in Article 13, Article 14, and Article Y(5), (6), (7) and (8), except for Article 13(2)(b) and Article 13(8). Requirement laid down in Article Y(8)(d) shall not apply to power park modules with maximum capacity larger than or equal to 10 MW.</p>
Article 20(2)	<p>Articles 20.2.b and 20.2.c from Regulation (UE) 2016/631 have to be maintained to cover grid following PPMs.</p> <p>It must be acknowledged that despite recent advances, grid-forming requirement and capabilities are not yet properly and fully modelled and demonstrated by the relevant stakeholders. Until then, grid following product will remain in the market, being an important generation technology.</p>	<p>Articles 20.2.b and 20.2.c: requirements on fast fault current must be kept</p>
Article 20(3)		
Article 20(4)	<p>To align with the text proposal for Article Y(5). The justification provided in Article Y(5) applies here also.</p>	<p>4. With regard to grid forming capability, if technically justified by the relevant TSO in accordance to Article Y(5), type B power park modules shall fulfil the following additional requirements in relation to grid forming capability:</p>

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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### Requirements for type C power park modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Includes new paragraphs

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 21(1)	<p>To align with the text proposal for Article Y(5). The justification provided in Article Y(5) applies here also.</p> <p>Both grid forming and grid following technologies shall be kept.</p>	<p>1. Type C power park modules shall fulfil the requirements listed in Article 13, Article 14, Article 15, Article Y(5), (6), and (8) and Article 20, except for Article 13(2)(b) Article 13(6) and Article 13(8) and Article 20(2)(a), unless referred to otherwise in point (v) of paragraph 3(d).</p>
Article 21(2) [deleted]	<p>Original Article 21.2 from Regulation (UE) 2016/631 has to be maintained to cover grid following PPMs.</p> <p>It must be acknowledged that despite recent advances, grid-forming requirement and capabilities are not yet properly and fully modelled and demonstrated by the relevant stakeholders. Until then, grid following product will remain in the market and being an important generation technology.</p>	<p>2. Type C power park modules shall fulfil the following additional requirements in relation to frequency stability:</p> <p>(a) the relevant TSO shall have the right to specify that power park modules be capable of providing synthetic inertia during very fast frequency deviations;</p> <p>(b) the operating principle of control systems installed to provide synthetic inertia and the associated performance parameters shall be specified by the relevant TSO.</p>
	<p>In Spain for instance, the national legislation since Royal Decree 2818/1998 (later superseded by RD 436/2004 and RD 661/2007) imposes obligation for a PPM owner to share its electrical infrastructure (up to the point of connection) with other owners whose PPM connect to the same point of connection. Hence, forming a shared connection grid.</p> <p>Said shared connection grids have existed for +20 years in Spain, and over these years neither the</p>	

<p>Article 21(2)</p>	<p>relevant authorities nor the TSO/RSO, at the time of authorising the connection of PPMs via a shared connection grid, have never impose any requirement for supplementary reactive power.</p> <p>If this requirement is not delimited, for existing PPMs in one of this shared connection grids means a retroactive application of NC requirements and co-financing the grid connection costs of new PPM connected to the same shared connection grids. If apply to new PPMs only, a new PPM would bear over-costs derived from the need to over-compensate electrical infrastructure beyond what is needed for the evacuation of its maximum capacity.</p> <p>In consequence, under these circumstances, it shall be the TSO/RSO responsible for procuring the supplementary reactive power to compensate the reactive power demand of said shared connection grids and their evolution over the time. To this end, the TSO/RSO shall make use of reinforcements via grid planning, use existing compensation equipment of their own or procure reactive power ancillary services (remunerated) by PPMs within said shared connection grid.</p>	<p>a) with regard to reactive power capability, the relevant system operator may specify supplementary reactive power to be provided if the connection point of a power park module is neither located at the high-voltage terminals of the step-up transformer to the voltage level of the connection point nor at the convertor terminals, if no step-up transformer exists. This supplementary reactive power shall compensate the reactive power demand of the high-voltage line or cable between the high-voltage terminals of the step-up transformer of the power park module or its convertor terminals, if no step-up transformer exists, and the connection point and shall be provided by the responsible owner of that line or cable.</p> <p>This requirement is not applicable in those cases where the national legislation imposes obligations for several power park modules, even when they are from different owners, to use and share the same electrical infrastructure up to the point of connection, and additional supplementary reactive power has not been requested by the relevant Authority when authorizing this shared use.</p>
<p>Article 21(3)</p>		
<p>Article 21(4)</p>	<p>To align with the text proposal for Article Y(5). The justification provided in Article Y(5) applies here also.</p> <p>Both grid forming and grid following technologies shall be kept.</p>	<p>4. With regard to grid forming capability, if technically justified by the relevant TSO in accordance to Article Y(5), type C power park modules shall fulfil the following additional requirements in relation to grid forming capability:</p>

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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## Requirements for type D power park modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Includes new paragraphs

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 22(1)	To align with the text proposal for Article Y(5). The justification provided in Article Y(5) applies here also.	Type D power park modules shall fulfil the requirements listed in Article 13, Article 14, Article 15, Article Y(5), (6) and (8), Article 20, and Article 21, except for Article 13(2)(b), Article 13(6), Article 13(7), Article 13(8), Article 15(3), Article Y(8)(d) and Article 20(2)(a).
Article 22(2)	Oscillations damping control is not yet a standard control for all type of PPM. It should remain a voluntary requirement or an agreement between the PPM owner and the relevant TSO.	With regard to power oscillations damping control, if specified by the relevant TSO, type D power park modules shall have a power oscillation damping function which helps to attenuate the power oscillations through the control of the active power, reactive power, or both.....”

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New provision	

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## TITLE II CHAPTER 4 - Requirements for offshore power park modules

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 23		
Article 24		
Article 25		
Article 26		
Article 27		
Article 28		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New article	

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## TITLE III - Operational notification procedure for connection

Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Includes new articles

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 29		
Article 30		
Article 30a [new]		
Article 30b [new]		
Article 31		
Article 32		
Article 33		
Article 34		
Article 35		
Article 36		
Article 37		
Article 38		
Article 39		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New article	

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## TITLE IV - Compliance

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Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 40		
Article 41		
Article 42		
Article 43		
Article 44		
Article 45		
Article 46		
Article 47		
Article 48		
Article 49		
Article 50		
Article 51		
Article 52		
Article 53		
Article 54		
Article 55		
Article 56		
Article 57		
Article 58		
Article 59		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New article	

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## TITLE V - Derogations

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Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 60		
Article 61		
Article 62		
Article 63		
Article 64		
Article 65		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New article	

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## **[DELETED]** TITLE VI - Transitional arrangements for emerging technologies

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Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Title VI [deleted]		



Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 70a [new]		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New article	

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## TITLE VII - Final provisions

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Please write your comments on the ACER draft amendments and your alternative text proposals, if any, in the table below

Includes new articles

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 71		
Article 71a [new]		
Article 72		

Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
New article	

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## Other additional provisions

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Please write your amendment proposals, if any, in the table below

	Text amendment proposal (if applicable)
Other new provisions	

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## Background Documents

[NC\\_RfG\\_ACER\\_draft\\_amendments\\_for\\_PC\\_2023\\_E\\_07.docx](#)

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