

ACER draft amendments to the Network Code on HVDC

Fields marked with * are mandatory.

Introduction

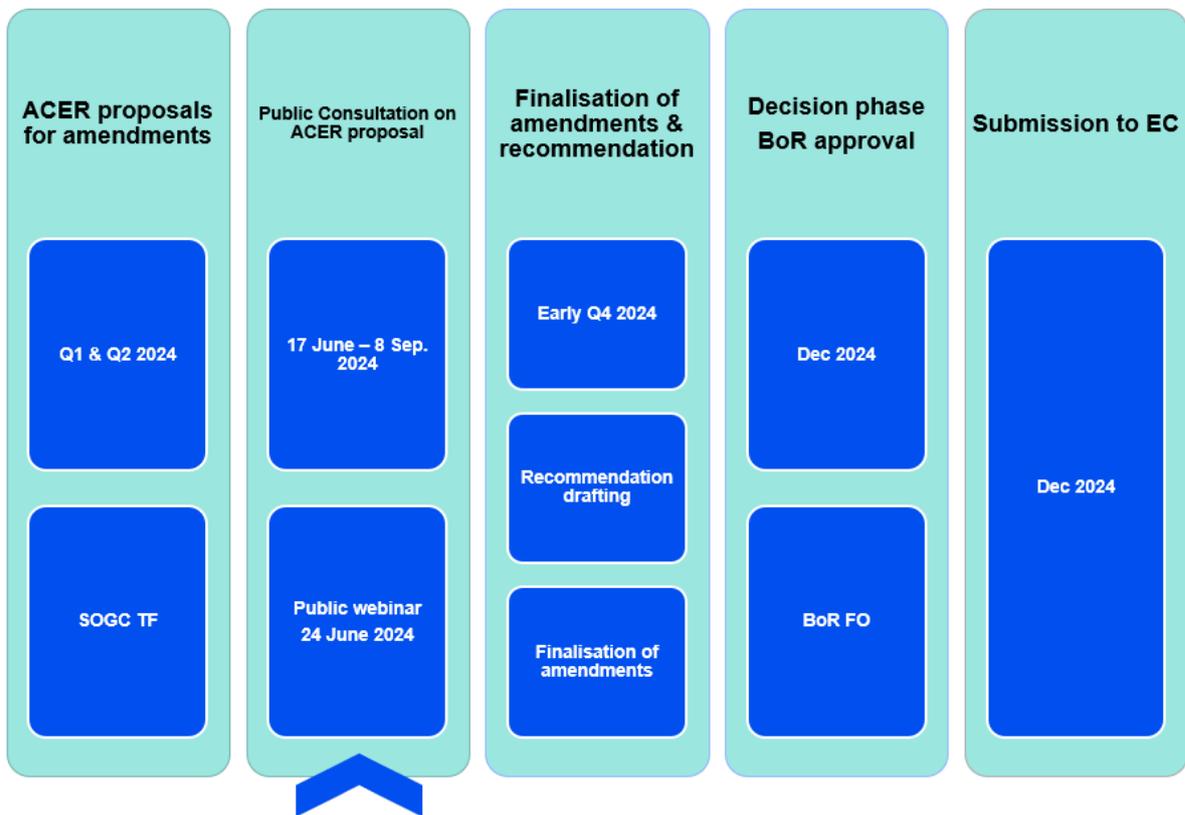
This consultation aims at presenting ACER's draft amendments to the **Commission Regulation (EU) 2016 /1447 of 26 August 2016 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules ('NC HVDC')**.

Responses to this consultation should be submitted by 8 September 2024.

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 to the NC HVDC, as presented to the GC ESC is outlined in the Figure below:



In the context of [the ongoing revisions of the European grid connection network codes](#), ACER will consult with stakeholders to collect views on ACER's concrete amendment proposals to the network code on grid connection requirements for high voltage direct current systems and related power park modules ([NC HVDC](#)).

