**ACER CONSULTATION EUROPEAN HVDC 2.0 NETWORK CODE**

**NATIONAL GRID ESO COMMENTS**

1. We acknowledge that GB is no longer a EU Member State, and will not be bound by the requirements of the HVDC 2.0 Network Code, however as a neighbouring TSO we are taking the opportunity to respond to the consultation., and we hope you find these comments helpful.
2. 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”. A term such as “*HVDC Interface Point*” or “*Interface Connection Point*” or alternative would be more appropriate. The problem is that in GB we have used the term Interface Point for many years and the use of the same term in Europe but with a different meaning is going to create confusion for many developers.
3. 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.
4. 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:-

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.

1. Article 12 – A new section has been added on rate of change of frequency withstand capability. For HVDC Systems these are as follows:-

• ±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

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.

1. Article 14 – Grid Forming HVDC System only – In general, the technical requirements look pretty similar to RfG 2.0. We note:-
   1. 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.
   2. 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 remote synchronous area with it as a direct result of this requirement. 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 ~~coordinated with sources external to the HVDC system~~ specified by the TSO which, ~~and~~ if applicable, shall be within the isolated AC network’s design and operational limits”*
2. 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.
3. Article 39(1)(b) – We believe the word “control areas” should be changed to “control area”.
4. 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.
5. Article 40(a) – there are now new provisions for the fault ride through capability of power to gas units (eg Hydrogen Electroylsers) - 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.