

Question No.	Question	Response
1	In WP3, the document specified the minimum number of HVDC converters and STATCOMs but there is no mention of the minimum number of synchronous generators (SG) or the grid conditions (low inertia, weak grid). Also, there is no mention if the SG models will be provided. Can you clarify this point?	<p>This can be agreed with the TWG-E and proposed by the bidder. A suggestion may be 2-3 in close vicinity.</p> <p>SG Models can not be provided by the TWG-E. The contractor is expected to obtain and use generic models which are suitable to complete this type of study.</p>
2	According to the document, Carbon Trust will provide the models for the study. In case we have questions about the models, is support going to be provided? Are the provided models black box or fully transparent?	<p>Documentation on the use of models can be provided by Carbon Trust and the TWG-E. Further detail of the models can not be provided at this stage; however, the bidder can assume that some clarity can be provided at a later stage.</p> <p>These are fully transparent.</p>
3	In WP3, a study on “transformer saturation during energisation” is mentioned. Does it mean that black-start studies are expected?	<p>Within the scope of works, black-start studies are not expected. This statement refers to energisation of adjacent HVDC wind farm transformers.</p>
4	To define a detailed list of studies, we would like to know the control models of the provided converter models. Can you please provide this information?	<p>The models are capable of: voltage control, power factor control, negative sequence current control, positive sequence current control, circulating current suppression control.</p>
5	As stated in WP2, CT will provide the multi-vendor HVDC & WTG PSCAD models to the consultant. Please advise how these models will be provided as a black box or open models?	<p>See Question 2.</p>
6	<p>Please confirm if the below information/data shall be provided to the consultant,</p> <ul style="list-style-type: none"> <li>- The network model representing the network strength for the current and planned future</li> <li>- For Multi-infeed interaction calculation, MVA value of HVDC links and FACTS devices (at least indicative values)</li> </ul>	<ul style="list-style-type: none"> <li>- For the network model mentioned, the TWG-E expects information found within the public domain. The TWG-E may obtain some models from national grid; however, this is not guaranteed. Carbon Trust can provide guidance on which areas to look at for information.</li> <li>- For multi-infeed interaction calculation, the MVA value of HVDC links and FACTS devices (or indicative values) can be provided</li> </ul>

	<ul style="list-style-type: none"> <li>- For SSTI screening, SCC level of generators (at least indicative values)</li> <li>- For SSTI detailed study: generator and step up transformer detailed information (datasheet) shall be provided. For the generators, it is highly recommended to provide power system stabilizer model and parameters (if exists), turbine and governor model and parameters, excitation system model and parameters. Generator mechanical parameters such as number of turbine masses, diagram showing the inertia and parameter of each turbine generator mass for the complete drive train, diagram showing stiffness constants and parameter between each turbine generator mass for the complete drive train, number of poles and torsional mode frequencies (Hz) should also be requested.</li> </ul>	<ul style="list-style-type: none"> <li>- For SSTII screening, the SCC level of generators (or indicative values) can be found from a variety of sources. The contractor could refer to the Electricity Ten Year Statement by National Grid.</li> <li>- For the last point mentioned, the bidder should make suitable generator assumptions. This cannot be provided in full detail. The contractor should propose assumptions and then agree those with TWG-E.</li> </ul>
7	<p>“Harmonic resonance in AC voltages” and “Harmonic interaction between HVDC converters” are listed in WP3 as part of key simulation studies. However, they were not mentioned in WP1 and WP2. Do we need to consider these topics during literature review as well?</p>	<p>For these two aspects listed as key simulation studies, the bidder should look at these factors within their literature review.</p>
8	<p>It is stated in WP2 that “two of HVDC converters shall be connected to the same node”. However, it may be more realistic to have the HVDC converters connected to different buses which are in close vicinity to each other.</p>	<p>The TWG-E suggests that the contractor should consider a setup with two HVDC converters connected to same node; with one other in close vicinity.</p>
9	<p>With respect to the multi-vendor HVDC models to be provided, are they compatible in terms of simulation time step and Fortran compiler versions? Otherwise, it may be difficult to integrate them together.</p>	<p>Time step – micro second. Compiler versions include gf42, gf46, and if9.</p>

10	It is not clear if only HVDC-connected wind farms should be studied. Should the study also include control interactions with large wind farms that are AC-connected?	The bidder may choose to study this if there is sufficient data and may include this within their ITT response.
11	Under WP2 (page 10) it says “ The successful contractor should identify data/sources of data for synchronous generation operation” . This is not clear.  1) What data is meant? 2) Is it expected that contractor will obtain all data (from third parties) within the project?	See Question 6.
12	Does the total expected budget include the optional WP4 and WP5?	The bidder should assume that the expected budget includes all optional work packages.
13	In WP2: it is stated that the test case should include “minimum 3 HVDC converters” -> please confirm that it is 3 HVDC links. Also does all 3 HVDC links are with OWF connections?	The bidder should assume that this statement means that there are three HVDC connected offshore wind farms.
14	In WP3: it is stated "The contractor should make specific use of the already developed multivendor HVDC models and WTG models from previous work conducted by the TWG-E."  - Is it possible to provide both HVDC and WTG models during tender phase?	See Question 2.
15	Does thus HVDC models and WTG models will be provided as a “as-build HVDC-OWF system” or the contractor should integrate the HVDC and WTG models	The TWG-E will only provide the onshore and offshore HVDC connector model and a suitable model to connect a windfarm at 66 kV level. The contractor is expected to integrate WTG models.

	within the same PSCAD workspace and build the HVDC-OWF system?	
16	Does the provided HVDC model includes already the power oscillation damping control or should this control be developed within this contract as an additional work?	The WTGs in the model include a frequency-based power reduction feature that allows them to reduce their outputs based on the respective profile
17	In a HVDC-OWF system, frequency control may be implemented in two different approaches: direct communication is sent from the SO to the OWF WPP control and/or communication is sent from the onshore converter station to the offshore converter station that acts on offshore grid frequency to mimic the onshore grid frequency. Such two different approaches can be both be implemented in a real HVDC-OWF system. Does the HVDC system that will be provided by the TWG-E, includes already one or both approaches?	The TWG can confirm that the HVDC system that will be provided is a system which sends communication signals from onshore to offshore. This effectively emulates a communication link with a reasonable delay.
18	Can TWG-E confirm that the HVDC models that will be provided includes also the FRT function? And is already valid for AC fault performances?	The TWG-E understands that the HVDC models include the FRT function and includes AC fault performances.
19	The following sentence is not clear: “The successful contractor should develop a scope to provide to the TWG-E that will identify the methodology to study CI & SSTI for HVDC connected OWFs.” -> who will provide the methodology to study CI and SSTI? Is the contractor or the TWG-E?	The contractor should provide the methodology, and should expect discussions with the TWG-E on the proposal.

20	In WP2 and WP3: several network configurations can exist, and this can lead to a high number of configurations/cases to be considered. Should the contractor propose one main configuration?	The bidder should expect discussions on this matter with the TWG once contract has been awarded. During bid stage, the bidder is free to propose their approach to this.
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