The revisions to the NC HVDC aim to:

- Enhance the existing grid connection regulatory framework.
- Align the code with the [ACER Recommendation](#) on reasoned proposals for amendments to the network codes on requirements for grid connection of generators and on demand connection.
- Ensure the interconnected system is adapted to emerging trends, such as the increasing generation capacity of offshore networks (AC hubs) and the connection of new system users (storage, demand facilities, including power-to-gas demand units).

Stakeholder's details

ACER is highly committed in processing personal data in a lawful way.

Find out more how we process your data: <https://www.acer.europa.eu/the-agency/about-acer/data-protection>

* Name of the stakeholder:

National Grid Electricity System Operator - Great Britain

* Contact person:

* Contact person's email address:

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

Please, specify the country:

* 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)

Instructions

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

1. download the ACER draft amendments in the Word file provided below. The file could also be accessed on the right panel of the consultation form under the Background Documents;

2. comment on the ACER's draft amendments through this online consultation form and adding your alternative text proposals to the table, if any; and
3. uploading the alternative amendment proposals to the **entire NC HVDC** document 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.

Step 1

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

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

Step 2

Kindly note that this consultation form follows the structure of the NC HVDC 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 5	//	//
Article 6	//	//
Article 7	//	//
Article 8	//	//
Article 9	//	//
Article 10	//	//

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(s) 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 HVDC, 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 HVDC**, 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_HVDC_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 HVDC 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

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

193414fe-b81b-401f-a6f3-4f541a3c431c/HVDC_2.0_Consultation_AJ270824_V3.docx

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.

Please upload your file

The maximum file size is 1 MB

Please upload your file

The maximum file size is 1 MB

Please upload your file

The maximum file size is 1 MB

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 EU survey tool, which cannot be increased.

Whereas Section

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 HVDC Whereas section, including new recitals

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
(1)		
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		
(13)		
(14)		
(15)		
(16)		
(17)		
(18)		
(19)		

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

	Text amendment proposal (if applicable)
New recital	

Definitions (Article 2)

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)[deleted]		
Article 2(2)		
Article 2(3)		
Article 2(5)[deleted]		
Article 2(6)[deleted]		
Article 2(4)		
Article 2(5)		
Article 2(6)		
Article 2(7)		
Article 2(8)[NEW]		
Article 2(9)[NEW]	<p>Interface Point - Under the new definitions, the HVDC 2.0 Code removes the definition of “HVDC Interface Point” and replaces it with the term “Interface Point”. In GB we already use the term “Interface Point”, which is the boundary between an Offshore Transmission System and Onshore Transmission System. In Europe the new definition of Interface Point is defined as “the AC interface of an isolated AC network at which technical specifications affecting the performance of the relevant equipment can be prescribed as specified by the relevant system operator and as identified in the connection agreement”, which in summary is the connection point between an isolated AC network behind an HVDC System. We would request that the ACER Proposal of Interface Point is changed to another term as long as it is not exactly the same as “Interface Point”</p>	<p>A term such as “HVDC Interface Point” or “Interface Connection Point” or alternative would be more appropriate</p>

Article 2(10)[NEW]		
Article 2(11)[NEW]		
Article 2(12)[NEW]		
Article 2(13)[NEW]		
Article 2(14)[NEW]		
Article 2(15)[NEW]		
Article 2(16)[NEW]		
Article 2(17)[NEW]		
Article 2(18)[NEW]		

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

	Text amendment proposal (if applicable)
New definition	Propose the definition of Interface Point is changed to another term as long as it is not the same as Interface Point

Please upload figures or tables if necessary
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TITLE I - GENERAL PROVISIONS

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		
Article 3	<p>Article 3 (7) - Notwithstanding the requirements of Article 3(7) we note the requirements of the Regulation apply to the AC side of HVDC Systems. We assume that means both ends of the HVDC System including isolated systems and it would be helpful if this was clarified. It is unclear how the obligations of the HVDC Code apply if one country is a Member State and the remote end HVDC connection point is located in a Non-EU Member State. This could also be challenging where a plant is connected behind an HVDC System in a Non – Member State’s jurisdiction but will be influenced by the overall design of the HVDC System, in particular requirements such as frequency, voltage and controller requirements. It is also unclear how the requirements apply to HVDC Systems and DC Connected Power Park Modules connected prior to the introduction of the EU Connection Network Codes, HVDC Systems and DC Connected Power Park Modules caught by the requirements of HVDC 1.0 and the requirements applicable to plants caught by HVDC 2.0 – please also see our comments on Article 85a.</p>	

