Analysis of Flange Tolerance Relaxation and Shimming on Large Diameter Bolted Connections- Clarification Questions and Responses

ID	Document Reference	Questions	Responses
1	Description of tender section 4	Does the Carbon Trust/OWA see any benefit of physical testing to validate the FE works and the impact of shimming?	The scope of the proposed project is analytical only; physical testing is not anticipated.
2	Description of tender section 4	What software/ format is acceptable for the project to be conducted in, it is assumed that standard industry software such as ABAQUS/ANSYS would be acceptable?	Standard industry software, such as ABAQUS/ANSYS or other similar validated software, typically used for FE analysis is acceptable.
3	Description of tender section 4	Is there any requirement to provide models or analysis setups as part of deliverables for the project?	Deliverables should describe the modelling approach adopted and the resulting outputs, however models are not required as deliverables. This project could however provide a good opportunity to review the FE model.
4	Description of tender section 4	Is there any interest from the Carbon Trust/OWA to investigate alternative fabrication processes to mitigate flange fabrication challenges?	If the consultant identifies value in alternative methodologies as a mitigation, these can be discussed in WP4. We know that flatness tolerances can differ quite a lot between fabricators, so analysing this would add benefit to the project.
5	Description of tender section 3	Annex 2 is referred to (p7, section 3.2.i) but it is not included in pdf file "OWA_S4_AFToR_ITT_Description-of-Tender_v1(f)_20210512_0". Please provide Annex 2, or details of the format required for the Work Package descriptions.	The annex 2 reference is an error. What it should reference is the scope of works table provided at the end of Section 4. The bid document should detail the bidder's proposed approach to work using work packages defined within this table as a guide. We do not have specifications on how to layout your approach to work.
6	Description of tender section 4	Would the TWG Foundations group or OWA partners provide the dimensions of the flanges to be modelled in WP2?	The contractor should assume flange details typical of current generation WTGs or MP/TP connections. OWA members may be able to provide details, however this shall not be relied upon to progress the studies. We will agree on a base-case geometry including flange diameters, flange cross-sections, bolt sizes,

			pretension level and number of bolts, before the work commences.
7	Description of tender section 4	Would the actual stress spectra to be modelled be provided? (Is this what is meant by the phrase 'under advised tension' in the description of WP2 in Section 4?)	The contractor shall assume loading regimes representative of current generation WTGs. The OWA shall comment on these loads and may be able to provide representative loading, but this shall not be relied upon to progress the studies. We will agree on a base-case setup regarding soil, diameters, water depth, WTG and location for typical fatigue load input prior to project commencement.
8	Description of tender section 4	Is there a design envelope of MP, TP and tower geometries of most interest to Carbon Trust? E.g. range of flange diameters, flange thicknesses, TP/tower wall thickness, bolt sizes, etc. This may also include values that are currently not in production, but are envisaged for future designs.	The studies shall consider geometries typical of current generation WTGs and MP/TP designs. The contractor may propose near future WTGs and MP/TPs where these assumptions are considered reliable. An example of interesting dimensions could include: • Flange diameters: 7-8m • Partial flange height: 170-220mm • Bolt size: M64, M72 and M80
9	Description of tender section 4	Would Carbon Trust provide information on what specific of flange tolerance challenges with the current state-of-the-art are of interest to them. Examples include: - Flange mating surface flatness - Bolt hole location and form - Tower/TP wall to flange circular runout, etc.	The study shall consider all tolerances as required by design standards relating to WTG/TP and MP/TP flanges that may impact on ULS and FLS design capacity. However, surface flatness should be specifically considered.
10	Description of tender section 4	Is there a preferred FEA software names list Carbon Trust could share with Contractors?	Standard industry software, such as ABAQUS/ANSYS or other similar validated software, typically used for FE analysis is acceptable.
11	Description of tender section 4	Is the final Summary Report D05 made in a format specific to the Contractor, Carbon Trust, or even published as a White Paper document?	The contractor can suggest their preferred format.