Article 4	<p>Article 4(1)(c) - Except for Article 26 (post fault active power recovery), Article 31 (sub-synchronous torsional interaction damping capability), Article 33 (HVDC System Robustness) and Article 50 (Power Quality) the requirements of HVDC 2.0 do not apply to existing HVDC Systems unless:-</p> <p>the existing HVDC System or plant connected behind an HVDC System has been subject to a substantive modification. These “substantive modification” changes are quite onerous and cover issues such as a percentage increase in the maximum power transmission capability, the percentage change in short circuit capacity at the end of the HVDC System, a percentage change in existing reactive power capability either from the HVDC System itself or plant connected to it, a change in components of the HVDC System or plant connected to it other than for maintenance or repair activities or a change in the underlying technology of the HVDC System. It is unclear, however, what the % change would be which necessitates a change and in some cases this could make the difference between a project being economically unviable.</p>	
Article 5		
Article 6		
Article 7		
Article 8		
Article 9		
Article 10		

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

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TITLE II - GENERAL REQUIREMENTS FOR HVDC CONNECTIONS

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 11		
Article 12	<p>Article 12 – A new section has been added on rate of change of frequency withstand capability. For HVDC Systems these are as follows:-</p> <ul style="list-style-type: none"> • ± 5.0 Hz/s over a period of 0.25 s • ± 2.5 Hz/s over a period of 0.5 s • ± 1.25 Hz/s over a period of 2 s <p>These are quite onerous and more so than RfG 2.0 and DCC 2.0. We observe that the rate of change of frequency settings are different between Synchronous Power Generating Modules, Power Park Modules and HVDC Systems. We are interested in the rationale for this, because Plant connected behind an HVDC System has a different RoCoF rate than that in RfG. We also observe the different ROCOF Settings for different plant types, which means that as soon as one class of technology trips it is then likely to lead to cascade tripping, though it is true to say that certain plant types (eg synchronous) will struggle to meet the RoCoF levels proposed for Power Park Modules and HVDC Systems. We would also note that in GB we have rate of change of frequency relays fitted to detect loss of mains but we understand the requirements of Article 12 are a plant withstand requirement not a protection setting requirement.</p>	
Article 13		
	Article 14 – Grid Forming HVDC System only – In general, the technical requirements look pretty	

Article 14

similar to RfG 2.0. We note:-

Grid Forming is not mandated on HVDC Systems or plant connected to HVDC Systems above unless specified by the TSO. This is different to RfG 2.0 where is it mandated on all plant of 10MW or above and connected via a feeder or subsidiary feeder of 110kV or above.

There is also a requirement for an inertial response to be provided without delay. In this case the contribution to inertia shall be specified in accordance with paragraphs (1)(b)(iv) (the TSO specifies the relevant dynamic performance of the HVDC System) and (1)(c)(iv) (the TSO in agreement with the HVDC System Owner shall specify the relevant dynamic performance of the HVDC System and its associated performance parameters). "The inertia shall be provided with a damped system response and the energy needed for this function shall be coordinated with sources external to the HVDC system and if applicable within the isolated AC network's design and operational limits". We are concerned with this clause. HVDC Links are very fast acting and have the capability to use the remote end System (eg Synchronous Area) as the equivalent of an infinite battery. This means that any phase change on one side results in an instantaneous supply of MW from the other, which does present some significant system risks. Potential alternatives to this include the energy storage for inertia being provided by either storage installed within the link itself or by a bespoke third party. The problem is that with multiple Interconnectors, there is a risk that a blackout in one synchronous area could take the

We would propose the wording is changed so that the clause in red above is changed to the blue text as follows:- "The inertia shall be provided with a damped system response and the energy needed for this function shall be specified by the TSO which, if applicable, shall be within the isolated AC network's design and operational limits".

	remote synchronous area with it as a direct result of this requirement	
Article 15		
Article 16		
Article 17		
Article 18		
Article 19		
Article 20		
Article 21		
Article 22		
Article 23		
Article 24		
Article 25		
Article 26		
Article 27		
Article 28		
Article 29		
Article 30		
Article 31		
Article 32		
Article 33		
Article 34		
Article 35		
Article 36		

Article 37	Article 37 – Black Start – We note that there is no change to the Black Start requirements between HVDC 1.0 and HVDC 2.0. We would note that any updates to the Emergency and Restoration Code should not include technical requirements as these will need to be included in the Connection Network Codes including HVDC 2.0 rather than the revised version of the Emergency and Restoration Code.	
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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 III - REQUIREMENTS FOR ASYNCHRONOUSLY CONNECTED
POWER PARK MODULES, ASYNCHRONOUSLY CONNECTED
DEMAND FACILITIES, ASYNCHRONOUSLY CONNECTED POWER-TO-
GAS DEMAND UNITS, ASYNCHRONOUSLY CONNECTED
ELECTRICITY STORAGE MODULES AND REMOTE-END HVDC
CONVERTER STATIONS**

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 38		
Article 39	<p>Article 39(1)(b) – We believe the word “control areas” should be changed to “control area”.</p> <p>Article 39(3) remote end plant is required to withstand a rate of change of frequency of +/- 2Hz /s as an average of the rate of change of frequency for the previous 1 second – This is different to the proposed wording for RfG 2.0 so could be a mistake.</p>	Article 39(1)(b) Change the word "Control Areas" to "Control Area"
Article 40		
Article 40a[NEW]	Article 40(a) – there are now new provisions for the fault ride through capability of power to gas units (eg Hydrogen Electrolysers) - This is very welcome and necessary from a System perspective though we note that hydrogen electrolysers may have a problem with fault ride through capability which is an issue the industry will need to address.	
Article 40b[NEW]		
Article 41		
Article 42		
Article 43		
Article 44		
Article 45		
Article 46		
Article 47		
Article 48		
Article 49		

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

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TITLE IV - INFORMATION EXCHANGE AND COORDINATION

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 51		
Article 52		
Article 53		
Article 54		

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 V - 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

	Comment on the ACER draft amendments	Alternative text amendment proposal (if applicable)
Article 55		
Article 56		
Article 57		
Article 58		
Article 59		
Article 60		
Article 61		
Article 62		
Article 63		
Article 64		
Article 65		
Article 66		

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 VI - COMPLIANCE

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 67		
Article 68		
Article 69		
Article 70		
Article 71	<p>Article 71 – Compliance Testing for HVDC Systems – there are no specific tests for Grid Forming on HVDC Systems if specified by the TSO. The same comments were noted as part of the RfG 2.0 Consultation. We do understand there is a group in Europe looking at this issue but it is worth noting as part of this consultation.</p>	
Article 72	<p>Article 72 – Compliance testing for asynchronously connected power park modules, asynchronously connected demand facilities, asynchronously connected power to gas demand and asynchronous electricity storage modules. Most of this section refers to compliance testing for asynchronous power park modules and asynchronous electricity storage modules, which then refers back to RfG 2.0. It should be noted that under RfG 2.0 there are no specific compliance tests for Grid Forming even though it is mandated in RfG 2.0. There is very little detail on compliance testing for asynchronously connected demand and we would question whether that is the intention of the drafting. We do understand there is a group in Europe looking at this issue but it is worth noting as part of this consultation.</p>	

Article 73	Article 73 - Compliance simulations for HVDC Systems – If Grid Forming has been specified there are no specific simulation tests for simulating Grid Forming capability. We do understand there is a group in Europe looking at this issue but it is worth noting as part of this consultation.	
Article 74	Article 74 Compliance simulations for asynchronously connected power park modules, asynchronously connected demand facilities, asynchronously connected power to gas demand and asynchronous electricity storage modules. Most of this section refers to compliance simulations for asynchronous power park modules and asynchronous electricity storage modules, which then refers back to RfG 2.0. It should be noted that under RfG 2.0 there are no specific compliance simulations for Grid Forming even though it is mandated in RfG 2.0. There are no requirements for compliance simulations for asynchronously connected demand and we would question whether this is the intention of the drafting. We do understand there is a group in Europe looking at this issue but it is worth noting as part of this consultation.	
Article 75		

Article 76	<p>Article 76 – Monitoring – In GB we are not bound by monitoring requirements, which is a process by which TSOs need to demonstrate they have complied with the requirements of the Regulation. We note a new clause has been added which states “ACER, in cooperation with ENTSO for Electricity, shall maintain a public online repository where relevant national information regarding the progress of implementation of this Regulation shall be made available. The information to be made available shall at least include legal texts, implementation monitoring files, summaries of all the proposals for non exhaustive requirements, TSO and DSO requirements and compliance tests and process to be performed and links to the national implementation websites” It is not clear to what level of detail the information should be supplied noting this is quite an onerous requirement and whether or not issues of confidentiality have been considered, bearing in mind Generators will supply confidential data to us as the GB TSO, which is not permitted to be released to other parties and especially not in the public domain.</p>	
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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 VII - DEROGATIONS

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 77		
Article 78		
Article 79		
Article 80		
Article 81		
Article 82		
Article 83		

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 VIII - FINAL PROVISIONS

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 84		
Article 85		
Article 85a[NEW]	<p>Article 85a – Repeal – It is still unclear to us what requirements apply to pre HVDC 1.0 Systems, HVDC Systems caught by HVDC 1.0 and HVDC Systems caught by HVDC 2.0 especially noting that some projects have a 7 year build period. This could be difficult for developers and TSOs to follow and we believe further clarity is required in this regard.</p>	
Article 86		

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

Annex I - Frequency ranges referred to in Article 11

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)
Annex I		

Please upload figures or tables if necessary

The maximum file size is 1 MB

Annex II - Requirements applying to frequency sensitive mode, limited frequency sensitive mode overfrequency and limited frequency sensitive mode underfrequency

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)
Annex II		

Please upload figures or tables if necessary

The maximum file size is 1 MB

Annex III - Voltage ranges referred to in Article 18

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)
Annex III		

Please upload figures or tables if necessary

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Annex IV - Requirements for U-Q/Pmax-profile referred to in Article 20

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)
Annex IV		

Please upload figures or tables if necessary

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Annex V - Voltage-against-time-profile referred to in Article 25

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)
Annex V		

Please upload figures or tables if necessary

The maximum file size is 1 MB

Annex VI - Frequency ranges and time periods referred to in Article 39(2)

(a)

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)
Annex VI		

Please upload figures or tables if necessary

The maximum file size is 1 MB

Annex VII - Voltage ranges and time periods referred to in Article 40

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)
Annex VII		

Please upload figures or tables if necessary

The maximum file size is 1 MB

Annex VIII - Reactive power and voltage requirements referred to in Article 48

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)
Annex VIII		

Please upload figures or tables if necessary

The maximum file size is 1 MB

Other additional provisions

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

	Text amendment proposal (if applicable)
Other new provisions	

Please upload figures or tables if necessary

The maximum file size is 1 MB

Useful links

[more info on ACERs HVDC public consultation \(https://www.acer.europa.eu/documents/public-consultations/pc2024e05-public-consultation-amendments-electricity-grid-connection-network-code\)](https://www.acer.europa.eu/documents/public-consultations/pc2024e05-public-consultation-amendments-electricity-grid-connection-network-code)

Background Documents

[ACER_draft_amendment_proposal_NC_HVDC_for_PC_2024_E_05.docx](#)

Contact

ACER-ELE-2022-015@acer.europa.eu